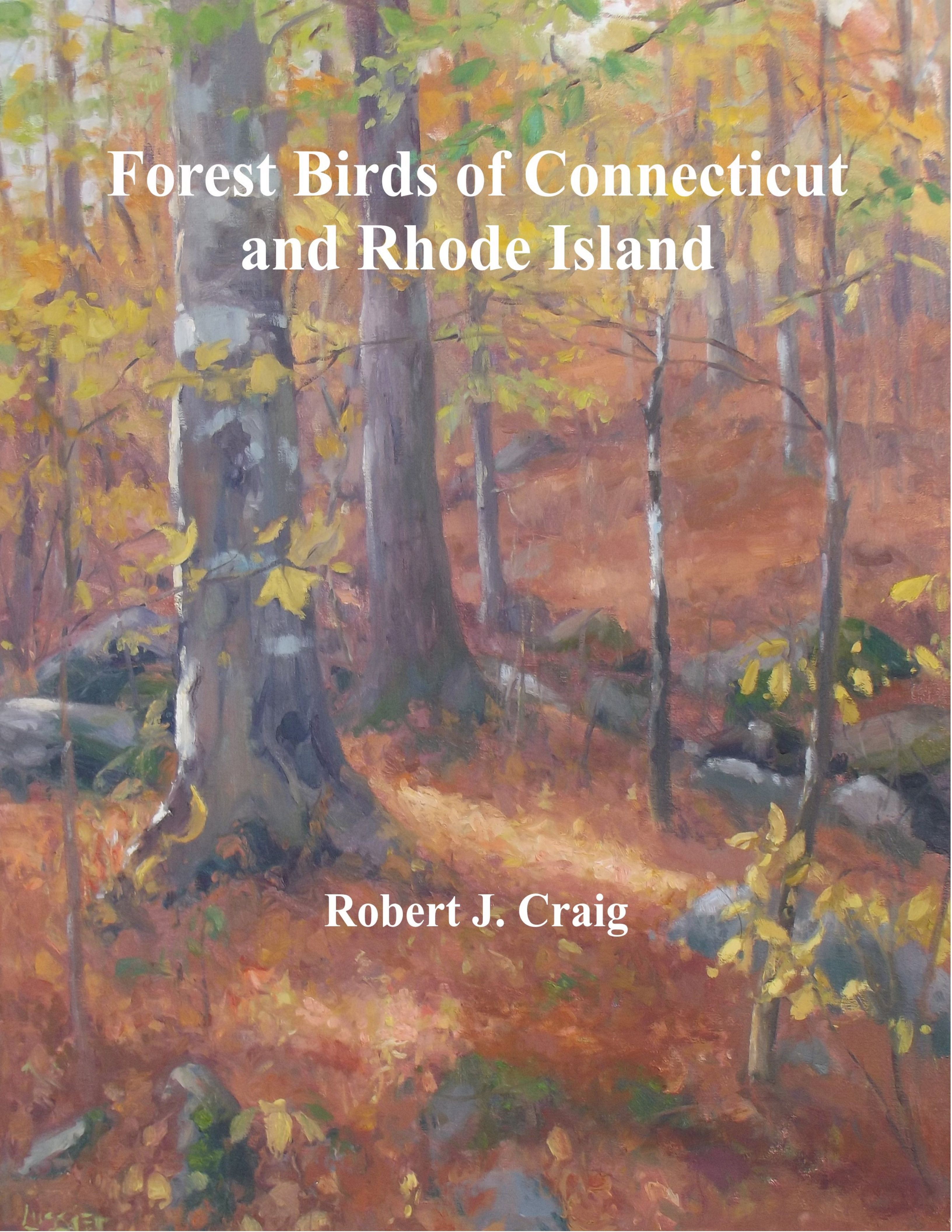

Forest Birds of Connecticut and Rhode Island

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Foreword

The idea for this study traces it origin to 1982, when a Connecticut breeding bird atlas was first being envisioned. At that time, I initiated a discussion with colleagues about going beyond a traditional atlas project and including in it not only distributional but also habitat and population data. I argued that without such data, the atlas would have limited utility. I did not convince my colleagues, although I continued to hold out hope that conducting a more comprehensive survey would at some point be possible.

To lay the groundwork for a fully quantitative effort, in 1985 I began a pilot study in northeastern Connecticut that involved using the relatively simplistic strip transect approach to surveying (Craig 1987). It performed reasonably, but with the development of variable circular plot methods and the expansion in microcomputer technology during the 1980s, the complex computations associated with this new and more powerful approach became manageable. The variable circular plot possessed utility across a variety of terrains, had the ability to survey large areas efficiently, could account for differential species detectability and had otherwise substantial theoretical underpinnings. Hence, it became the tool I chose for conducting the type of surveys I envisioned (Craig et al. 1992, Craig 1996) and it is the backbone of the present study.

Based on data gathered in this investigation, the distribution, patterns of population density and habitat associations of all forest bird species in Connecticut and Rhode Island are presented. Elucidation of these patterns, both for the forest bird community as a whole and for the individual species that make it up, provide a basis for understanding the ecological processes that drive distributions across entire landscapes. They further provide conservationists with a comprehensive overview of forest bird resources of the region.

Despite the enormous volume of data gathered for this work, the research presented is still one of snapshots in time. It may be thought of as a starting point, and not yet a complete statement, for understanding the patterns and processes at work in forest bird communities.

Still another fundamental aspect of this project has been its use as a teaching tool. An entire generation of students worked with me on every phase of this project, from censusing to habitat characterization to the development of data spreadsheets to statistical analyses to formulating conclusions. My belief is that students best learn to become scientists by investigating, under tutelage, actual scientific questions. I propose this approach as a model for science education.

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INTRODUCTION

Connecticut and Rhode Island have entered the 21st century with their natural landscapes remarkably intact despite their dense human populations. Some of the greatest remaining expanses of forest from Washington to Boston characterize these states (Rosenberg et al. 1999), particularly the forests of eastern Connecticut−western Rhode Island and northwestern Connecticut. However, the region is rapidly growing (Connecticut Office of Policy and Management 2002), and within a generation this landscape is likely to become fragmented and urbanized. Hence, it is left to the present generation to make critical decisions about the future persistence of the region's natural =features. Because sound conservation decisions must be based on substantive data, a key goal of this investigation is to provide a quantitative database for the region's forest avifauna.

In addition to providing such a database, broad scale studies permit investigation of ecological processes that operate across whole landscapes. Scale is a critical issue in interpreting ecological phenomena in that differing community processes may act at differing scales. Ecological studies conducted at the landscape level typically show, for example, greater stability in populations and species composition than they do at smaller scales. Dynamic processes that involve regional microhabitat patchiness are also best revealed by broader investigations. Moreover, greater insights may be obtained into species-habitat relationships when a broader perspective is employed, because species that use multiple microhabitats are better characterized by them (Wiens 1989).

Historical background. The avifauna of Connecticut and Rhode Island has been reviewed by Linsley (1843), Merriam (1877), Howe and Sturtevant (1899), Sage et al. (1913), Mackenzie (1961), Manter (1975), Zeranski and Baptist (1990), and Clark (1999). Furthermore, Dowhan and Craig (1976) and Craig (1979) reported on the historic distribution and conservation status of rare Connecticut birds. Principal large-scale studies of the region's birdlife include works by Askins et al. (1987), Craig (1987, 1990), Ferren (1998), Craig et al. (2003) and Craig and Klaver (2013). In addition, Breeding Bird Surveys (U.S. Fish and Wildlife Service), Christmas Counts (National Audubon Society), and Summer Bird Counts (e.g., Zeranski and Purnell 2001) have yield information on the relative abundance of birds in southern New England.

The most complete previous sources for summer bird distributions are Rhode Island (Enser 1992) and Connecticut (Bevier 1994a) breeding bird atlases. The strengths of these atlases are in their documentation of the local presence of species, particularly rare species, because they employ numerous observers working over extensive areas. They also provide broad scale confirmation of breeding. However, as with other large-scale surveys, they have weaknesses (James et al. 1996, Thomas 1996). Bevier (1994) observed that in Connecticut, level of survey effort varied among locations and, consequently, particularly absence data must be interpreted with caution. Moreover, differences in observer experience are a potentially large but unquantified source of data variance (Davis 1981, McDonald 1981, Farmer et al. 2012).

Scope. In this volume, I extend these earlier works by mapping the population density of forest birds inhabiting Connecticut and Rhode Island. For each species, I also estimate total populations, provide quantitative evaluations of habitat affinities and examine variance in populations. I further relate landscape−level variation in habitats with geographic patterns of population density and distribution.

METHODS

THE ENVIRONMENT

Physical environment..- Much of Connecticut and Rhode Island are characterized by a bedrock geology of gneisses, schists and granites, although sandstones predominate in central Connecticut, marble exposures pass through northwestern Connecticut and significant exposures of carboniferous rock, including coal seams, pass through Rhode Island. These are overlain in numerous locations by glacial sediments of varying depths (Stone et al. 1999) and major drainages are characterized by glacial outwash (Ilgen et al. 1966, Roberts 1981). Eastern Connecticut and Rhode Island are in particular covered with extensive deposits of glacial sand and gravel associated in part with recessional moraines (Hickox 2012).

The interplay of chemical and physical weathering, as well as glacial events on these parent materials, have yielded soils of varying but frequently poorer quality. One of the principal agricultural values of many of the local soils, e.g., Brookfield-Brimfield, Charlton-Hollis, Saco-Rippowam-Pootatuck and Charleton-Canton-Leicester, is for timber production (Ilgen et al. 1966, Roberts 1981).

Based on characteristics of its physical and biotic environments, Connecticut has been divided into 7−10 ecoegions that range from the mountainous northwestern portion of the state to low-lying coastal regions. Ecoregional boundaries vary among authors, however (Dowhan and Craig 1976, Metzler and Barrett 2006, US EPA 2013). Rhode Island has been divided into 3−4 ecoregions that range from the hilly northwestern portion of the state to the coastal plain environments of Narragansett Bay and Block Island. Ecoregion boundaries also vary among authors (Enser 1992, US EPA 2013). Conditions in both states largely represent a continuum from their northwest to southeast portions, but ecoregional subdivisions prove useful for focusing attention on regional habitat differences.

Vegetation.- Within Connecticut, forest cover varies from 74.8% in the northwest (Litchfield Co.) to 37.0% in the southwest (Fairfield Co). Rhode Island forest cover averages less than in much of Connecticut and varies from 60.3% in the north (Providence Co.) to 57.5% along the coast (Bristol-Newport-Washington Co.). In both states, the extent of forest cover is declining as urbanization proceeds (Alerich 1999, 2000).

The most widespread forest associations are those dominated by oaks, hickories and birches (Alerich 1999, Table 1). On more mesic sites (Fig. 1), Northern Red Oak (*Quercus borealis*) occurs in varying mixtures with other oaks, Shagbark Hickory (*Carya ovata*), Pignut Hickory (*C. glabra*), Black Birch (*Betula lenta*), Red Maple *(Acer rubrum*) and American Hornbeam (*Carpinus caroliniana*). Toward the south and east and in more xeric locations, Black Oak (*Q. velutina*) progressively replaces Northern Red Oak and frequently associates with Black Birch, Pignut Hickory and Red Maple. Also more common at xeric locations throughout the region are White Oak, American Chestnut (*Castanea dentata*), albeit as root-sprout saplings, and Bigtooth Aspen (*Populus grandidentata*). At the most xeric sites, particularly on sandy, glacial deposits and rocky ridges (Fig. 2), Chestnut Oak (*Q. prinus*) and Scarlet Oak (*Q. coccinea*) often become predominant. Mockernut Hickory (*C. tomentosa*), Black Cherry (*Prunus serotina*) and Sassafras (*Sassafras albidum*) join the various oak-hickory-birch assemblages, particularly toward the coast. In coastal Rhode Island and to an increasing extent in extreme southeastern Connecticut, the evergreen American Holly (*Ilex opaca*) and Smooth Holly (*Ilex glabra*) are present in the forest understory (Dowhan and Craig 1976, R. Craig pers. obs; Fig. 3).

Mesic deciduous forests of richer soils and coves (Fig. 4), are vegetated by Sugar Maple (*A. saccharum*), Red Maple, White Ash (*Fraxinus Americana*), American Beech (*Fagus grandifolia*), Yellow Poplar (*Liriodendron tulipifera*), Yellow Birch (*B. lutea*) and Butternut (*Juglans cinerea*), although oaks and hickories are common associates as well. Deciduous associations of hydric (swamp) soils (Fig. 5) are frequently dominated by Red Maple, which is joined in these situations by such species as Yellow Birch, Black Tupelo (*Nyssa sylvatica*), Black Ash (*F. nigra*), Green Ash (*F. pennsylvanica*) and Swamp White Oak (*Q. bicolor*). In coastal Rhode Island and extreme southeastern Connecticut, Rhododendron (*Rhododendron maximum*) is present locally in the understory, although the species may also be found uncommonly in western Connecticut. River bottom and floodplain communities (Fig. 6) are dominated by Red Maple, Green Ash, Black Tupelo, Swamp White Oak, Bitternut Hickory (*C. cordiformis*), American Elm (*Ulmus americana*), Slippery Elm (*U. rubra*), Sycamore (*Platanus occidentalis*), Eastern Cottonwood (*Populus deltoides*), Black Willow (*Salix nigra*) and, particularly along the largest rivers, Silver Maple (*A. saccharinum*) and Pin Oak (*Q. prinus*) (Dowhan and Craig 1976, R. Craig pers. obs).

Particularly in the north, deciduous trees of mesic environments are joined by Eastern White Pine (*Pinus strobus*) and Eastern Hemlock (*Tsuga canadensis*) to form conifer-northern hardwood associations (Fig. 7). These conifers may form nearly pure hemlock-white pine stands at mesic locations. Moreover, in cove sites associated with rivers and streams, Eastern Hemlock occurs in nearly pure groves (Fig. 8), although the

FIG. 1. Northern Red Oak-dominated forest slopes at Macedonia Brook State Park, Kent, CT.

FIG. 2. Chestnut Oak-Scarlet Oak-dominated ridgetop forest with Mountain Laurel understory at Cockaponset State Forest, Haddam, CT.

FIG. 3. Oak-dominated forest with holly understory at Great Swamp Wildlife Management Area, South Kingstown, RI.

FIG. 4. Sugar Maple-White Ash forest at Yale Forest, Ashford, CT.

FIG. 5. Coastal Red Maple-dominated wetland at Trustom Pond National Wildlife Refuge, South Kingstown, RI showing a dense Catbriar (*Smilax rotundifolia*) understory and *Usnea* lichens growing from the branches.

FIG. 6. Floodplain forest along the Connecticut River, Portland, CT. Multi-trunked Silver Maples characterize the canopy and sparse woody growth is typical of the understory

FIG. 7. Old growth hemlock-pine-northern hardwood forest at White Memorial Foundation sanctuary, Litchfield, CT.

FIG. 8. Old growth Eastern Hemlock grove at Devil's Hopyard State Park, East Haddam, CT.

FIG. 9. Pitch Pine-oak forest with huckleberry understory at Nicholas Farm Management Area, Coventry, RI.

FIG. 10. Pitch Pine-dominated ridge top forest on Mt. Misery, Voluntown, CT. Scrub Oak and Huckleberry predominate in the understory.

FIG. 11. Dead stand of Eastern Hemlock at Devil's Hopyard State Park, East Haddam, CT.

FIG. 12. Spruce plantation at Pachaug State Forest, Voluntown, CT.

FIG. 13. Eastern Hemlock-Yellow Birch-Red Maple swamp at Bigelow Hollow State Park, Union, CT.

FIG. 14. Atlantic White Cedar-dominated swamp at Pachaug StateForest, Voluntown, CT. Rhododendron (*Rhododendron maximum*) and Mountain Laurel form a dense understory in this swamp.

introduced Wooly Adelgid (*Adelges tsugae*) is presently decimating hemlock stands (Fig. 11; U.S. Forest Service 2002).

Conifer associations also may be found at xeric sites. Particularly in northern Connecticut, near the Connecticut-Rhode Island border and in southern Rhode Island, Eastern White Pine joins with oaks and hickories to form pine-oak associations (Fig. 9). Pitch Pine (*P. rigida*) is locally common at such locations and occasionally assumes dominance on sandy soils and rocky ridges (Fig. 10). Planted stands of Red Pine (*P. resinosa*), rather frequent in the region into the 1980s, are now largely eliminated as a consequence of disease and subsequent logging. Moreover, limited stands of planted Norway Spruce (*Picea abies*), White Spruce (*P. glauca*), White Fir (*Abies concolor*), Douglas-fir (*Pseudotsuga menziesii*) and European Larch *(Larix decidua*) occur occasionally (Fig. 12), primarily in State-owned forests and in Christmas tree plantations (Dowhan and Craig 1976, R. Craig pers. obs).

In hydric situations, Eastern White Pine and Eastern Hemlock may co-occur with deciduous swamp species to form conifer-swamp hardwood associations (Fig. 13). Atlantic White-cedar (*Chamaecyparis thyoides*) may occur in these mixed stands especially to the east, although it also predominates on muck and peat soils (Fig. 14). Black Spruce (*Picea nigra*) occurs as an occasional coniferous associate or, primarily in northwestern Connecticut, as a dominant bog tree (R. Craig pers. obs.).

Conifers also are important elements of successional forests. Eastern White Pine is a common to predominant member of forests regenerating after logging or abandonment. Eastern Redcedar (*Juniperus virginiana*) is also common in successional forests, with its prevalence tending to increase from north to south (Dowhan and Craig 1976).

STUDY AREAS

I established 147 transects (Fig. 15), with transects traversing about 3.2−4 km of forest depending upon terrain and other local conditions. I recorded locations, elevations of points and distances between points with a Garmin Etrex global positioning device (Garmin, Inc. Olathe, KS). Each transect had 15 survey points upon which I measured seven habitat variables. Hence, I covered ca. 515 km of forest habitat along which there were 2,205 total survey points and upon which I made 15,435 habitat measurements. Transects were situated on public land, private land with public access or on private land for which I had owner-granted access. Within this constraint, transect selection followed a randomized block protocol, with sites occupied within all geographic regions.

Habitat evaluation.- After each survey period for birds, I visually evaluated habitat variables to a 70 m radius from each sampling station: 1) forest type, 2) vegetation type, 3) moisture regime, 4) diameter of canopy trees at breast height (dbh), 5) canopy cover, 6) understory density and 7) elevation. I later revisited all sites to refine and verify these measurements.

To determine forest type, I estimated conifer cover to the nearest 10% by categorizing ca. 30 canopy trees as deciduous or coniferous. Forest type consisted of three categories: 1) deciduous: ≤10% evergreen conifers, 2) mixed: 20−60% evergreen coniferous, 3) coniferous: ≥70% evergreen conifers. Vegetation types represented major associations of tree species encountered: 1) oak–dominated (e.g., oak-hickory-birch), 2) mesic/hydric mixed deciduous; e.g., maple-birch-ash, 3) conifer (hemlock-white pine)-northern hardwood, 4) pine-oak, 5) conifer (hemlock, plantation conifers, white pine), 6) mixed sites, e.g., half xeric oak, half hydric mixed deciduous.

Moisture regimes were based on examination of soil conditions and on the presence of vegetative indicator species: 1) hydric: poorly drained or muck and peat soils dominated by swamp trees and such understory species as Sweet Pepperbush (*Clethra alnifolia*), Highbush Blueberry (*Vaccinium corymbosum*), Swamp Azalea (*Rhododendron viscosum*), Spicebush (*Lindera benzoin*), Black Alder (*Ilex verticillata*), Speckled Alder (*Alnus rugosa*), With-rod (*Viburnum cassinoides*), Cinnamon Fern (*Osmunda cinnamomea*) and *Sphagnum* mosses, 2) mesic: various silt loam and sandy loam soils dominated by such species as Eastern Hemlock, White Ash, Sugar Maple, Red Oak, Shagbark Hickory, American Beech, Hobblebush (*Viburnum alnifolium*) and Nannyberry (*V. lentago*) and 3) xeric: exposed bedrock and sandy, gravelly, and rocky soils dominated by canopy species like Chestnut Oak, Scarlet Oak and Pitch Pine, and such understory species as Huckleberry (*Gaylussacia baccata*), Lowbush Blueberry (*V. angustifolium, V. vacillans*), Scrub Oak (*Q. ilicifolia*), Post Oak *(Q. stellata*) and Bracken Fern (*Pteridium aquilinum*). In practice, I distinguished swamp sites as hydric, dry ridges and sandy uplands as xeric, and used mesic as a broader category describing intermediate situations.

I divided prevailing canopy tree dbh into three categories: 1) young forest: ≤15 cm, 2) mature forest: >15−45 cm, and 3) old growth: >45 cm. Most stands had canopy trees with ca 25−40 cm dbh, although much larger trees punctuated many. However, they only rarely occurred in sufficient numbers to classify as truly old growth. To document such older trees, I also measured their dbh with a tape.

I similarly divided canopy cover into three categories: 1) open: ≤40% cover, 2) semi-open: 50−60% cover, and 3) closed: ≥70% cover. Most undisturbed forests classified as closed, whereas selectively logged forests or stands with ≥20% forest gaps (e.g., blowdowns or dead trees) were semi-open. Open stands were generally heavily logged sites or early old field stages reverting to forest.

I evaluated understory density for larger shrubs and saplings ca 1−4 m tall rather than for low ground covers and herbaceous growth: 1) open: ≤20% cover; 2) moderate: 30−60% cover, and 3) dense: ≥70% cover. Typically, dense hemlock stands and heavily deer-browsed forests had open understories, whereas swamps and forests with semi-open canopies classified as dense. I classified situations intermediate between these as having moderate density.

BIRD SURVEYS

I used the Variable Circular Plot (VCP) technique to survey quantitatively bird populations in primarily forested landscapes. It has wide utility in evaluating populations over a variety of terrains at the landscape level (Reynolds et al. 1980, Scott et al. 1986). Moreover, it has a well-developed theoretical underpinning that permits the construction of statistical confidence intervals (CI) around population estimates (Buckland et al. 2001, Thomas et al. 2010).

I chose to survey 15 points/ transect because this number proved to be the maximum I could survey during the peak of morning bird activity (before 09:00 in summer and 10:30 in winter). Survey points were generally about 200 m apart, a distance greater than that used in other studies (e.g., Scott et al. 1986) and empirically determined to minimize detecting the same birds from two successive points. In instances where loudly vocal birds might be detected from two stations, I lengthened distances to ensure sampling individuals only once. In practice, I occasionally detected loudly vocal or widely ranging individuals at two stations. In such instances, I entered their presence into calculations for only the first station of encounter.

I estimated at each sample point the horizontal distance at first detection to all birds encountered. The vast majority of detections were aural, and I distinguished between detections of singing, territorial males and vocalizations by species not generally distinguishable to sex. My sampling period at each station was eight minutes, a time used frequently in VCP surveys (e.g., DeSante 1981, Scott et al. 1986). It is a period short enough to approximate an instantaneous count (minimize movement of birds), yet long enough to record adequately all birds present. I occasionally detected rarer bird species, particularly raptors, outside this sampling period. If I found no other individuals during the survey, I included such detections in my survey, reasoning that doing so yielded a more accurate representation of true species richness.

Routes began at first light (ca. 05:15 in summer, 07:00 in winter) and lasted ca. 3.5−4 h. I performed surveys under conditions of low wind and at most minimal precipitation. Survey routes followed existing hiking trails where possible in order to travel expeditiously between points and to re-locate easily survey points. Except for old logging roads that did not break the forest canopy, I avoided using forest roads. When no paths were available, I followed compass bearings through the forest.

I limited my summer field observations to between 20 May and 5 July, the height of the local breeding season for forest birds, to minimize alteration of survey results due to behavioral changes (Skirvin 1981). Similarly, I limited my winter observations from mid-December to the end of February, the heart of the local winter season. To determine whether surveying in this way was sufficient to avoid seasonal changes in results, I plotted my survey data vs. the order of survey.

I surveyed transects in random order in northeastern Connecticut during the summer of 2001 and winter of 2001−2002. I surveyed in southeastern Connecticut in 2002−2003, and I repeated these observations in 2004−2005 and 2005−2006, for northeastern and southeastern Connecticut, respectively. I surveyed Rhode Island in 2003−2004, central Connecticut in 2006−2007, northwestern Connecticut in 2007−2008 and southwestern Connecticut in 2008−2009. The size of these regions varied, so the number of transects established in each region also varied, such that sampling intensity was similar for each region.

Although I recorded all birds encountered regardless of habitat affiliation, in analyses I considered only those species associated with forest. I broadly defined such species as those that inhabit 1) unbroken forest, 2) forest openings caused by tree fall or selective logging, 3) closed to partly open swamps, and 4) forested river banks. These constituted principal habitat patch types within the broader category of forest landscape, with the last three often referred to as forest gaps. I did not include in detailed analyses species that were associated primarily with marshes, shrub swamps, extensive fields, large clear-cuts, open water, or species detected flying high overhead, whose presence was unrelated with the forest environment. Hence, species like the Willow Flycatcher (*Empidonax traillii*) and Yellow Warbler

(*Setophaga petechia*), were associated almost exclusively with summer marsh shrubbery and were excluded from analyses, whereas the Tree Sparrow (*Spizella arborea*), also associated with marsh shrubbery, occupied open forests in winter as well, so it was included in analyses. Excluded species are, however, described briefly in a separate section of this report.

The use of the VCP technique is limited to those individuals with advanced identification skills and experience estimating distance of sounds over a variety of terrains. Even with such constraints, observer differences in perception can be great (Davis 1981, Campbell and Francis 2011, Farmer et al. 2012). Hence, in this study I alone observed to eliminate this source of variance. My experience with this technique dates to 1971. Furthermore, to maximize consistency in distance estimation, during each survey I directly measured the distance to at least several vocalizing birds.

ANALYSIS

Model.- I calculated population estimates from my field data with Distance 6.0 software (Thomas et al. 2010). I followed the recommendations of Buckland et al. (2001) in developing a protocol for choosing a detection function that best approximated the characteristics of my detection distances. Choosing the model was an iterative process, involving exploratory data analysis and progressive refinements of the analysis to yield a model that best predicted density with minimized variance. Based on initial plots of detection probability vs. detection distances for each species, I grouped similar distance observations, often into five to eight categories, to minimize data "heaping" in detection distances and to improve the robustness of density estimation. I sought cut points for these intervals that were between favored rounding distances. I further truncated detection data to eliminate the largest 5−10% of values, thereby facilitating model fitting by eliminating outliers. I sought a model that yielded a smooth curve with near 100% detection probability at the left shoulder.

I next explored the fit of detection data to six models recommended by Buckland et al. (2001): uniform/cosine, uniform/simple polynomial, half normal/cosine, half normal/hermite polynomial, hazard rate/cosine and hazard rate/simple polynomial. I evaluated model fit by visual inspection of plotted data, with Akaike's Information Criterion and with chi-square goodness of fit tests. Once I chose the best-fitting model, I computed population density and empirically estimated its variance.

In instances where species occurred in flocks, e.g., Black-capped Chickadee (*Poecile atricaipilla*), I performed analyses with bird flocks (clusters) as the basis of measurement. I tested whether the size of clusters was increasingly underestimated with distance, and adjusted analyses to account for any distance effects (see Buckland et al. 2001).

Model fitting is most effective for species in which >60 distance estimations have been made. Because my sample sizes were large, most species had detection frequencies adequate for conducting Distance analyses. For species occurring infrequently, I made the best estimates that my data permitted. However, estimates obtained refer to densities only *within* forest habitats. For species occurring solely in forests, these computations also refer to their regional values. However, for species occurring in additional habitats (e.g., Gray Catbird, *Dumatella carolinensis,* which inhabits forest gaps as well as other more open landscapes), the computations refer only to their values within primarily forested landscapes.

Population variance.- Data gathered during this survey may be thought of as generating single season snapshots of regional populations. To gain perspective on my observations with respect to within year sampling variance and population changes between years, I performed a duplicate survey of a transect from the same and previous years during each year of the study. I also duplicated the northeastern and southeastern Connecticut surveys during separate years. When I report overall densities of species, these should be interpreted as not only averages of individual transect values, but also as averages of densities over the eight-year duration of the study.

I further examined variance and population trends in Breeding Bird Survey data (Sauer et al. 2014) to gain additional perspective on summer observations. This survey generates data that are not habitat-specific and concern relative rather than absolute abundance, but annual changes in Breeding Bird Surveys provide a gross indication of long-term population fluctuations (Geissler and Noon 1981, Craig 2005). I examined data from 1966 to 2013 for the United States and from the New England-mid Atlantic region. For analysis of variance and population trends in winter populations, I analyzed birds/ party hr data from Christmas Counts (http://netapp.Audubon.org/CBCOObservation/Historical/ResultsBySpecies.aspx?1), also from 1966−2013, for consistency with analyses from the Breeding Bird Survey. I examined winter data from the entire United States and from New England.

Data from these large-scale surveys generally did not adhere to parametric statistical assumptions, so I sought correlations between populations and years with Kendall's τ statistic. When data met parametric assumptions, I performed regression analyses to assess the shape and strength of population trends. I explored data fit to linear, quadratic, power function and exponential models. I also calculated coefficients of variation (CV) from annual indices to provide a measure of expected percent annual population fluctuation. I employed SPSS Version 15 and R version 3.3.2 computer software for statistical analyses.

In addition to these studies, I compared my data with other published and unpublished sources of broad-scale and long-term observations on birds for this region, particularly the results of breeding bird atlases of Massachusetts (Peterson and Meservey 2003, Walsh and Peterson 2013), Connecticut (Bevier 1994a) and Rhode Island (Enser 1992). Such comparison provided independent verification of patterns and trends uncovered during this study. To gain a perspective of populations trends and variance at a more local scale, I also examined transect surveys performed in northeastern Connecticut (Craig 1987).

To learn whether geographic patterns existed in species' populations, I examined densities among the six regions examined in this study. Data again generally did not meet parametric assumptions, so I sought relationships with Kruskal-Wallis tests, although I compared these findings with results of Walsh analyses of variance.

More uncommon species were often not present at particular transects. Although densities of zero are legitimate in statistical analyses, as the proportion of zeros in data rises, variance in density estimates also rises. To assess at what point the variance appeared to make statistical testing less meaningful, I plotted coefficient of variation vs. number of transects where a species was present (Fig. 16). Doing so showed that when species were present at less than 39 transects, the slope of variance vs. transects occupied increased steeply. Hence, I chose 39 as the minimum number of transect occurrences used for conducting statistical analyses.

In several instances where I was interested in north−south rather than regional trends, I assigned each of the transects to north or south and then performed a Mann-Whitney *U* test to search for differences. Because nonparametric tests did not permit entering duplicate data from individual regions, in these instances I used 2004−2005 data from eastern Connecticut in analyses, as these were the closest in time to observations made for the rest of the study area.

Habitats and habitat affiliation.- I investigated geographic distributions in habitat for the seven variables measured. Most of these habitat features comprise categorical variables and, therefore, are best analyzed using nonparametric statistical procedures. Moreover, they are not all orthogonal measures. For example, forest cover type is related to vegetation type. To search for such correlations among the variables, I employed Kendall's τ tests.

I chose to examine the response of species to individual habitat variables rather than to synthetic combinations of these variables because I believe that the former responses are of greatest ecological consequence. I analyzed individual birds' habitat use vs. habitat availability with Mann-Whitney *U* tests, with use computed from observations of birds at or within 70 m from sample points. Because adjacent survey points on transects were possibly not independent samples, I computed habitat availability from the first, middle and last survey point of each transect in order to yield 441 samples that I deemed completely independent in that they were at least ca. 1200 m apart. Species included for analysis were those for which the 95% confidence interval of habitat measures was ± 10% of their mean, or a minimum sample size of 33 observations (Craig 2012), a size similar to that computed by Morrison et al. (1986) for comparable analyses. When I made <33 observations, I describe observations in percents but do not perform statistical tests. When examining habitat affiliations of flocking species, I used only one observation/flock in analyses to maintain statistical independence of data.

For species occurring year-round, I sought evidence from individual birds for seasonal shifts in habitat use. Because seasonal shifts constituted dichotomous measures and most habitat measures were categorical variables, I analyzed with stepwise binary logistic regression analysis. I again chose species for analysis with a minimum sample size of 33 observations/season/year. I evaluated model fit with the Nagelkerke r^2, Hosmer and Lemeshow goodness of fit test, –2 log likelihood probability and the percent of observations correctly classified by the model.

I also studied habitat associations in species that occurred at a minimum of 39 study locations (Fig. 16) by examining the relationship between population density/ transect and the means of habitat variables/ transect. Most population data were not normally distributed, with particularly winter data having probability distributions skewed toward more low-density populations. Hence, I employed Kendall's τ statistic to uncover significant relationships. In these and other tests on multiple parameters, I corrected for true α levels with the false discovery rate method (Benjamini and Hochberg 1995).

To seek evidence for seasonal changes in populations by species occurring year-round, I performed nonparametric Wilcoxon significance tests. To determine if populations shifted geographically or changed patterns of habitat use from summer to winter, I computed summer-winter differences in populations that were negative when summer values were lowest and positive when they were greatest. Computing in this manner yielded data that often met parametric assumptions. For species meeting these assumptions, I used stepwise multiple regression analysis to enter population differences as the dependent variable and forest cover, vegetation type, moisture regime, dbh, canopy cover, understory density and elevation as independent variables. In this and other tests, I checked the fit to model assumptions with data plots, frequency histograms, residual plots, Durbin-Watson tests for serial correlation of residuals, collinearity statistics, Levene's test for equality of error variances and Kolmogorov-Smirnov and Shapiro-Wilk normality tests. When collinearity proved to exist among habitat measures, I repeated analyses using z scores for habitat measures to eliminate collinearity bias. I considered the significance of effects, partial correlations and r^2 in assessing test results. For species not meeting parametric assumptions, I performed separate Kendall's τ correlations, correcting for α levels for multiple hypothesis tests with the false discovery rate method.

Community parameters.- An analysis that considers more completely community parameters and community-habitat relationships will appear separately, as this report focuses primarily on individual species. With this focus in mind, I studied, based on data gathered for individual species, the proportions of the community experiencing population increases, decreases or no population trend. I related these population trends to occurrence within one of three general classes of habitat use: 1) forest interior-associated, 2) edge/successional habitat-associated, and 3) habitat generalists. I based assignment to these classes on published reports and on habitat data gathered during this study. I evaluated the enumeration data from these analyses with χ^2 tests or, in the case of winter data with small cell counts, Fisher's exact test.

To gain some perspective on the relative contribution of species to ecological processes within the forest bird community, I also computed an avian importance value for each species in a manner analogous to computing importance values for trees within forest communities (Mueller-Dombois and Ellenberg 1974). The importance value is the sum of three components converted to percents: 1) relative density—the population of a species/ sum of all populations, 2) relative dominance—the biomass of all individuals of a species/ sum of biomasses for all species, and 3) relative frequency—the sum of species occurrences on transects/ total transects (147). For 2), I substituted mass for the related measure of basal area used in tree computations, generally using published seasonal measures of mass obtained from species accounts in the *Birds of North America* (P. Rodewald, Ed. 2015), although I substituted my own locally obtained data when available. After computing values, I ranked species from most to least important. Although computing importance in this way yields an imperfect measure, it provides a first approximation for how much a species may be associated with such ecosystem measures as nutrient and energy flow. To gain additional perspective on the role of community importance, I also compared importance values to population trends and habitat affiliations as computed above. I evaluated differences among means of these categories with Kruskal-Wallis χ^2 tests.

My last set of analyses involved examining seasonal population trends among resident species. I computed the percent of species that underwent summer-winter population declines and increases or showed no clear population trend. I also computed the percent of species that either did or did not shift populations to lower elevations during winter. Doing so provided a community view of the proportion of resident species that appeared to undergo seasonal movement to the south of southern New England.

DATA STRENGTHS AND LIMITATIONS

Population data gathered in this study have advantages over earlier large scale surveys of this region: 1) they record a wide range of quantitative data on bird populations over a broad area, 2) they provide a statistical sample for the entire region, thereby allowing inferences to be drawn about not only positive but negative data, 3) they have been gathered in a less labor intensive manner with reduced sources of variance, and 4) they permit analysis of large scale community patterns and processes.

Despite these strengths, any large-scale survey of bird populations has limitations. Populations may change even within a season (Anderson et al. 1981), with pairs of birds vacating or establishing territories during the breeding season. Because I placed transects throughout the region and visited them in random order, my data may be considered to represent average seasonal conditions.

Although I have eliminated observer differences as a source of variance, any observer is likely to have perceptual biases, which result in estimates departing from true values (Scott et al. 1981, Sauer et al. 1994, Farmer et al. 2014). I have minimized this by having an observer with long experience and training with the survey procedures (Kepler and Scott 1981, Sauer et al. 1994). However, my data must be considered to have some systematic bias due to observer perception.

Another source of limitation is that some forest species, notably owls, are not detected well by the procedures used in this survey. Moreover, species other than forest inhabitants are generally not considered. Because this survey employed a population sampling protocol rather than intensive survey of all areas, the potential for missing the rarest species is increased, although in practice I encountered nearly all extant forest birds of the region.

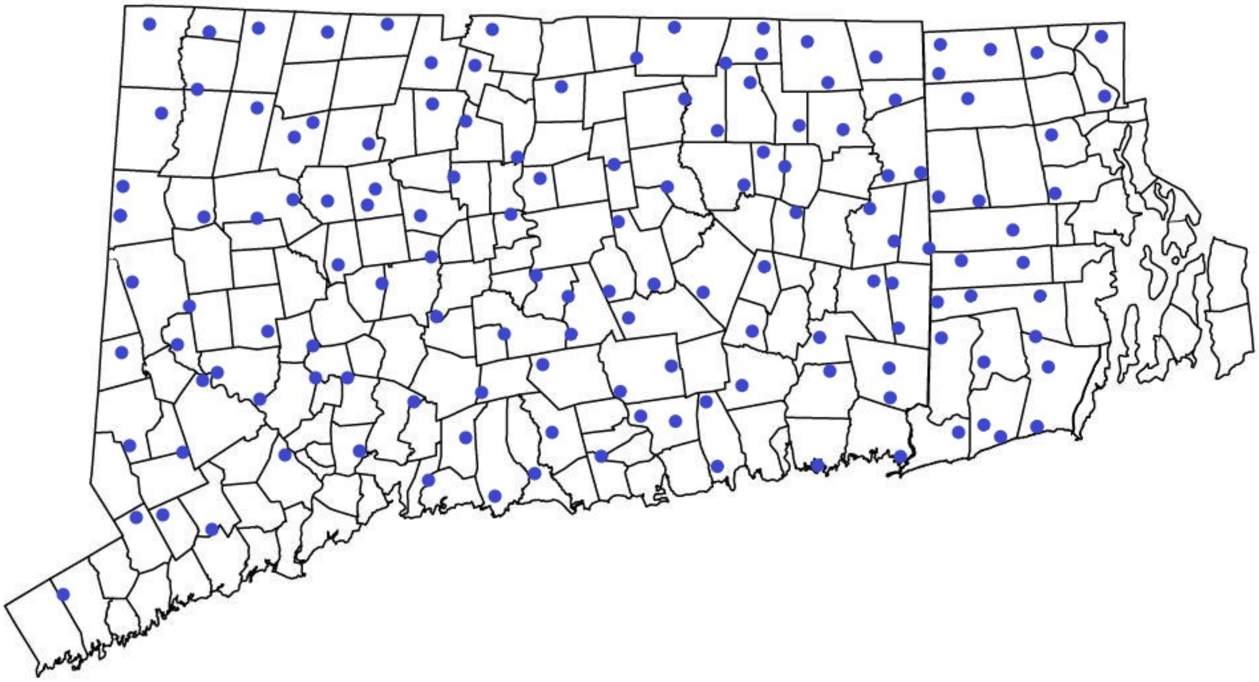

FIG. 15. Study area, with transect locations denoted by dots.

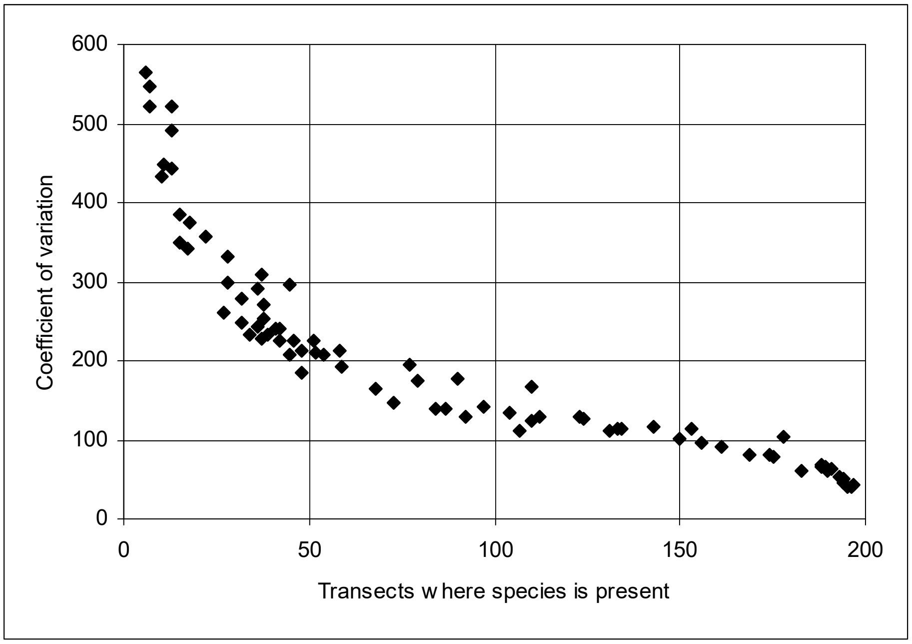

FIG. 16. The relationship between the number of transects where each species is present vs. the coefficient of variation for species occurrence.

TABLE 1. Mean ± SD habitat scores for each transect. See text for explanation of scores. RI = Rhode Island, NWCT = northwestern Connecticut, NECT = northeastern Connecticut, SECT = southeastern Connecticut, CECT = central Connecticut, SWCT = southwestern Connecticut.

Region	Transects	Forest	Vegetation	Moisture	dbh	Canopy	Understory	Elevation
NECT	TR1	1.07	1.60	2.40	2.00	2.83	2.33	228.27
	Eastford	0.26	1.59	0.69	0.00	0.36	0.45	25.09
NECT	TR2	2.07	3.40	2.13	2.13	3.00	2.17	254.13
	Ashford	0.70	1.80	0.35	0.35	0.00	0.84	25.30
NECT	TR3	2.00	3.73	2.40	2.00	2.77	2.07	129.00
	Thompson	0.38	0.88	0.54	0.38	0.42	0.46	21.30
NECT	TR4	1.47	2.73	2.20	2.00	2.73	2.50	181.20
	Putnam	0.52	1.28	0.56	0.00	0.46	0.50	42.46
NECT	TR5	2.33	4.00	2.00	2.10	2.53	2.00	265.80
	Union	0.49	1.46	0.33	0.21	0.52	0.65	48.73
NECT	TR6	1.53	3.93	2.20	1.93	2.57	1.93	234.20
	Hampton	0.64	2.66	0.41	0.18	0.56	0.26	34.07
NECT	TR7	1.00	1.07	2.63	2.00	2.73	2.13	216.67
	Chaplin	0.00	0.26	0.48	0.00	0.46	0.35	37.03
NECT	TR8	2.20	3.73	2.20	2.00	2.77	2.10	273.07
	Union	0.68	1.79	0.37	0.00	0.42	0.60	32.04
NECT	TR9	1.33	1.87	2.40	2.00	3.00	2.20	205.93
	Pomfret	0.49	1.30	0.51	0.00	0.00	0.37	47.89
NECT	TR10	1.93	4.20	2.10	1.93	2.60	2.53	177.60
	Sterling	0.80	2.37	0.54	0.18	0.51	0.52	23.28
NECT	TR11	1.27	1.73	2.27	2.00	2.47	2.10	285.00
	Stafford	0.46	1.28	0.46	0.00	0.52	0.28	45.09
NECT	TR12	1.47	3.80	2.00	1.93	2.57	2.33	136.87
	Scotland	0.52	2.81	0.00	0.18	0.56	0.49	28.17
NECT	TR13	2.00	4.20	2.73	1.97	2.57	2.13	109.07
	Mansfield	0.76	1.82	0.46	0.13	0.50	0.64	37.06
NECT	TR14	1.07	1.47	2.00	2.00	2.80	2.47	212.20
	Coventry	0.26	0.64	0.00	0.00	0.56	0.48	24.80
NECT	TR15	1.07	1.87	2.10	2.00	2.87	2.27	197.87
	Hebron	0.26	1.64	0.54	0.00	0.35	0.32	24.33
NECT	TR16	1.60	2.47	2.70	1.97	2.47	2.87	158.80
	Sterling	0.83	2.07	0.59	0.13	0.52	0.40	24.32
NECT	TR17	1.20	2.20	2.20	2.00	2.33	2.17	314.67
	Willington	0.41	1.66	0.46	0.00	0.49	0.36	44.85
NECT	TR18	2.07	3.20	2.00	2.00	2.73	2.10	241.53
	Woodstock	0.26	0.77	0.00	0.00	0.46	0.60	25.79
NECT	TR19	1.53	2.67	2.00	2.07	2.87	1.93	179.07
	Willington	0.64	1.76	0.00	0.26	0.35	0.46	32.15
NECT	TR20	1.93	3.67	2.40	2.00	2.33	2.53	71.33
	Plainfield	0.80	1.72	0.51	0.00	0.49	0.52	31.97
NECT	TR21	1.07	1.87	2.57	2.00	2.67	2.53	172.87
	Plainfield	0.26	2.10	0.53	0.00	0.49	0.48	19.62
NECT	TR22	2.07	3.73	2.47	2.07	2.87	1.93	166.40
	Killingly	0.70	1.79	0.52	0.18	0.35	0.82	43.96
NECT	TR23	1.33	2.00	2.50	2.00	2.40	2.50	223.93

	Bolton	0.49	1.25	0.50	0.00	0.51	0.50	30.40
NECT	TR24	1.73	3.20	2.43	2.00	2.53	2.47	191.93
	Tolland	0.59	1.57	0.50	0.00	0.52	0.48	47.97
NECT	TR25	1.20	2.20	2.17	2.00	2.33	2.17	262.33
	Stafford	0.56	1.93	0.49	0.00	0.49	0.36	22.11
NECT	TR26	1.67	2.73	2.13	2.00	2.53	2.40	204.73
	Woodstock	0.49	1.22	0.35	0.00	0.52	0.47	31.66
SECT	TR27	1.00	1.20	2.67	2.00	2.93	2.13	237.87
	Portland	0.00	0.41	0.49	0.00	0.26	0.35	35.71
SECT	TR28	1.53	3.13	2.37	1.90	2.73	2.67	97.87
	Griswold	0.52	2.07	0.48	0.21	0.46	0.49	26.98
SECT	TR29	1.00	1.20	2.47	2.00	2.60	2.27	99.67
	Lyme	0.00	0.41	0.55	0.00	0.51	0.46	40.37
SECT	TR30	1.00	1.87	2.40	2.00	2.73	2.37	84.33
	Preston	0.00	2.10	0.57	0.00	0.46	0.48	27.03
SECT	TR31	1.00	1.00	2.77	2.00	2.27	2.07	42.33
	Groton	0.00	0.00	0.42	0.00	0.70	0.96	17.73
SECT	TR32	1.00	1.47	1.80	2.00	2.53	2.93	156.40
	Lebanon	0.00	0.52	0.32	0.00	0.52	0.26	21.27
SECT	TR33	1.40	1.93	2.07	2.40	2.87	2.07	132.20
	E. Haddam	0.74	1.79	0.26	0.51	0.35	0.70	44.93
SECT	TR34	1.47	2.87	2.30	2.00	2.50	2.50	113.33
	N. Stonington	0.74	2.39	0.53	0.00	0.57	0.60	27.33
SECT	TR35	1.40	1.87	2.07	2.00	2.87	2.23	133.33
	Colchester	0.51	1.13	0.26	0.00	0.35	0.68	42.73
SECT	TR37	1.00	1.67	2.00	2.00	2.47	1.77	80.40
	E. Haddam	0.00	0.49	0.00	0.00	0.52	0.59	39.45
SECT	TR38	1.00	1.60	2.07	1.93	2.73	2.73	143.87
	Bozrah	0.00	1.55	0.26	0.18	0.70	0.46	29.26
SECT	TR39	1.33	2.33	2.23	1.93	2.53	2.37	123.27
	Colchester	0.62	1.88	0.46	0.26	0.52	0.61	24.52
SECT	TR40	1.00	1.40	2.07	1.97	2.53	3.00	22.60
	Stonington	0.00	0.51	0.26	0.13	0.52	0.00	14.97
SECT	TR41	1.20	2.07	2.13	1.93	2.73	2.33	75.33
	Ledyard	0.41	1.67	0.48	0.26	0.46	0.49	32.83
SECT	TR42	1.00	1.07	2.80	2.00	2.87	2.73	60.87
	E. Lyme	0.00	0.26	0.41	0.00	0.35	0.46	35.96
SECT	TR43	1.07	2.00	1.97	1.97	2.73	1.57	67.33
	E. Haddam	0.26	0.38	0.13	0.13	0.46	0.62	33.66
SECT	TR44	1.60	2.80	2.47	2.00	2.63	2.53	114.13
	Voluntown	0.74	2.21	0.64	0.00	0.67	0.48	21.83
SECT	TR45	1.00	1.40	1.93	2.00	2.77	2.30	102.33
	E. Lyme	0.00	0.51	0.42	0.00	0.42	0.49	24.56
SECT	TR46	1.00	1.07	2.33	2.00	2.67	2.60	152.20
	Marlborough	0.00	0.26	0.45	0.00	0.49	0.51	30.26
SECT	TR47	1.93	3.47	2.27	2.00	2.73	1.83	97.60
	Franklin	0.80	1.96	0.46	0.00	0.46	0.70	39.23
SECT	TR48	1.27	3.93	1.97	2.00	2.53	2.87	89.00
	N. Stonington	0.46	2.60	0.40	0.00	0.64	0.35	20.38
SECT	TR49	1.00	1.07	2.23	2.00	2.53	2.23	118.07

	Montville	0.00	0.26	0.42	0.00	0.64	0.56	28.27
SECT	TR50	1.53	2.40	2.07	2.00	2.60	1.40	36.80
	Lyme	0.52	0.74	0.26	0.00	0.51	0.51	14.74
SECT	TR51	1.40	2.53	2.60	1.97	2.40	2.87	108.53
	Voluntown	0.63	2.03	0.47	0.13	0.63	0.35	30.01
RI	TR52	1.73	3.07	2.97	2.00	2.87	2.53	219.60
	Burriville	0.70	1.87	0.13	0.00	0.35	0.48	27.94
RI	TR53	2.47	4.87	2.67	2.00	2.80	2.43	104.13
	Exeter	0.52	1.13	0.49	0.00	0.41	0.50	10.69
RI	TR54	2.33	5.00	2.87	2.00	2.60	2.77	47.80
	Richmond	0.62	1.36	0.35	0.00	0.51	0.42	16.69
RI	TR55	1.00	1.93	2.00	2.00	1.93	3.00	13.07
	S. Kingstown	0.00	0.26	0.53	0.00	0.70	0.00	5.32
RI	TR56	1.00	1.07	2.33	1.97	3.00	2.27	105.00
	Johnston	0.00	0.26	0.59	0.13	0.00	0.42	16.54
RI	TR57	1.00	1.00	2.73	2.00	3.00	2.23	154.20
	Foster	0.00	0.00	0.37	0.00	0.00	0.37	9.14
RI	TR58	1.93	3.67	2.60	1.80	2.40	2.63	140.20
	N. Smithfield	0.59	1.54	0.43	0.41	0.51	0.61	50.34
RI	TR59	1.87	3.73	2.43	2.00	2.33	2.67	76.67
	Exeter	0.83	2.49	0.56	0.00	0.49	0.45	10.90
RI	TR60	1.13	1.53	2.47	2.00	2.47	2.93	138.80
	Burriville	0.35	1.06	0.52	0.00	0.52	0.26	46.44
RI	TR61	1.00	1.53	2.50	1.90	2.33	2.73	37.00
	Charlestown	0.00	1.55	0.63	0.28	0.49	0.42	25.84
RI	TR62	1.07	2.13	2.77	1.83	2.47	2.53	142.40
	W. Greenwich	0.26	2.07	0.46	0.36	0.52	0.48	17.36
RI	TR63	1.00	1.00	2.63	1.97	2.73	2.07	85.20
	Lincoln	0.00	0.00	0.48	0.13	0.46	0.26	12.57
RI	TR64	1.80	3.20	2.80	1.93	2.47	2.93	118.67
	Coventry	0.68	1.78	0.53	0.26	0.64	0.18	18.07
RI	TR65	1.07	1.20	2.83	1.43	2.60	2.13	206.33
	Burriville	0.26	0.77	0.31	0.46	0.51	0.30	6.25
RI	TR66	1.00	2.80	2.27	1.83	2.17	2.80	34.67
	S. Kingstown	0.00	2.68	0.65	0.31	0.65	0.41	5.25
RI	TR67	1.40	2.27	1.87	2.00	2.40	2.93	177.00
	Foster	0.51	0.70	0.48	0.00	0.51	0.26	7.10
RI	TR68	1.40	1.93	2.70	1.93	2.80	2.67	114.40
	Hopkinton	0.74	1.79	0.41	0.26	0.41	0.62	19.82
RI	TR69	1.27	2.13	2.53	1.73	1.87	2.47	19.80
	Charlestown	0.59	1.51	0.61	0.46	0.92	0.64	14.14
RI	TR70	2.07	3.40	2.13	1.90	2.63	2.47	172.33
	Gloucester	0.70	1.80	0.55	0.21	0.61	0.48	10.92
RI	TR71	2.87	5.67	2.80	1.97	2.73	2.47	94.53
	W. Greenwich	0.35	0.90	0.37	0.13	0.46	0.48	12.99
RI	TR72	1.53	2.80	2.70	1.93	2.73	2.27	109.93
	Cranston	0.83	2.40	0.46	0.26	0.46	0.53	9.51
RI	TR73	1.80	3.27	2.87	2.00	2.87	2.53	138.73
	Exeter	0.56	1.53	0.30	0.00	0.35	0.44	17.18
RI	TR74	1.27	1.87	2.73	2.00	2.60	2.27	112.40

	Cumberland	0.46	1.36	0.46	0.00	0.51	0.42	17.81
RI	TR75	1.20	1.67	2.43	1.97	2.67	2.20	112.07
	Scituate	0.41	1.11	0.50	0.13	0.49	0.41	7.09
RI	TR76	1.07	1.27	2.37	2.00	2.40	2.80	45.27
	Westerly	0.26	0.80	0.58	0.00	0.51	0.41	14.02
RI	TR77	2.80	5.40	2.20	2.00	2.27	2.80	37.40
	Exeter	0.41	1.24	0.86	0.00	0.46	0.41	2.47
CECT	TR78	1.00	1.40	2.57	2.00	3.00	2.40	138.87
	Chester	0.00	1.55	0.50	0.00	0.00	0.51	24.22
CECT	TR79	1.13	2.13	1.90	1.97	2.27	2.70	40.60
	E. Windsor	0.35	0.64	0.39	0.13	0.70	0.46	8.69
CECT	TR80	1.00	2.47	2.00	2.00	2.47	3.00	58.27
	Madison	0.00	2.39	0.00	0.00	0.52	0.00	9.63
CECT	TR81	1.27	1.67	2.10	2.00	2.33	1.70	207.80
	W. Hartford	0.46	0.90	0.28	0.00	0.49	0.56	50.61
CECT	TR82	1.00	1.60	2.10	1.87	2.60	1.77	189.73
	Meridan	0.00	1.55	0.34	0.35	0.51	0.68	53.95
CECT	TR83	1.00	2.27	2.00	2.00	2.20	2.57	35.67
	Portland	0.00	1.33	0.00	0.00	0.41	0.46	16.96
CECT	TR84	2.07	4.13	2.73	1.90	2.33	2.73	104.00
	Simsbury	0.46	1.41	0.42	0.21	0.49	0.42	24.76
CECT	TR85	1.13	2.47	2.03	1.97	2.33	2.30	44.33
	Branford	0.35	1.96	0.13	0.13	0.49	0.56	25.90
CECT	TR86	1.13	2.60	2.23	2.00	2.93	1.93	192.53
	Durham	0.35	2.38	0.32	0.00	0.26	0.18	36.48
CECT	TR87	1.73	2.47	2.03	2.00	2.73	1.73	150.07
	Suffield	0.46	0.92	0.13	0.00	0.46	0.59	25.33
CECT	TR88	1.00	1.00	2.63	2.00	2.87	2.80	188.73
	Haddam	0.00	0.00	0.35	0.00	0.35	0.37	27.43
CECT	TR89	1.00	2.00	1.87	1.93	1.93	2.43	24.47
	Windsor	0.00	0.00	0.23	0.18	0.26	0.82	13.02
CECT	TR90	1.20	2.07	2.20	2.00	2.33	2.63	36.71
	Guilford	0.41	2.12	0.32	0.00	0.49	0.48	19.90
CECT	TR91	1.07	2.07	2.33	1.93	2.40	2.87	119.13
	Farmington	0.26	2.09	0.49	0.26	0.63	0.35	21.49
CECT	TR92	1.20	2.13	2.00	2.03	2.73	1.80	97.64
	Middletown	0.41	0.52	0.00	0.30	0.46	0.56	33.75
CECT	TR93	1.07	2.00	2.07	2.00	2.27	2.60	111.60
	N. Branford	0.26	0.38	0.18	0.00	0.59	0.47	33.89
CECT	TR94	1.13	1.93	2.07	2.00	2.53	1.80	185.36
	Bloomfield	0.35	0.59	0.18	0.00	0.52	0.56	42.71
CECT	TR95	1.00	1.53	2.57	1.97	2.63	1.93	195.57
	Plainville	0.00	1.55	0.42	0.13	0.55	0.26	27.72
CECT	TR96	1.20	3.40	2.10	1.90	2.87	2.43	119.00
	Killingworth	0.41	2.75	0.34	0.28	0.35	0.56	35.39
CECT	TR97	1.53	2.60	1.97	2.00	2.73	2.37	104.27
	E. Granby	0.52	1.50	0.35	0.00	0.46	0.69	24.97
CECT	TR98	1.13	2.00	2.53	1.90	2.47	1.33	213.13
	Middletown	0.35	1.56	0.48	0.21	0.52	0.49	34.21
CECT	TR99	1.00	1.87	2.17	2.00	2.53	2.57	90.47

	North Haven	0.00	1.51	0.41	0.00	0.52	0.50	48.95
CECT	TR100	1.00	2.00	1.87	1.97	2.53	2.40	114.07
	Wethersfield	0.00	0.00	0.30	0.13	0.52	0.74	32.19
CECT	TR101	1.00	1.40	2.23	2.00	2.40	2.93	88.67
	Westbrook	0.00	1.55	0.42	0.00	0.74	0.26	37.14
CECT	TR102	1.00	2.27	1.50	2.00	2.07	1.57	16.21
	E. Hartford	0.00	1.33	0.46	0.00	0.26	0.73	8.86
NWCT	TR103	1.93	3.20	2.00	2.00	2.80	2.27	354.47
	Hartland	0.59	1.21	0.00	0.00	0.41	0.59	29.36
NWCT	TR104	1.60	2.53	2.07	2.07	2.27	2.70	213.47
	Harwinton	0.63	1.25	0.32	0.26	0.59	0.46	26.16
NWCT	TR105	1.00	2.20	1.93	2.00	2.33	2.93	361.13
	Warren	0.00	2.01	0.18	0.00	0.49	0.18	37.82
NWCT	TR106	1.27	2.33	2.10	2.00	2.87	2.40	431.73
	Norfolk	0.59	1.84	0.28	0.00	0.35	0.60	53.48
NWCT	TR107	1.40	2.67	2.00	2.00	2.67	2.57	246.60
	Woodbury	0.51	1.35	0.00	0.00	0.49	0.46	30.68
NWCT	TR108	2.07	3.80	1.97	2.00	2.67	2.53	352.13
	Torrington	0.59	1.57	0.13	0.00	0.49	0.52	21.34
NWCT	TR109	1.53	2.87	1.93	2.00	2.40	2.40	320.80
	Cornwall	0.83	2.23	0.26	0.00	0.51	0.76	44.69
NWCT	TR110	1.07	1.20	2.37	2.07	2.60	2.37	233.80
	Burlington	0.26	0.77	0.44	0.26	0.63	0.44	33.71
NWCT	TR111	1.07	1.27	2.20	2.00	2.73	2.77	427.60
	Salisbury	0.26	0.59	0.37	0.00	0.46	0.53	124.50
NWCT	TR112	1.27	2.27	2.13	1.93	2.53	2.40	448.27
	Cornwall	0.46	1.53	0.35	0.26	0.52	0.69	35.37
NWCT	TR113	1.20	2.00	2.37	1.97	2.73	2.37	221.87
	Plymouth	0.41	1.60	0.55	0.13	0.46	0.44	49.26
NWCT	TR114	1.67	2.67	2.00	2.00	2.67	2.17	268.00
	Barkhamsted	0.62	1.18	0.00	0.00	0.49	0.62	55.81
NWCT	TR115	1.27	1.67	2.40	2.00	2.67	2.07	210.20
	Roxbury	0.46	0.90	0.43	0.00	0.49	0.53	44.43
NWCT	TR116	1.00	1.07	2.57	1.93	2.47	2.50	326.80
	Kent	0.00	0.26	0.46	0.18	0.64	0.46	65.24
NWCT	TR117	2.20	3.73	1.80	2.00	2.20	2.27	297.07
	Litchfield	0.56	1.44	0.32	0.38	0.68	0.50	23.57
NWCT	TR118	1.93	3.33	2.13	2.00	2.40	1.83	438.00
	Canaan	0.70	1.54	0.35	0.00	0.51	0.52	115.59
NWCT	TR119	1.00	1.00	2.60	2.00	2.80	2.57	356.53
	Sharon	0.00	0.00	0.51	0.00	0.41	0.46	32.74
NWCT	TR120	1.53	3.00	2.03	2.00	2.73	2.03	255.87
	Litchfield	0.64	2.10	0.13	0.00	0.46	0.77	21.26
NWCT	TR121	1.13	2.13	1.93	1.97	2.33	2.23	434.93
	Goshen	0.35	0.35	0.26	0.13	0.72	0.50	24.98
NWCT	TR122	1.13	2.13	2.37	1.97	2.47	2.13	235.33
	Burlington	0.35	2.10	0.44	0.13	0.52	0.30	15.59
NWCT	TR123	1.13	1.27	2.53	2.00	2.87	1.83	322.27
	Kent	0.35	0.70	0.48	0.00	0.35	0.75	81.53
NWCT	TR124	1.40	2.20	2.10	2.00	2.47	2.17	162.20

	New Milford	0.51	0.77	0.39	0.00	0.52	0.49	40.72
NWCT	TR125	1.73	2.87	1.93	2.00	2.73	1.83	340.00
	Colebrook	0.59	0.99	0.18	0.00	0.46	0.41	51.41
NWCT	TR126	2.13	3.67	1.90	2.00	2.27	1.90	300.33
	Torrington	0.64	1.50	0.28	0.00	0.70	0.34	20.03
NWCT	TR127	1.47	2.33	2.27	2.07	2.67	2.33	219.73
	New Hartford	0.74	1.76	0.46	0.26	0.49	0.56	46.46
NWCT	TR128	2.00	3.00	1.97	2.00	2.40	1.83	372.87
	Goshen	0.00	0.00	0.13	0.00	0.51	0.41	23.38
NWCT	TR129	1.87	3.13	2.30	2.00	2.63	2.07	111.20
	Granby	0.64	1.64	0.56	0.00	0.55	0.42	34.65
NWCT	TR130	1.33	2.13	2.17	1.83	2.80	2.53	209.93
	Thomaston	0.49	1.64	0.31	0.36	0.41	0.74	31.27
SWCT	TR131	1.00	1.87	2.53	1.97	2.87	2.63	219.47
	Bethany	0.00	2.10	0.48	0.13	0.35	0.44	26.68
SWCT	TR132	1.00	1.40	2.40	2.00	2.60	1.67	116.47
	Woodbridge	0.00	0.51	0.43	0.00	0.51	0.62	36.81
SWCT	TR133	1.00	1.93	1.93	2.00	2.80	2.37	218.73
	Redding	0.00	2.09	0.18	0.00	0.41	0.44	22.37
SWCT	TR134	1.00	1.07	2.27	2.00	2.80	2.07	117.87
	Oxford	0.00	0.26	0.50	0.00	0.41	0.37	38.27
SWCT	TR135	1.33	1.80	1.93	2.00	2.80	1.93	91.73
	Southbury	0.49	0.94	0.18	0.00	0.41	0.53	20.05
SWCT	TR136	1.13	2.13	1.80	1.93	2.80	1.77	114.27
	Easton	0.35	1.51	0.32	0.18	0.41	0.53	26.21
SWCT	TR137	1.47	2.87	2.00	2.00	2.80	1.93	96.67
	Shelton	0.52	1.88	0.00	0.00	0.41	0.50	41.90
SWCT	TR138	1.00	2.20	2.23	2.00	2.93	2.40	155.53
	Weston	0.00	2.48	0.42	0.00	0.26	0.47	48.90
SWCT	TR139	1.00	2.20	2.20	2.00	2.73	2.33	223.53
	New Fairfield	0.00	2.01	0.37	0.00	0.46	0.49	31.68
SWCT	TR140	1.33	2.53	2.20	2.00	2.93	1.77	239.00
	Danbury	0.49	2.03	0.41	0.00	0.26	0.42	23.81
SWCT	TR141	1.53	2.47	2.03	2.07	2.73	1.70	110.40
	Newtown	0.52	0.64	0.30	0.26	0.59	0.62	37.68
SWCT	TR142	1.00	1.13	2.40	1.70	2.40	2.87	213.00
	Wolcott	0.00	0.35	0.47	0.46	0.63	0.35	65.31
SWCT	TR143	1.00	1.80	2.00	2.00	2.33	2.10	194.33
	Wilton	0.00	1.52	0.46	0.00	0.62	0.51	21.30
SWCT	TR144	1.53	2.67	2.00	1.97	2.93	1.23	133.53
	Bridgewater	0.52	1.45	0.00	0.13	0.26	0.32	45.76
SWCT	TR145	1.07	2.40	1.80	1.97	2.53	1.90	89.33
	Stamford	0.26	1.40	0.32	0.13	0.52	0.54	34.39
SWCT	TR146	1.07	2.80	2.33	1.93	2.27	2.83	224.53
	Naugatuck	0.26	2.65	0.45	0.26	0.59	0.36	23.64
SWCT	TR147	1.00	2.40	2.10	2.00	2.47	2.17	158.47
	Naugatuck	0.00	2.41	0.47	0.00	0.52	0.79	33.86
SWCT	TR148	1.07	1.67	2.50	2.00	2.40	2.03	177.87
	Woodbridge	0.26	1.59	0.50	0.00	0.51	0.69	35.25

RESULTS AND DISCUSSION

HABITAT

Transects (Table 1) varied widely in their habitat characteristics, although regional differences among them were significant in every habitat measure (Table 2). Southern and central Connecticut had the most deciduous forest (Kruskal-Wallis χ^2 = 62.6, df = 5, P < 0.001) and most deciduous vegetation types (Kruskal-Wallis χ^2 = 26.9, df = 5, P < 0.001; Fig. 17) of the regions. Western and central Connecticut were more mesic than the eastern portions of the study area, with Rhode Island averaging most xeric (Kruskal-Wallis χ^2 = 64.1, df = 5, P < 0.001). Tree size as measured by dbh showed limited variation, although Rhode Island had the smallest trees of any region (Kruskal-Wallis χ^2 = 37.8, df = 5, P < 0.001). Canopy cover also showed limited variation, although central Connecticut had the most open forests of any region (Kruskal-Wallis χ^2 = 20.2, df = 5, P = 0.001). Understory density was greatest in Rhode Island and least in southwestern Connecticut (Kruskal-Wallis χ^2 = 35.5, df = 5, P < 0.001). Elevation was greatest by far in northwestern Connecticut and least in southeastern to central Connecticut and Rhode Island (Kruskal-Wallis χ^2 = 159.8, df = 5, P < 0.001).

A correlations matrix of the seven habitat variables (Table 3) showed that more coniferous forest types were positively associated with elevation, although vegetation types were not, even though forest type and vegetation type were themselves closely related. Instead, particularly oak communities were associated with more xeric conditions. Lower moisture was also positively associated with smaller trees, greater canopy cover and greater understory density, with xeric sites tending to have dense huckleberry cover. Larger trees and greater canopy cover were further associated with lower understory density and greater elevation, and larger trees were positively related to greater canopy cover. Greater understory density was also associated with lower elevation.

TABLE 2. Mean regional measures of habitat characteristics and Kruskal-Wallis ranks for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Forest	1.58	1.48	1.21	1.15	1.16	1.54
Rank	198.6	179.9	114.3	102.4	103.9	168.4
Vegetation	2.82	2.43	1.97	2.08	2.14	2.67
Rank	187.4	162.3	110.4	128.5	130.2	157.1
Moisture	2.28	2.14	2.25	2.15	2.15	2.55
Rank	159.4	111.6	145.9	117.3	118.3	224.5
dbh	2.00	2.00	2.00	1.97	1.97	1.93
Rank	176.4	173.8	152.0	139.9	134.1	105.7
Canopy	2.65	2.57	2.65	2.68	2.50	2.54
Rank	165.3	134.7	164.0	181.4	114.7	134.5
Understory	2.26	2.28	2.35	2.12	2.29	2.56
Rank	129.6	134.7	155.7	104.1	148.1	202.3
Elevation	203.6	306.0	103.7	163.4	114.7	106.1
Rank	193.8	251.3	85.4	154.1	99.8	91.7

BIRD SURVEYS

I recorded 36,702 summering individuals of 123 species and 13,742 wintering individuals of 63 species. Of these species, 88 summering and 51 wintering ones classified as forest-associated. Neither number of species (summer: $F_{1,146}$ = 0.4, P = 0.52; winter: $F_{1,146}$ = 0.4, P = 0.52) nor numbers of individuals encountered on surveys showed trends toward seasonal shifts (summer: $F_{1,146}$ = 0.03, P = 0.88; winter: Kendall's τ = 0.02, N = 147, P = 0.69),

TABLE 3. Kendall's τ correlations among habitat measures. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation, P = probability level. * = significant result.

	Region					
	F	V	M	D	C	U
V	0.68					
P	<0.01*					
M	−0.01	−0.13				
P	0.66	<0.01*				
D	0.10	0.00	−0.15			
P	0.03	0.99	<0.01*			
C	0.03	0.03	0.10	0.15		
P	0.51	0.51	0.01*	<0.01*		
U	−0.08	−0.08	0.15	−0.17	−0.18	
P	0.05	0.05	<0.01	<0.01*	<0.01*	
E	0.12	0.11	−0.05	0.12	0.14	−0.13
P	0.03	<0.01*	0.18	<0.01*	<0.01*	<0.01*

TABLE 4. Regional measures of species richness and community population density (corrected for males) encountered during surveys. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer:						
Species	37.9	40.7	37.0	35.6	35.1	35.9
SD	4.3	4.4	3.6	2.4	4.6	3.4
Density	411.2	542.0	450.3	386.8	420.3	424.4
SD	59.8	70.5	61.6	55.6	86.6	84.7
Winter:						
Species	11.8	11.7	15.8	15.3	15.5	13.9
SD	3.0	3.7	2.9	3.1	3.1	3.6
Density	57.7	52.4	94.0	77.9	103.5	104.8
SD	23.6	29.1	31.3	31.5	38.6	46.9

indicating that my sampling was not affected by within-season changes in bird activity.

Species richness and community density.- Regions differed in richness (summer: $F_{5,141} = 7.2$, $P < 0.001$; winter: $F_{5,141} = 8.3$, $P < 0.001$; Table 4). Bonferroni multiple comparisons showed that in summer, richness in northwestern Connecticut was greater than in most of the rest of the study area. In winter, richness in northeastern and northwestern Connecticut was lower than in the rest of the study area.

Community density also differed among regions (summer: $F_{5,141} = 14.9$, $P < 0.001$; winter: $F_{5,141} = 11.6$, $P < 0.001$; Table 4). Multiple comparisons showed that in summer, northwestern Connecticut had greater density than all other regions. In winter, density was lower in northeastern and northwestern Connecticut than in the rest of the study area except for southwestern Connecticut.

Annual variation in species richness for duplicated regions was lower in summer (29 ± 1%) than winter (44 ± 1%; $F_{1,96} = 89.7$, $P < 0.001$). The difference between regions was non-significant ($F_{1,96} = 1.8$, $P = 0.18$), and no interaction occurred between regions and seasons ($F_{1,96} = 1.0$, $P = 0.32$). Daily variation in richness was 16% in summer and 34% in winter, in both cases about a third less than annual variation. Annual variation in density was lower in summer (12 ± 1%) than winter (38 ± 4%; $t_{98} = 6.7$, $P < 0.001$). The difference among regions was non-significant for both summer ($t_{48} = 0.6$, $P = 0.57$) and winter ($t_{48} = 0.5$, $P = 0.64$; inequality of seasonal variances precluded entering season into an analysis of variance). Daily variation in density also was roughly a third less than annual variation (summer: 5%, winter: 25%).

Cumulative species trends.- For species with population trends that I could assess

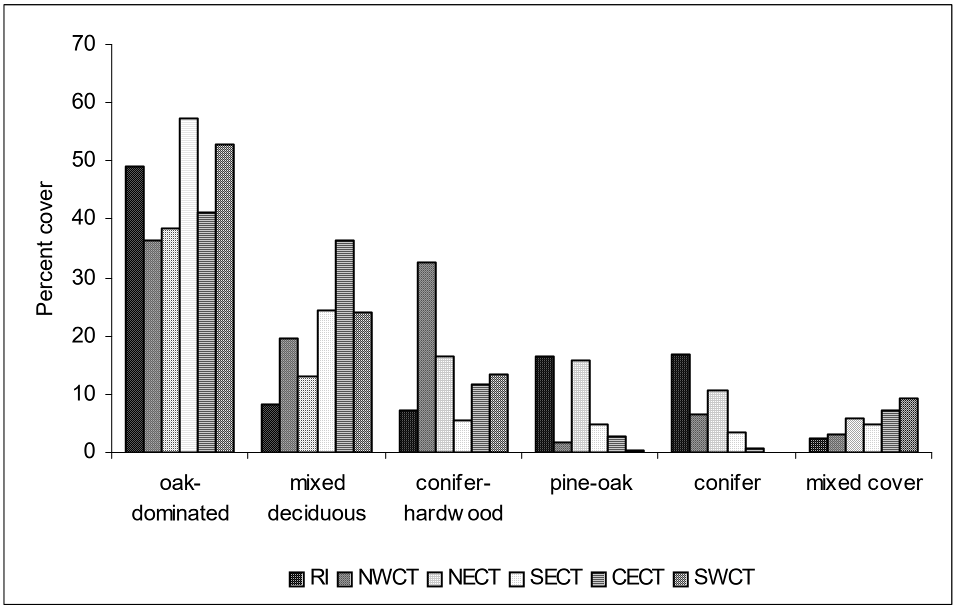

FIG. 17. Percent cover of vegetation types by region. RI = Rhode Island, NWCT = northwestern Connecticut, NECT = northeastern Connecticut, SECT = southeastern Connecticut, CECT = central Connecticut, SWCT = southwestern Connecticut.

clearly, those showing population increases predominated in both summer and winter (χ^2 test of seasonal difference = 3.43, $P = 0.18$). Species associated with edge and successional habitats also predominated in both summer and winter, although generalist species became more important community components in winter ($\chi^2 = 9.98$, $P = 0.01$; Table 5).

When I examined summer population trends vs. habitat association, species showing population increases were primarily inabitants of forest interiors, whereas species experiencing population declines were by far most closely associated with edge and successional habitats. Species not experiencing clear population trends were primarily habitat generalists (χ^2 test of population trend difference = 9.62, $P = 0.05$; Table 6).

Increasing species during winter were associated with edge and successional habitats, whereas decreasing species were associated with generalist habitat associations, although not significantly so (Fisher's exact $P = 0.61$). Species not experiencing clear population trends were also primarily habitat generalists (Table 6).

Computed importance values for species showed that in summer, abundant and widely distributed species tended to dominate in importance despite their low biomass. Of the top ten most important summer residents, five had declining populations and six were forest interior inhabitants (Table 7). However, even though species showing no population change were comparatively few (Table 5), they had the greatest mean importance values, whereas declining species had the lowest (Kruskal-Wallis $\chi^2 = 8.6$, $n = 79$, $P = 0.01$). Moreover, no significant difference occurred among importance values for categories of species' habitat use (Kruskal-Wallis $\chi^2 = 3.6$, $n = 79$, $P = 0.17$).

In winter, abundant and widespread species again had the highest importance values, with seven of the top 10 having increasing populations and generalist habitat requirements (Table 8). However, neither importance values of population trend

TABLE 5. Percent comparison of seasonal population trends and habitat use by forest bird species. *n* = 84 summer, 47 winter. I = increase, D = decrease, NC = no change, FI = forest interior, ES = edge and successional habitats, G = generalist.

	Population trend			Habitat		
	I	D	NC	FI	ES	G
Summer	46.4	39.3	14.3	38.1	41.7	20.2
Winter	59.6	23.4	17.0	14.9	44.7	40.4

TABLE 6. Percent comparison of seasonal population trends vs. habitat use by forest bird species. *n* = 84 summer, 47 winter. FI = forest interior, ES = edge and successional habitats, G = generalist.

	N	Habitat		
		FI	ES	G
Summer:				
Increasing	39	46.2	30.8	23.1
Decreasing	33	33.3	57.8	9.1
No change	12	25.0	33.3	41.7
Winter:				
Increasing	28	11.5	53.8	34.6
Decreasing	11	18.2	27.3	54.5
No change	8	12.5	37.5	50.0

categories (Kruskal-Wallis $\chi^2 = 5.3$, $n = 38$, $P = 0.07$) nor importance values of habitat categories (Kruskal-Wallis $\chi^2 = 1.7$, $n = 38$, $P = 0.42$) showed a significant pattern.

Examination of seasonal populations among 33 resident species with sufficient data to judge trends showed that 58% experienced summer-winter declines, whereas 24% showed increases and 18% showed no clear trend. Of 14 resident species with sufficient data to judge whether they moved to lower elevations during winter, 64% showed such movement, whereas 36% showed no strong evidence of movement.

Interpretation of community patterns.- Habitat patterns uncovered demonstrate the influence of glaciation on the landscapes of southern New England, with particularly the southeastern portion of the study area exhibiting more xeric conditions in this region of recessional moraines and often sandy to gravelly soils (Dowhan and Craig 1976). The study area also exhibits a southeast to northwest gradient in elevation great enough to yield progressively more northern-associated ecoregions across this gradient. Indeed, oak-dominated and pine-oak forest associations give way to conifer-northern hardwood associations in more northern, higher elevation locations. Only the lowlands of the Connecticut River valley present any substantial departure from this general pattern (Dowhan and Craig 1976).

Greater community richness and density toward the most highly elevated, northern-associated portion of the study area is consistent with the observation of Rabenold (1979) that a reverse diversity gradient exists in northeastern North America. He attributed this reverse gradient to the more concentrated pulse of productivity to the north, although Craig and Klaver (2013) were previously unable to verify the occurrence of such a pulse.

It is notable that species undergoing population increases predominated year-round, particularly as edge and successional habitat-associated birds were also the largest species group year-round. Clearly, the forest bird community consists of far more than simply interior-dwelling species. However, the maturing forests of southern New England (Alerich 1999, 2000) should provide less habitat for edge/successional specialists, and indeed when population trends are compared with habitat associations, summering edge/successional species experience the most population declines. In contrast, forest interior species are disproportionately associated with increases.

TABLE 7. Ranked summer importance values vs. population trends and habitat association.

Species	IV %	Population trend	Habitat
Ovenbird	124.3	n/c	interior
Red-eyed Vireo	119.0	n/c	interior
Scarlet Tanager	108.2	decline	interior
Veery	107.9	decline	interior
Wood Thrush	106.3	decline	interior
Tufted Titmouse	103.8	increase	generalist
American Robin	102.9	decline	edge
Eastern Wood Pewee	102.3	increase	interior
Blue Jay	102.0	decline	generalist
Brown-headed Cowbird	101.9	increase	edge
Black-capped Chickadee	101.1	increase	generalist
American Goldfinch	101.0	increase	generalist
Downy Woodpecker	100.0	n/c	generalist
White-breasted Nuthatch	99.9	increase	generalist
Gray Catbird	94.8	increase	edge
Mourning Dove	94.2	n/c	edge
Great Crested Flycatcher	92.7	n/c	generalist
American Crow	91.8	increase	edge
Black-and-white Warbler	90.6	increase	interior
Northern Cardinal	88.4	increase	edge
Eastern Phoebe	79.9	n/c	generalist
Eastern Towhee	79.1	decline	edge
Baltimore Oriole	76.7	n/c	edge
Yellow-throated Vireo	75.6	n/c	generalist
Common Yellowthroat	75.5	decline	edge
Cedar Waxwing	71.5	increase	edge
Hairy Woodpecker	71.3	n/c	generalist
Rose-breasted Grosbeak	70.6	n/c	edge
Blue-gray Gnatcatcher	69.6	increase	generalist
Red-bellied Woodpecker	66.2	increase	interior
American Redstart	62.0	decline	edge
Black-throated Green Warbler	59.5	increase	interior
Worm-eating Warbler	58.2	increase	interior
Hermit Thrush	57.8	decline	interior
Pileated Woodpecker	57.4	increase	interior
Pine Warbler	53.6	increase	interior
Northern Flicker	51.7	decline	generalist
Chipping Sparrow	51.4	increase	edge
Louisiana Waterthrush	50.0	increase	interior
Song Sparrow	47.5	decline	edge
Red-shouldered Hawk	40.4	increase	interior
Carolina Wren	38.5	increase	edge
Wild Turkey	37.5	increase	edge
Yellow-billled Cuckoo	35.0	decline	edge
Blue-headed Vireo	34.9	increase	interior
Ruby-throated Hummingbird	32.7	increase	generalist
Black-throated Blue Warbler	32.0	increase	interior
Chestnut-sided Warbler	30.4	decline	edge
Eastern Kingbird	27.3	decline	edge
Brown Creeper	27.0	decline	interior
Indigo Bunting	26.7	n/c	edge
Warbling Vireo	26.2	increase	edge
Hooded Warbler	26.2	decline	edge
Red-tailed Hawk	25.6	increase	generalist
Prairie Warbler	25.3	decline	edge
Canada Warbler	24.1	decline	interior
Northern Waterthrush	24.1	decline	interior
Blue-winged Warbler	24.1	decline	edge
Blackburnian Warbler	23.8	decline	interior
Black-billed Cuckoo	22.5	decline	edge
Yellow-rumped Warbler	22.2	increase	interior
Acadian Flycatcher	22.2	increase	interior
Yellow-bellied Sapsucker	21.8	increase	generalist
Broad-winged Hawk	19.4	n/c	interior
Winter Wren	19.2	decline	interior
House Wren	18.6	decline	edge
Red-breasted Nuthatch	17.8	increase	interior
Least Flycatcher	15.1	decline	edge
Purple Finch	11.6	decline	edge
Eastern Bluebird	11.6	increase	edge
Cooper's Hawk	10.6	increase	edge
Magnolia Warbler	9.8	decline	generalist
Common Raven	9.6	increase	generalist
White-eyed Vireo	7.6	decline	edge
Dark-eyed Junco	7.2	decline	interior
Northern Goshawk	6.6	decline	interior
Ruffed Grouse	6.3	decline	edge
Fish Crow	5.4	increase	edge
Cerulean Warbler	5.0	increase	Interior

Importance value data show that no particular habitat category is represented disproportionately within the forest bird community in either summer or winter, although declining summer species are disproportionately low in overall community importance. Analysis of data from resident species demonstrates that the majority of species tend to reduce populations in winter, often by moving south of the study area, and individuals that remain tend to congregate at lower elevation, less energetically expensive locations (see also Craig 2012).

SPECIES ACCOUNTS

Following are detailed accounts of the occurrence of the 88 summering and 51 wintering forest bird species inhabiting southern New England. Additional notes are provided for species encountered during the survey but not studied in detail.

A notable observation about densities calculated for individual species is that many were below those reported for elsewhere. In these other studies, birds were often studied in preferred habitat and in the heart of their ranges. In this study, densities are reported for the entire landscape, which includes habitats that are unsuitable. Moreover, many of the species studied were at their range periphery. Hence, my density estimates are best interpreted as means for the entire forest ecosystem of southern New England rather than as assessments of density within core habitats.

TABLE 8. Ranked winter importance values vs. population trends and habitat association.

	IV%	Population trend	Habitat
Black-capped Chickadee	113.6	increase	generalist
White-breasted Nuthatch	108.7	increase	generalist
Tufted Titmouse	107.6	increase	generalist
Downy Woodpecker	103.6	n/c	generalist
Golden-crowned Kinglet	102.6	increase	interior
American Goldfinch	96.4	increase	generalist
American Crow	91.1	increase	edge
Blue Jay	84.7	decline	generalist
American Robin	84.2	increase	edge
Hairy Woodpecker	76.3	n/c	generalist
Red-bellied Woodpecker	73.6	increase	interior
Pileated Woodpecker	67.8	increase	interior
Northern Cardinal	60.6	increase	edge
Brown Creeper	56.1	decline	interior
Dark-eyed Junco	55.7	increase	edge
Mourning Dove	50.2	n/c	edge
Red-tailed Hawk	37.7	increase	generalist
Pine Siskin	34.1	decline	generalist
Carolina Wren	34.0	increase	edge
Eastern Bluebird	26.1	increase	edge
Northern Flicker	25.9	increase	generalist
White-throated Sparrow	23.7	increase	edge
Common Raven	21.4	increase	generalist
Common Redpoll	21.0	n/c	generalist
Cedar Waxwing	17.0	n/c	edge
Red-shouldered Hawk	15.3	increase	generalist
Red-breasted Nuthatch	15.1	increase	interior
Song Sparrow	14.7	increase	edge
Winter Wren	14.6	decline	interior
Ruffed Grouse	12.2	decline	edge
Wild Turkey	9.4	increase	edge
Gray Catbird	9.4	increase	edge
Yellow-rumped Warbler	7.4	decline	edge
Sharp-shinned Hawk	6.1	decline	generalist
Easterm Towhee	5.6	increase	edge
Red Crossbill	4.3	n/c	generalist
Pine Grosbeak	3.7	decline	generalist
Northern Goshawk	3.2	decline	generalist

RUFFED GROUSE

Bonasa umbellus

Density.- I found Ruffed Grouse on only 5% of summer and 4% of winter transects, although birds were nearly always detected at close range, so computed densities were comparatively high. Based on 15 pooled detections, I tentatively estimate summer density in primarily forested landscapes as 0.74 birds/km^2 with a total population of 6787. I estimate winter density as 0.66 birds/km^2 with a total population of 6036.

I found individuals of this often secretive species only in eastern and northwestern Connecticut. It was absent on counts in Rhode Island and elsewhere.

Population variance.- Breeding Bird Survey data showed generally stable U.S. populations (trend = 0.66, n = 693, %CV = 15.3; Kendall's $\tau = -0.05$, n = 48, P = 0.67) that exhibited roughly 10 year cycles, although particularly since 2006 a population increase appears to have occurred. However, Northeastern breeding populations have undergone a concave decline (trend = −7.44, n = 30, %CV = 104.9; Kendall's $\tau = -0.91$, n = 48, $P < 0.001$). U.S. Christmas Counts showed a cyclic but overall steady decline since 1966 (Kendall's $\tau = -0.72$, n = 48, $P <$ 0.001, %CV = 27.7). New England counts showed a similarly cyclic but steeper decline during the same period (Kendall's $\tau = -0.71$, n = 48, $P < 0.001$, %CV = 47.3).

On summer line transects through northeastern Connecticut, Craig (1987) incidentally detected the species but did not compute densities. Elsewhere, densities of 22 adults/km^2 have been reported from prime habitat (Rusch et al. 2000), and Nickerson (2003) reported 11.5−24.4 birds/km^2 in Massachusetts.

Habitat.- My small sample of summering individual Ruffed Grouse showed that they occupied higher elevation habitats that were more open canopied and with greater understory density than would be predicted from habitat availability. In winter, birds occupied higher elevation forests that were more coniferous, more xeric, more open canopied and with denser understories than would be predicted from habitat availability (Table 1). In summer and particularly winter, I observed birds inhabiting dry pine-oak forest including coastal plain pine barrens-like conditions.

TABLE 1. Habitat availability vs. use by individual Ruffed Grouse. n = 7 summer, 7 winter. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.29	2.14	2.29	2.00	2.29	2.71	185.3
Winter use	1.57	2.71	2.71	2.00	2.29	2.43	203.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	28.6	42.9	14.3	14.3	0.0	0.0
Winter use	42.9	0.0	0.0	57.1	0.0	0.0

Elsewhere in Northeast, the species is reported from early successional conifer-deciduous forest. A mix of small forest openings, young forest and mature forest is thought to be optimal. In more northern areas, it is frequently associated with aspen (*Populus* spp.) forest (Rusch et al. 2000).

History.- The Ruffed Grouse was reported to be common by Sage et al. (1913), although Zeranski and Baptist (1990) stated that it had declined in Connecticut since the 1980s. In Rhode Island, Howe and

Sturtevant (1899) described it as common in the northern and western parts of the state but rare toward the coast. At 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found that 26% had Ruffed Grouse, whereas during this study 10% (2001−2002) and 6% (2004−2005) of eastern Connecticut sites had birds.

Breeding bird atlas data showed that in the 1970s, the Ruffed Grouse was a definite or probable breeder at 33.6% of Massachusetts survey blocks, although it was infrequent on Cape Cod and adjacent islands (Nickerson 2003). In the 1980s, it was a definite or probable breeder at 44.3% of Connecticut blocks, although it appeared to be less frequent in central and southern Connecticut (Clark 1994a). It was also definite or probable at 24.8% of Rhode Island blocks (Enser 1992). In the 2000s, definite and probable breeders dropped to 27.1% of primarily western Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The density of this permanent resident species does not appear to differ greatly seasonally. However, its presence on transects only in eastern and northwestern Connecticut suggests that densities are greatest in these regions. This pattern corresponds with that also reported in the Connecticut Breeding Bird Atlas. Densities may be least toward the coast.

My limited observations of habitat use indicate that the Ruffed Grouse has receded to higher elevation habitats. Within them, it is primarily associated with forests of more open canopies with denser understories. In winter, its use of habitats may shift to more coniferous and xeric sites. This latter observation is notable in that use of xeric pine-oak habitat appears to have been largely overlooked, although reported by Bull (1974) for the Long Island pine barrens and Nickerson (2003) for the Cape Cod pinelands. Furthermore, although the Ruffed Grouse is rare to absent on the coastal plain south of Long Island, in 1972 R. Craig (pers. obs.) observed it in similar xeric habitats in the New Jersey Pine Barrens.

My observation that the Ruffed Grouse is present in pine-oak habitats also suggests that early 19th century reports of Heath Hens (*Tympanuchus c. cupido*) in eastern Connecticut's "shrubby barrens" (Sage et al. 1913) should be treated with suspicion. As no specimens or archaeological evidence of Heath Hens exist for Connecticut (Clark 1999), such reports are likely based on incorrectly identified Ruffed Grouse.

Conservation.- Northeastern breeding bird surveys, Christmas Counts, Massachusetts Breeding Bird Atlases and data of Craig (pers. obs.) indicate that the Ruffed Grouse has declined regionally since the 1970s. The forests of southern New England are maturing (Ward and Barsky 2000, Alerich 1999, 2000), which is reducing the suitability of local habitats.

In addition to habitat change, during the years of the Ruffed Grouse decline, the Wild Turkey (*Meleagris gallopavo*) became established and greatly expanded populations in southern New England (Clark 1999, Walsh and Peterson 2013). The possibility that growth in turkey populations has contributed to the Ruffed Grouse decline warrants investigation.

Sponsored by Jay Cantor

WILD TURKEY

Meleagrus gallopavo

Summer

Density (birds/km^2): 0.89 (n = 50, 95% CI: ± 0.29)
CT: 1.02
RI: 0.28

Population (birds): 8,153 (95% CI: ± 2629)
CT: 7,702
RI: 451

Density.- I found Wild Turkeys on 24% of summer but only on 3% of winter transects. Because of their low winter detectability, I made no winter population estimates. Low detections may have been due in part to the species' secretive nature at this season, although the few winter tracks I observed suggested that birds largely vacated forest habitat during this season. Indeed, most birds I observed in winter were in agricultural land.

Although males were more conspicuously vocal than females in summer, I detected them with about equal frequency. Hence, I consider my computations above to represent most reasonably total population density. Summer densities averaged least in Rhode Island and greatest in southwestern Connecticut (Table 1). Population estimates are based on less than 60 detections, so have higher variance.

Population variance.- Breeding Bird Survey data showed populations undergoing a concave U.S. (trend = 7.96, n = 2061, %CV = 114.6; Kendall's τ = 0.99, n = 48, P < 0.001) and Northeast increase (trend = 17.86, n = 88, %CV = 174.0; Kendall's τ = 0.95, n = 48, P < 0.001), particularly since 1990. U.S. (Kendall's τ = 0.99, n = 48, P < 0.001, %CV = 108.7) and New England (Kendall's τ = 0.95, n = 48, P < 0.001, %CV = 128.7) Christmas Counts also showed accelerating rates of increase, particularly since 1990.

TABLE 1. Summer population density estimates (birds/km^2) for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.42		0.92			
2003−2008	0.28	1.18	0.15	1.64	1.03	0.28

TABLE 2. Habitat availability vs. use by individual Wild Turkeys. n = 25. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.40	3.24	2.10	1.94	2.46	2.28	175.4

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	24.0	36.0	4.0	8.0	12.0	16.0

Duplicated density estimates for eastern Connecticut showed an 80−84% decline (Table 1). Craig (1987) incidentally detected the species but did not compute its densities on summer line transects through northeastern Connecticut. Elsewhere, densities are generally estimated at 1−5 birds/km^2 (Eaton 1992).

Habitat.- Summering individual Wild Turkeys typically occupied higher elevation mixed hardwood forest/forest openings that were more mesic and open canopied than would be predicted from habitat availability (Table 2). I also made incidental summer observations of birds feeding in hayfields, croplands and lawns as well as nesting in hayfields and mature forest. I made only one winter observation of a bird within 70 m, so could make no assessment of winter habitat use.

Elsewhere in the Northeast, the species is reported to inhabit open, mature hardwood forests from fall to spring and forest openings in summer (Eaton 1992). Such open forests tend to have high understory density.

History.- The Wild Turkey was extirpated from Connecticut and Rhode Island by the early 19th century (Howe and Sturtevant 1899, Sage et al. 1913), but was reestablished during the 1970s when wild caught birds were released at various Connecticut locations (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the Wild Turkey was a definite or probable breeder at 1.0% of western Massachusetts survey blocks (Cardoza 2003). In the 1980s, it was a definite or probable breeder at 29.7% of particularly northwestern Connecticut blocks (Clark 1994b). It was also definite or probable at 3.0% of Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders had explosively increased to 59.7% of blocks across Massachusetts (Walsh and Peterson 2013).

Synthesis.- Since its re-establishment, the Wild Turkey has become a regular resident across southern New England, with my density estimates already at the lower end of estimates from elsewhere. Similarly to breeding bird atlases, populations appear greatest in western Connecticut and least in southeastern Connecticut and Rhode Island. However, because of the considerable variance observed in duplicated data from eastern Connecticut (consistent, however, with data from the Breeding Bird Survey) geographic patterns in populations should be interpreted with caution.

My observations of habitat use are in general agreement with other reports that highlight the presence of forest openings in areas occupied, although I found no evidence of preference for greater understory density. My lack of winter observations suggest that the species is largely absent from forested landscapes during this season, in contrast to other reports.

Conservation.- Breeding Bird Survey and Christmas Count data show that Wild Turkey populations are undergoing a rapid continental and regional increase. However, density estimates from eastern Connecticut declined across this region from the first to second set of observations, suggesting that the increase may not always occur consistently, but may include fluctuations due to such factors as winter mortality.

SHARP-SHINNED HAWK

Accipiter striatus

Density.- I found only one summering Sharp-shinned Hawk during this study—a bird detected incidentally to surveys in northeastern Connecticut. The species also appeared at 5% of winter transects, with all observations occurring from central Connecticut east through Rhode Island. From my nine detections, I tentatively estimate a winter density of 0.22 birds/km^2 and total population of 1984 for a typical winter.

Population variance.- Breeding Bird Survey data showed a U.S. (trend = 0.39, n = 1032; %CV = 17.4; Kendall's τ = 0.52, n = 48, P < 0.001) and northeastern U.S. (trend = 2.06, n = 35; %CV = 34.6; Kendall's τ = 0.60, n = 48, P < 0.001) population increase. Christmas Counts showed a convex increase with a decline in numbers occurring since about 2003 for U.S. (Kendall's τ = 0.68, n = 48, P < 0.001, %CV = 35.1) and New England data (Kendall's τ = 0.64, n = 48, P < 0.001, %CV = 55.4).

Bildstein and Meyer (2000) summarized reported breeding densities as 0.88 nests/km^2 in New Brunswick and 0.08−0.32 nests/km^2 in Alaska. I found no estimates of winter density.

Habitat.- My one observation of summer habitat use was of a bird using young to mature deciduous and pine-oak forest punctuated by forest openings. Wintering individuals tended to occupy more coniferous, mesic, open-canopied forests at lower elevations than would be predicted from habitat availability (Table 1).

Bildstein and Meyer (2000) reported breeding habitat to consist of unbroken tracts of coniferous, mixed and deciduous forests, although forests typically have at least some conifers. Dense, younger forests with closed canopies may be favored. Winter habitat is otherwise characterized as continuous coniferous, mixed and deciduous forest, forest edge and more open habitats (Bildstein and Meyer 2000).

TABLE 1. Habitat availability vs. use by individual Sharp-shinned Hawks. n = 9. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Winter use	1.56	2.56	2.11	2.00	2.33	2.39	80.22

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	33.3	22.2	22.2	11.1	11.1	0.0

History.- Sage et al. (1913) knew the Sharp-shinned Hawk as a fairly common Connecticut breeder, although Howe and Sturtevant (1899) found it uncommon in Rhode Island. Breeding populations began declining by the 1920s and were virtually extirpated until birds began reappearing in the 1970s (Zeranski and Baptist 1990). However, Craig (1987) still reported no birds on summer line transects through northeastern Connecticut. It has been a rare winter resident in our region historically (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a probable breeder at 0.7% of mostly western Massachusetts survey blocks (Roberts 2003). In the 1980s, it definitely or probably bred at 2.0% of mostly western Connecticut blocks (Smith and Devine 1994a) and probably at 1.2% of Rhode Island blocks (Enser 1992). By the 2000s, it had expanded to definitely or probably breeding at 3.7% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- My lack of summer observations suggest that the Sharp-shinned Hawk is still a rare summer resident. However, it is notoriously secretive during the breeding season (Fuller and Titus 1990), so surveys like this one may not fully account for its presence.

Consistent with its historic status, wintering populations are generally rare and seem concentrated particularly in the lower elevation, more climatically mild eastern portions of the study area. My estimated winter density is virtually the only available for this season, although it is generally similar to those reported for the breeding season.

My few observations of winter habitat use are in general agreement with other reports in that birds appear to select locations that are comparatively mesic, open and at lower elevation.

Conservation.- Continued growth in breeding populations as reported by the Breeding Bird Survey and breeding bird atlases may eventually lead to populations in Connecticut and Rhode Island returning to levels not seen since the early 1900s. However, the maturation of regional forests (Ward and Barsky 2000) may negatively affect the breeding increase, as breeders are often associated with younger forest.

Evidence from the Christmas Count suggests that long-term cycles on the order of 50 years may exist in winter populations both continentally and regionally, with populations presently entering a decline phase. Such a trend may produce declining numbers of wintering birds in coming years. However, Duncan (1996) demonstrated that declines in birds migrating past Cape May Point, New Jersey occurred at the same time that winter populations in New England were growing, which suggests that regional declines also can be related to continental redistribution of populations.

COOPER'S HAWK

Accipiter cooperii

Density.- Although infrequently encountered as a breeder, the Cooper's Hawk was less rare than the Sharp-shinned Hawk, appearing on 10% of transects and also incidentally at three additional sites. I found it in summer throughout Connecticut and Rhode Island. From my 15 detections, I tentatively estimate a summer density of 0.53 birds/km^2 and a total summer population of 4820.

Birds appeared on winter surveys only once in Connecticut, although these were clearly paired birds that were late winter arrivals to the breeding ground. I incidentally observed a similar late winter arrival of paired birds in Rhode Island, and also incidentally observed winter birds at two additional Connecticut locations. My limited winter data yielded no population estimate.

Population variance.- Breeding Bird Survey data showed that summer populations have undergone a concave increase in the U.S. (trend = 2.86, n = 1855, %CV = 45.1; Kendall's τ = 0.86, n = 48, $P < 0.001$) and Northeast (trend = 8.80, n = 76, %CV = 120.5; Kendall's τ = 0.93, n = 48, $P < 0.001$). Christmas Counts also showed an accelerating U.S. (Kendall's τ = 0.90, n = 48, $P < 0.001$, %CV = 53.0) and New England increase (Kendall's τ = 0.74, n = 48, $P < 0.001$, %CV = 103.3).

Rosenfield and Bielefeldt (1993) reported breeding densities of 0.04−0.15 nests/km^2 in the western U.S., 0.02−0.30 nests/km^2 in the east, and 0.12−0.16 nests/km^2 in Wisconsin. Winter densities range from 0.02−0.10 birds/km^2 in Wisconsin (Gates 1972).

TABLE 1. Habitat availability vs. use by individual Cooper's Hawks. n = 13. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.44	3.44	2.06	2.00	2.33	2.61	139.6

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	7.7	46.2	15.4	7.7	7.7	15.4

Habitat.- Summering individual Cooper's Hawks tended to occupy lower elevation habitats that were more coniferous, mesic, open-canopied and with denser understories than would be predicted from habitat availability. They were present particularly in mixed hardwood forests (Table 1). My several observations of wintering birds were in mesic, closed or open canopy mixed deciduous forest as well as at the edge of xeric oak forest.

The species is known elsewhere in winter and summer from deciduous, mixed, and coniferous habitats, and forest edge is thought to be an important habitat requirement. Moreover, it appears to be associated with mature trees. It is tolerant of forest fragmentation and also may occupy residential areas (Rosenfield and Bielfeldt 1993).

History.- Sage et al. (1913) knew the Cooper's Hawk as a common but declining breeder in Connecticut. Howe and Sturtevant (1899) similarly thought it common in Rhode Island. Summer populations declined into the 1970s, when it was largely absent as a Connecticut breeder (Zeranski and Baptist 1990). Even in the 1980s, no birds occurred on summer line transects through northeastern Connecticut (Craig 1987).

Sage et al. (1913) reported the species as occasional in winter and Howe and Sturtevant (1899) thought it probably occurred at this season. It has continued its rare winter status into recent times (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a probable or definite breeder at 0.8% of primarily western Massachusetts survey blocks (Meservey 2003a). By the 1980s, it was probable or definite at 2.2% of Connecticut blocks, all but one of which was in the western part of the state (Smith and Devine 1994b). It was also a definite breeder at 1.2% of Rhode Island blocks during this time (Enser 1992). During the 2000s, probable or definite breeders greatly increased to 20.3% of Massachusetts blocks, with a lower frequency of occurrence in the Berkshires than in the rest of the state (Walsh and Peterson 2013).

Synthesis.- The Cooper's Hawk is a widespread breeder that is likely far more common than generally supposed due to its extremely secretive nature. When I encountered birds, they were generally at close range, which yielded an estimate of breeding density at the higher end of other reports. Wintering birds appear to retain their historically rare status, however.

Observations of habitat use are in general agreement with other reports and link birds with comparatively coniferous, mesic, open-canopied, denser understoried, lower elevation forests.

Conservation.- The Breeding Bird Survey and Massachusetts Breeding Bird Atlases indicate that summer populations are increasing strongly. Christmas Count data indicate winter populations are also growing at an accelerating rate, although some supposed winter residents are actually early breeding season arrivals. The maturation of regional forests (Ward and Barsky 2000) may benefit the species, although forest fragmentation appears unlikely to impact populations negatively.

Sponsored by Glen Dash

NORTHERN GOSHAWK

Accipiter gentilis

Density.- The Northern Goshawk appeared on 6% of summer transects, principally in northeastern and northwestern Connecticut, although three detections were from Rhode Island. Birds also appeared on 2% of winter transects in eastern Connecticut and Rhode Island.

Inasmuch as birds vocalized in both summer and winter, making seasonal detections reasonably similar, I pooled all data in computing detectability. From my 15 detections, I tentatively estimate a summer density of 0.12 birds/km^2 and a total population of 1062. I estimate a winter density of 0.06 birds/km^2 and a total population of 521. Notably, however, of these 15 total observations, 11 were from 2003 or earlier.

Population variance.- Breeding Bird Survey data showed that U.S. populations declined weakly (trend = −0.51, n = 292, %CV = 15.7; Kendall's $\tau = -0.47$, n = 48, $P < 0.001$). No Northeast data were available. U.S. Christmas Counts showed roughly five year cyclic increases and decreases, but with a weak, non-significant, longer term decline occurring since about 1993 (Kendall's $\tau = -0.14$, n = 48, P = 0.17, %CV = 36.9). New England data showed a similar but significant trend and a more variable pre-1985 pattern (Kendall's $\tau = -0.41$, n = 48, $P < 0.001$, %CV = 38.3).

Squires and Reynolds (1997) reported fall hawk watch data that indicated irruptions of fall migrants occur about every 5−10 years. Such irruptions appear related to the species' similarly cyclic occurrence on Christmas Counts. Elsewhere, breeding densities have been reported as 0.003−0.11 pairs/km^2 (Squires and Reynolds 1997). I found no reports of winter density.

Habitat.- My limited observations on individual summering Northern Goshawks showed that they tended to occupy conifer-hardwood, mesic, closed canopy, open understory and higher elevation forests more frequently than would be predicted from habitat availability (Table 1). Two winter observations were entirely in mesic, mature, semi-open forests with conifer cover.

TABLE 1. Habitat availability vs. use by individual Northern Goshawks. n = 5. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.40	1.80	2.20	2.00	2.80	2.20	208.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	60.0	0.0	40.0	0.0	0.0	0.0

Elsewhere in the East, the species is thought to prefer extensive, mature forests of mixed conifer-hardwoods. Nests are typically in closed canopy forests but often near small forest openings and water. In winter, extensive, mature forests and forest edge are used (Squires and Reynolds 1997).

History.- Sage et al. (1913) were aware of one breeding record in Connecticut. They and Howe and Sturtevant (1899) described the species as a rare and irregular winter visitor to southern New England. Since the 1930s, the species has become more common in summer (Zeranski and Baptist 1990). However, Craig (1987) reported no birds on summer line transects through northeastern Connecticut.

Breeding bird atlas data showed that in the 1970s, the Northern Goshawk was a definite or probable breeder at 4.5% of particularly western Massachusetts survey blocks (Clayton 2003). By the 1980s, it was a definite or probable breeder at 8.4% of western and eastern Connecticut blocks (Smith and Devine 1994c) as well as at 1.8% of Rhode Island blocks (Enser 1992). In the 2000s, definite and probable breeders had declined to 2.9% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Northern Goshawk is distributed as a breeder principally in northern, more mountainous portions of the study area—a finding consistent with that of the Connecticut and Rhode Island breeding bird atlases. It appeared in winter only in the eastern portion of the region, although this pattern may be an artifact of the years in which these surveys I conducted, as winter occurrence is cyclic. My estimate of breeding density is in line with other published reports and my computation of winter density is among the only available.

My few observations of habitat use are in general agreement with other reports in that birds appear particularly associated with conifer-hardwood, closed canopy, high elevation forests. Limited data also suggest that conifers are preferred in winter.

Conservation.- Breeding Bird Survey, Christmas Count, Massachusetts Breeding Bird Atlas, and data from this study suggest that a weak population decline has occurred particularly over the past decade. Indeed, in my previous report (Craig et al. 2003), I described the Goshawk as the commonest accipiter of the region. The Cooper's Hawk now holds this distinction. However, such a decline also may be part of a long-term population cycle rather than a cause for conservation concern. The maturation of regional forests (Ward and Barsky 2000) may be benefiting the species, as it is thought to be particularly associated with mature forests.

Sponsored by Sally Keil

RED-SHOULDERED HAWK

Buteo lineatus

Summer

Density (birds/km^2): 0.11 (n = 97, 95% CI: ± 0.03)
CT: 0.10
RI: 0.14
Population (birds): 979 (95% CI: ± 174)
CT: 760
RI: 219

Winter

Density (birds/km^2): 0.03 (pooled n = 113, 95% CI: ± 0.01)
CT: 0.03
RI: 0.02
Population (birds): 235 (95% CI: ± 110)
CT: 204
RI: 31

Density.- The loudly vocal Red-shouldered Hawk could be detected at great distances and was the most commonly encountered hawk of the study, appearing on 40% of summer and 15% of winter transects. Being easily located does not equate with commonness, however, as great detection distances led to a computed summer density much lower than that of the less frequently encountered but more secretive Cooper's Hawk.

Summering birds occurred most commonly in southern portions of the study area (0.14 vs. 0.08 birds/km^2, Mann-Whitney U = 2205.5, P = 0.02, n = 147) and appeared to be least common in lightly forested central Connecticut (Table 1). Birds were vocal throughout the year (see also Crocoll 1994), so I pooled all detection data in computing winter density. The species was rare during this season, however, and showed no clear regional pattern of occurrence.

Population variance.- Breeding Bird Survey data indicated that U.S. (trend = 3.0, n = 1552, %CV = 41.7; Kendall's τ = 0.98, n = 48, P < 0.001) and Northeast (trend = 3.4, n = 90, %CV = 47.3; Kendall's τ = 0.96, n = 48, P < 0.001) populations have undergone a concave increase. U.S. Christmas Counts showed a similar concave increase since about 1970 (Kendall's τ = 0.98, n = 48, P < 0.001, %CV = 40.1),

TABLE 1. Population density estimates (birds/km^2) and summer Kruskal-Wallis density ranks for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.16		0.16			
2003−2008	0.11	0.05	0.18	0.16	0.02	0.14
Rank	72.4	65.9	92.8	82.7	56.4	77.2
Winter						
2001−2003	0.02		0.05			
2003−2009	0.03	0.02	0.02	0.06	0.01	0.02

TABLE 2. Habitat availability vs. use by individual Red-shouldered Hawks. n = 6. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.16	2.17	2.25	2.00	2.50	2.33	135.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	66.7	16.7	0.0	0.0	0.0	16.7

TABLE 3. Summer population densities of Red-shouldered Hawks vs. habitat characteristics. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.11	0.08	0.04	0.11	0.03	0.02	−0.05
P	0.12	0.26	0.53	0.13	0.71	0.75	0.42

whereas New England data showed a weaker increase since 1990 (Kendall's τ = 0.96, *n* = 48, *P* < 0.001, %CV = 70.6).

Duplicated density estimates for eastern Connecticut showed a 13−31% change in summer and 50−60% increase in winter (Table 1). Craig (1987) estimated summer populations to be 2.5 birds/km^2 on line transects in northeastern Connecticut. Elsewhere, densities have been reported to range from 0.2−2.1 pairs/km^2 (Crocoll 1994).

Habitat.- Individual summering Red-shouldered Hawks tended to occupy more deciduous forests at lower elevations than would be predicted from habitat availability (Table 2). My two close range winter observations were in mesic, mature, semi-open conifer-hardwood forest.

Analyses of habitat variables vs. summer population densities (Table 3) showed no correlations. Typically, the species is associated with extensive, mature forest, particularly those with swampy areas and streams (Crocoll 1994).

History.- The Red-shouldered Hawk has been described historically as common throughout the year in Rhode Island and Connecticut (Howe and Sturtevant 1899, Sage et. al 1913), although Zeranski and Baptist (1990) thought it uncommon in summer and rare in winter in Connecticut.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 11.5% of particularly western Massachusetts survey blocks, although it was infrequent along the coast (MacDonald 2003). In the 1980s, it was a definite or probable breeder at 16.8% of Connecticut blocks, although it appeared to be less frequent in central Connecticut (Smith and Devine 1994d). It was also definite or probable at 7.3% of primarily western Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders had spread to 18.5% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Breeding populations are greatest in southern portions of the study area although, consistent with findings of breeding bird atlases, they appear less dense on the coastal plain and in central Connecticut. Computed breeding densities are at the lower end of those reported for elsewhere and well below those reported by Craig (1987). My winter density estimate is among the only available. Population estimates for duplicated regions are reasonably consistent among years for both summer and winter and demonstrate variance in line with that computed for the Breeding Bird Survey and Christmas Count.

My few observations of summer habitat associations for the Red-shouldered Hawk are consistent with those reported for elsewhere. Deciduous, lower elevation forests appear particularly suitable.

Conservation.- Breeding Bird Survey and Massachusetts Breeding Bird Atlases data indicate that breeding populations have increased in Connecticut and Rhode Island since the 1970s. Indeed, at 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found that 37% of sites had Red-shouldered Hawks, whereas during this study 54% (2001−2002) and 46% (2004−2005) of eastern Connecticut sites had birds.

Winter populations have been low in recent decades, although Christmas Count data suggest they are also increasing. The maturation of southern New England forests (Ward and Barsky 2000) may be benefiting the species, as it is thought to prefer such situations.

BROAD-WINGED HAWK

Buteo platypterus

Summer

Density (birds/km^2): 0.23 (n = 29, 95% CI: ± 0.09)
CT: 0.15
RI: 0.59

Population (birds): 2,068 (95% CI: ± 826)
CT: 1,134
RI: 934

Density.- I observed the more secretive Broad-winged Hawk at only 19% of transects, but at generally close range, so I computed its population as comparatively higher than that of the Red-shouldered Hawk. Although my sample was half of the 60 observations preferred for density estimation, my data fit a detectability curve well, so I believe my estimates of density are reasonable, albeit with high variance. Densities averaged greater in northern vs. southern portions of the study area (0.24 vs. 0.17 birds/km^2) and particularly Rhode Island (Table 1).

Population variance.- Breeding Bird Survey data indicated that U.S. (trend = 0.40, n = 1209, %CV = 5.7; Kendall's $\tau = 0.69$, n = 48, $P < 0.001$) populations have increased modestly. Northeastern populations showed no significant trend, however (trend = 0.00, n = 82, %CV = 9.2; Kendall's $\tau = -0.14$, n = 48, $P = 0.19$).

Duplicated density estimates for eastern Connecticut showed a 34−68% decline (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 2.5 birds/km^2. Elsewhere, densities have been reported to range from 0.2−0.5 pairs/km^2 (Goodrich et al 1996).

Habitat.- Individual Broad-winged Hawks tended to occupy forests that were more mesic, more closed canopied and with more open understories than would be predicted from habitat availability (Table 2).

TABLE 1. Summer population density estimates (birds/km^2) for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.35		0.19			
2003−2008	0.23	0.22	0.06	0.08	0.00	0.59

TABLE 2. Habitat availability vs. use by individual Broad-winged Hawks. n = 9. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.44	2.11	2.39	2.11	2.89	2.22	172.2

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	44.4	11.1	33.3	11.1	0.0	0.0

Elsewhere in the East, birds are reported to occupy younger forests than those occupied by Red-shouldered Hawks. Habitat is also characterized by forest openings and nearby water. Deciduous and mixed conifer-deciduous forests are used primarily, with pure conifers used rarely (Goodrich et al. 1996).

History.- The Broad-winged Hawk was reported to be fairly common by Sage et al. (1913), particularly in northwestern Connecticut. Zeranski and Baptist (1990) described it as less common in the 19th century when much of Connecticut was deforested. Howe and Sturtevant (1899) thought it to be a rare 19th century breeder in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the Broad-winged Hawk was a definite or probable breeder at 31.3% of Massachusetts survey blocks, although it was infrequent along the coast (Forster 2003a). In the 1980s, it was a definite or probable breeder at 35.2% of Connecticut blocks, although it appeared to be less frequent in central Connecticut (Smith and Devine 1994e). It was also definite or probable at 21.2% of Rhode Island blocks (Enser 1992). In the 2000s, definite and probable breeders had declined to 24.5% Massachusetts blocks throughout the state (Walsh and Peterson 2013).

Synthesis.- Computed breeding densities are in line with estimates from elsewhere. Breeding populations also appear to be greater in northern portions of the study area. Craig's (1987) much greater summer density estimate may represent a locally higher density, although the strip census method employed also appears to overestimate densities for wide-ranging species.

My duplicate observations from eastern Connecticut show densities of the same order of magnitude but with greater variance—likely due to limited sample size—than those observed for the Red-shouldered Hawk or on the Breeding Bird Survey.

My few observations of habitat use revealed no evidence that birds preferred younger forest or forest with openings, as reported elsewhere. However, in agreement with other reports, populations appeared to average greater in more mesic locations.

Conservation.- Evidence for a population trend is conflicting. Based on data from the Breeding Bird Survey, populations have increased modestly since at least the 1960s. In contrast, Massachusetts breeding bird atlases suggest a local decline. Similarly, my duplicate data for eastern Connecticut suggest some decline during the study period. Forests in the region have matured over this same period (Ward and Barsky 2000), and given the species' reported preference for younger forests, the local decline observed may be real.

RED-TAILED HAWK

Buteo jamaicensis

Summer

Density (birds/km^2): 0.43 (pooled n = 79, 95% CI: ± 0.15)
CT: 0.46
RI: 0.30

Population (birds): 3,927 (95% CI: ± 1,372)
CT: 3,444
RI: 483

Winter

Density (birds/km^2): 0.45 (pooled n = 79, 95% CI: ± 0.17)
CT: 0.52
RI: 0.15

Population (birds): 4,138 (95% CI: ± 1,511)
CT: 3,896
RI: 242

Density.- The vocal and conspicuous Red-tailed Hawk appeared to be about equally detectable year-round, so I pooled detections in computing seasonal population estimates. Summering birds occurred on 24% of transects, most commonly in southern portions of the study area (0.26 vs. 0.56 birds/km^2), and appeared to be most common in more lightly forested central and southwestern Connecticut (Table 1).

During winter, population density appeared to be about the same as in summer. The species occurred on 24% of transects and again occurred most commonly in southern portions of the study area (0.34 vs. 0.61 birds/km^2). Populations also appeared to be greatest in more lightly forested and southwestern Connecticut (Table 1).

Population variance.- Breeding Bird Survey data indicated that U.S. (trend = 1.78, n = 3445, %CV = 26.4; Kendall's τ = 0.99, n = 48, $P < 0.001$) and Northeast (trend = 3.75, n = 122, %CV = 50.7; Kendall's τ = 0.97, n = 48, $P < 0.001$) populations have undergone a concave increase. U.S. Christmas Counts have shown a strong but convex rate of increase since 1966 (Kendall's τ = 0.85, n = 48, $P < 0.001$, %CV = 27.7) that has slowed since about 1995. New England counts have shown a similar but more linear increase since 1966 Kendall's τ = 0.83, n = 48, $P < 0.001$, %CV = 47.3).

TABLE 1. Population density estimates (birds/km^2) for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.23		0.58			
2003−2008	0.23	0.28	0.25	0.88	0.63	0.30
Winter						
2001−2003	0.08		0.25			
2003−2009	0.30	0.14	0.25	0.99	1.19	0.15

TABLE 2. Habitat availability vs. use by individual Red-tailed Hawks. n = 27 summer, 14 winter. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.03	1.63	2.17	2.00	2.41	2.26	149.4
Winter use	1.21	1.79	2.14	1.96	2.89	2.57	88.4

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	59.3	33.3	3.7	0.0	0.0	7.4
Winter use	42.9	35.7	21.4	0.0	0.0	3.7

Duplicated density estimates for eastern Connecticut showed a 0−57% decline in summer and 0−275% increase in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found no birds, although they were present in the study area (R. Craig pers. obs). Elsewhere, densities in the Northeast have been reported as ranging from 0.2−50 pairs/km^2 (Preston and Beane 1993). Winter densities range from 0.11−0.36 birds/km^2 in Wisconsin (Gates 1972).

Habitat.- Summering individual Red-tailed Hawks tended to occupy lower elevation forests that were more deciduous, mesic, open-canopied and with less dense understories than would be predicted from habitat availability (Table 2). In winter, birds tended to occupy more deciduous, mesic, closed canopy forests with greater understory density and much lower elevations than would be predicted from habitat availability.

Elsewhere in the East, the species occupies forests more open or fragmented than its congeners, the Red-shouldered and Broad-winged Hawk. In winter, birds also may be found in marsh-shrub areas (Preston and Beane 1993).

History.- Historical reports of Red-tailed Hawk abundance are somewhat conflicting. Zeranski and Baptist (1990) thought it had undergone a long-term decline from the 19th to mid-20th century, but that it had increased since then. However, Sage et al. (1913) thought it common in summer, particularly inland, and less common in winter except along the coast, where it was more common. Howe and Sturtevant (1899) described Rhode Island birds as uncommon in summer but more common in winter.

Breeding bird atlas data showed that in the 1970s, the Red-tailed Hawk was a definite or probable breeder at 27.0% of Massachusetts survey blocks (Robinson et al. 2003). In the 1980s, it was a definite or probable breeder at 51.5% of Connecticut blocks (Smith and Devine 1994f). It was also definite or probable at 26.1% of Rhode Island blocks (Enser 1992). In the 2000s, definite and probable breeders had increased to 53.3% of particularly eastern Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- Breeding populations may be slightly greater in southern portions of the study area and most dense in central and southwestern Connecticut, although based on variance observed in duplicated eastern Connecticut observations (consistent with that reported by the Breeding Bird Survey and Christmas Counts, however), this trend should be interpreted with caution. My computed summer density is at the lower end of that reported by others, likely because I only considered populations of primarily forested landscapes. Winter densities are comparatively high compared with other reports, however, and are consistent with historic reports that birds tend to congregate toward the coast.

My observations of habitat associations are similar to those reported for elsewhere. Summering individuals appear to occupy habitats that are more deciduous, mesic, open and at lower elevations. In winter, birds appeared to occupy similar habitats but with more closed forest canopies.

Conservation.- The Breeding Bird Survey, Christmas Count, duplicated winter data from eastern Connecticut and Massachusetts breeding bird atlases indicate that Red-tailed Hawk populations are undergoing a increase despite the maturation of southern New England forests (Ward and Barsky 2000).

Sponsored by James and Nancy Weiss

MOURNING DOVE
Zenaida macroura

Summer

Density (males/km^2): 2.05 (n = 653, 95% CI: ± 0.26)
CT: 2.00
RI: 2.25
Population (males): 18,654 (95% CI: ± 2,348)
CT: 15,074
RI: 3,580

Winter

Density (males/km^2): 2.34 (n = 113, 95% CI: ± 0.77)
CT: 2.23
RI: 2.86
Population (males): 21,291 (95% CI: ± 7,053)
CT: 16,743
RI: 4,548

Density.- Although I recorded the Mourning Dove on 92% of summer forest transects, its call carried long distances, so not all birds encountered were likely to have been associated closely with forest habitats. Moreover, even in winter, nearly all detections on the 36% of transects where birds occurred were of vocalizing males. Hence, estimates of densities are best interpreted as those of males. Estimates refer only to that part of the population detectable from primarily forested regions.

Summer densities averaged least in southeastern Connecticut and greatest in southwestern Connecticut and Rhode Island (2.25 males/km^2), although there was no significant difference among regions (Kruskal-Wallis χ^2 = 2.3, n = 147, P = 0.80). Winter densities were least in northeastern and northwestern Connecticut and greatest in central Connecticut (Table 1). At this season, regional differences were significant (Kruskal-Wallis χ^2 = 12.1, n = 147, P = 0.03). Densities did not change from summer to winter (Wilcoxon Z = −1.4, n = 294, P = 0.15).

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	1.72		4.94			
2003−2008	1.91	2.00	1.81	2.45	2.10	2.25
Rank	71.1	73.2	67.5	85.6	72.1	77.0
Winter						
2001−2003	0.43		1.55			
2003−2009	1.57	1.20	2.79	1.86	4.91	2.86
Rank	70.5	59.3	79.4	68.8	91.7	74.6

TABLE 2. Habitat availability vs. use by individual Mourning Doves. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. * = significant relationship. n = 121 summer, n = 56 winter. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use							
	1.41	2.60	2.25	1.96	2.35	2.29	173.8
$P(U)$	0.30	0.17	0.89	0.25	<0.01*	0.99	0.41
Winter use							
	1.38	2.70	2.11	1.98	2.32	2.38	126.9
$P(U)$	0.93	0.35	0.02	0.97	<0.01*	0.59	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	38.8	20.7	15.7	11.6	5.8	7.4
Winter use	37.5	28.6	10.7	3.6	8.9	10.7

TABLE 3. Population densities of Mourning Doves vs. habitat characteristics. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. * = significant relationship. N = 147.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.11	0.07	0.07	−0.02	−0.06	−0.02	−0.01
P	0.83	0.21	0.21	0.75	0.28	0.65	0.81
Winter							
τ	−0.11	−0.03	−0.07	−0.03	−0.20	0.07	−0.22
P	0.05	0.61	0.20	0.62	<0.01*	0.21	<0.01*
Seasonal change							
τ	0.11	0.06	0.08	0.04	0.08	−0.07	0.13
P	0.08	0.34	0.17	0.50	0.15	0.23	0.02

Population variance.- Breeding Bird Survey data showed a nominal downward trend in U.S. populations (trend = −0.42, *n* = 3646, %CV = 7.2; Kendall's τ = −0.64, *n* = 48, *P* < 0.001) but slightly increasing Northeastern populations (trend = 0.10, *n* = 135, %CV = 3.9; Kendall's τ = 0.57, *n* = 48, *P* < 0.001). U.S. Christmas Counts showed significant population increases (polynomial model r^2 = 0.48, df = 47, *P* < 0.001, %CV = 12.7) to a maximum occurring about 1990, although decreases have occurred since then in a manner suggestive of a population cycle. New England populations showed a similar pattern (polynomial model r^2 = 0.69, df = 48, *P* < 0.001, %CV = 18.2).

Duplicated density estimates for eastern Connecticut showed a 11−63% change in summer and 80−265% increase in winter (Table 1). Craig (1987) found no birds on summer line transects through northeastern Connecticut, although they were present in the study area (R. Craig pers. obs.). Elsewhere, Miller et al. (2010) estimated nest density at 0.7−11.7/ ha in California.

Habitat.- Individual Mourning Doves observed in summer used forest canopies more open than those available, although they otherwise used habitats in approximately the proportions at which they were present. Wintering birds used lower elevation habitats that had more open canopies than those available (Table 2). Stepwise logistic regression analysis of habitat use yielded a model that showed a small but significant seasonal decline in elevations occupied (Nagelkerke r^2 = 0.06, % correctly classified = 68.4, *n* = 177, *P* = 0.004).

Analyses of habitat variables vs. population densities (Table 3) showed winter correlations with more open forest and locations of lower elevation. Seasonal differences in populations again showed a near significant positive relationship with lower elevations.

Elsewhere, the Mourning Dove is reported to inhabit forest edge, open woods, suburban areas and agricultural areas, but to avoid forest interiors and extensive forest. In the East, it frequently chooses conifers for nest sites (Mirarchi and Baskett 1994).

History.- The Mourning Dove was known as a common but declining Connecticut resident by Sage et al. (1913). Populations are thought increased there during the 20th century (Zeranski and Baptist 1990). It was described as "not uncommon" in summer in Rhode Island by Howe and Sturtevant (1899), although they found it rare or absent on the islands of Narragansett Bay.

Breeding bird atlas data showed that in the 1970s, the Mourning Dove was a definite or probable breeder at 71.4% of Massachusetts survey blocks (Carrolan 2003). In the 1980s, it was a definite or probable breeder at 95.6% of Connecticut blocks (Smith and Devine 1994g). It was also definite or probable at 73.3% of Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders remained essentially stable at 68.6% of blocks across Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Mourning Dove is a regular inhabitant of the landscapes surveyed during this study. Computed densities are at the lower end of reports from elsewhere, likely because I sampled in primarily forested habitat—habitat at the periphery of that typically used by the species. My observations of the species' year-round association with forest openings are, however, in general agreement with other reports.

In agreement with breeding bird atlases, the species appears to be uniformly distributed in summer. However, it retreats from higher elevations in winter. Despite the high variance observed in duplicated eastern Connecticut data, this winter pattern is apparently real based on the data of Craig (2012) and on the number of species exhibiting the same pattern in this study. Based on Christmas Count and duplicated eastern Connecticut data, populations also appear to be growing in winter,

Conservation.- Breeding Bird Survey and Christmas Count data show that the Mourning Dove has generally stable populations, although it may undergo winter population cycles.

YELLOW-BILLED CUCKOO

Coccyzus americanus

Summer

Density (males/km^2): 0.48 (N = 107, 95% CI: ± 0.18)
CT: 0.43
RI: 0.70

Population (males): 4,371 (95% CI: ± 1,637)
CT: 3,255
RI: 1,116

Density.- In identifying the Yellow-billed Cuckoo, I used the characteristic (Hughes 1999) *kowlp-kowlp-kowlp* call, which is apparently uttered only by males. Hence, I interpret densities as those of males.

Although occurring at low densities on 35% of transects in principally forested habitats, the Yellow-billed Cuckoo was much more common during the study period than its congener, the Black-billed Cuckoo. Similarly to this species, however, it reached its greatest densities in southeastern Connecticut and Rhode Island (Kruskal-Wallis $\chi^2 = 42.0$, $n = 147$, $P < 0.001$; Table 1).

Population variance.- Breeding Bird Survey data showed a variable, somewhat cyclic U.S. (trend = −1.75, $n = 2282$, %CV = 25.5; Kendall's $\tau = -0.82$, $n = 48$, $P < 0.001$) and Northeastern (trend = −2.05, $n = 130$, %CV = 40.9; Kendall's $\tau = -0.62$, $n = 48$, $P < 0.001$) decline in populations. Duplicated density estimates for eastern Connecticut showed a 27−390% change (Table 1).

Craig (1987) incidentally detected the species but did not compute its densities on summer line transects through northeastern Connecticut. Elsewhere, population densities are reported to range from 2.5−66.2 pairs/km^2 (Hughes 1999).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.15		0.40			
2003−2008	0.11	0.24	1.96	0.11	0.50	0.70
Rank	56.7	65.7	113.2	56.1	72.3	78.0

TABLE 2. Habitat availability vs. use by individual Yellow-billed Cuckoos. $n = 32$. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.22	1.91	2.22	1.98	2.39	2.44	118.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	56.3	25.0	6.3	6.3	3.1	3.1

Habitat.- Observations of individual Yellow-billed Cuckoos suggested that birds occurred at elevations substantially lower than those available and were present in particularly oak-dominated forests, although they otherwise used habitats in about the proportions at which they were present (Table 2). Population densities were also greatest in locations with lower elevations as well as in forests with higher deciduous cover (Table 3).

Elsewhere, the species is reported to inhabit open woods, thickets and scrub, often near water. It is also found in young forest

TABLE 3. Summer population densities of Yellow-billed Cuckoos vs. habitat characteristics. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.19	−0.20	−0.05	0.02	0.01	0.14	−0.24
P	<0.01*	<0.01*	0.44	0.79	0.94	0.04	<0.01*

and in riparian woods. It appears less frequent in extensive forests than the Black-billed Cuckoo, and populations appear greatest in unfragmented habitat. North American cuckoos are also reported to be nomadic and to have populations that track outbreaks of caterpillars (Hughes 1999).

History.- The Yellow-billed Cuckoo was described as a fairly common breeder of southern Connecticut by Sage et al. (1913). Similarly, Zeranski and Baptist (1990) believed that, although populations varied irregularly, it was more common than the Black-billed Cuckoo near the Connecticut coast. Howe and Sturtevant (1899) considered it common in Rhode Island but variable in occurrence.

Breeding bird atlas data showed that in the 1970s, the Yellow-billed Cuckoo was a definite or probable breeder at 11.0% of Massachusetts survey blocks, primarily in the eastern part of the state (Wiggin 2003). In the 1980s, it was a definite or probable breeder at 13.4% of blocks throughout Connecticut (Clark 1994c). It was also definite or probable at 20% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders decreased to 7.8% of blocks across Massachusetts, although total sightings increased from 169 to 258 (Walsh and Peterson 2013).

Synthesis.- The Yellow-billed Cuckoo is a secretive species that may be missed by typical survey methods (Hughes 1999). Population estimates based on vocalizations may, therefore, be conservative. Moreover, because I sampled birds inhabiting forests, my estimates refer only to forest portions of the regional population.

Similarly to earlier authors, I found evidence that the species is more common in southeastern portions of the study area. Duplicate observations from eastern Connecticut support this, although annual variation in eastern Connecticut counts was great. Such population variance is well known for the species (Hughes 1999) and is also demonstrated by data from the Breeding Bird Survey.

Although not generally considered to be a species of mature interior forest, I found the Yellow-billed Cuckoo to be uncommon but regularly occurring in such habitat, particularly at lower elevation sites. Contrary to Hughes (1999), I found it more common than the Black-billed Cuckoo in principally forested landscapes.

Conservation.- Breeding Bird Survey and Massachusetts Breeding Bird Atlas data indicate that the Yellow-billed Cuckoo is undergoing a long term decline, although duplicate data from eastern Connecticut show inconsistent population trends. Because the species is typically associated with open habitats and early successional forests, a factor likely driving the decline is the maturation of regional forests (Ward and Barsky 2000). Habitat (but not necessarily forest) fragmentation also may negatively influence populations as the region urbanizes. Because the species occurs in mature forest, even as regional forests mature it may remain as a rare resident.

Sponsored by Paul and Maureen Wolter

BLACK-BILLED CUCKOO

Coccyzus erythropthalmus

Summer

Density (birds/km^2): 0.11 (n = 54, 95% CI: ± 0.04)
CT: 0.08
RI: 0.24

Population (birds): 993 (95% CI: ± 375)
CT: 613
RI: 380

Density.- The Black-billed Cuckoo occurred on only 22% of transects during this study. Densities appeared greatest in especially eastern Connecticut and Rhode Island (Table 1), although the species is notoriously variable in annual occurrence (Hughes 2001).

In identifying this species, I used the characteristic *cu-cu-cu-cu* call, which is uttered by both sexes (Hughes 2001). Hence, population estimates are of total individuals. However, they are based on <60 detections, so have comparatively high variance.

Population variance.- Breeding Bird Survey data showed a variable, perhaps cyclic U.S. (trend = −3.25, n = 1313, %CV = 46.7; Kendall's $\tau = -0.80$, n = 48, $P < 0.001$) and Northeastern (trend = −4.22, n = 108, %CV = 76.9; Kendall's $\tau = -0.79$, n = 48, $P < 0.001$) decline in populations. Declines have occurred roughly linearly since 1966, although annual variance has declined greatly since about 1993.

Duplicated density estimates for eastern Connecticut showed a 57−63% decline (Table 1). Craig (1987) incidentally detected the species but did not compute its densities on summer line transects through northeastern Connecticut. Elsewhere, forest densities are reported as 17 males/km^2 in West Virginia and 0.5 birds/km^2 in Michigan. (Hughes 2001).

TABLE 1. Summer population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.21		0.24			
2003−2007	0.09	0.05	0.09	0.00	0.04	0.24

TABLE 2. Habitat availability vs. use by individual Black-billed Cuckoos. n = 11. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.18	2.09	2.45	2.00	2.36	2.45	90.27

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	63.6	18.2	0.0	0.0	18.2	0.0

Habitat.- Individual Black-billed Cuckoos occupied much lower elevation habitats that were more deciduous, xeric, open canopied and with greater understory density than would be predicted from habitat availability (Table 2). Their infrequent occurrence provided little data with which to compare population densities and habitat variables.

Elsewhere, the species is known to inhabit forest edge, tree groves, and thickets. It also occupies deciduous and mixed cover in old fields, young forest and wetland borders. It is reported to be more frequent in extensive forests than the Yellow-billed Cuckoo, and populations appear greatest in unfragmented habitat (Hughes 2001).

History.- The Black-billed Cuckoo was described as a common breeder of southern Connecticut by Sage et al. (1913), although they reported that it had declined substantially from the 1890s. Howe and Sturtevant (1899) described it as a not uncommon summer resident in Rhode Island. Zeranski and Baptist (1990) believed that although populations varied irregularly in Connecticut, it was more common than the Yellow-billed Cuckoo away from the coast.

Breeding bird atlas data showed that in the 1970s, the Black-billed Cuckoo was a definite or probable breeder at 23.5% of Massachusetts survey blocks, appearing to occur more commonly in the eastern part of the state (Cassie 2003a). In the 1980s, it was a definite or probable breeder at 15.1% of blocks throughout Connecticut (Clark 1994d). It was also definite or probable at 47.9% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders decreased to 10.3% of blocks with no clear pattern of occurrence in Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Black-billed Cuckoo is a secretive species that may be missed by typical survey methods (Hughes 2001). Population estimates based on vocalizations may, therefore, be conservative. Moreover, because I sampled birds inhabiting primarily forested landscapes, my estimates refer only to populations at these locations. Hence, my estimates are below those reported for elsewhere.

Although the species has been thought to predominate in northern portions of the study area (Zeranski and Baptist 1990), I found it particularly in eastern regions. Moreover, I found only limited evidence of a north-south difference in densities even over the years during which eastern regions were surveyed. Hence, I suspect that habitat factors, including locations of caterpillar outbreaks, play a larger role in determining distributions. The variable annual occurrence of the species (Hughes 2001), a phenomenon also observed during duplicate eastern Connecticut observations, is likely related particularly to such outbreaks. Indeed, I observed that cuckoos were invariably present at locations with Gypsy Moth (*Lymantria dispar*) caterpillar outbreaks.

My limited observations of habitat use were generally in line with reports from elsewhere. However, birds appeared to occur at greatly lower elevations than habitat availability would predict, which is also at odds with the notion that the species predominates in northern portions of the study area.

Conservation.- Breeding Bird Survey and Massachusetts Breeding Bird Atlas data strongly indicate that the Black-billed Cuckoo is undergoing a long term decline. Because the species is typically associated with early successional forests, a factor likely driving the decline is the maturation of regional forests (Ward and Barsky 2000). However, it is known to inhabit mature forest and I found that it was rare but regularly occurring in such environments. Its reproductive success in forests is unknown, but its presence there suggests that, even as regional forests mature, it may remain present as a rare resident.

RUBY-THROATED HUMMINGBIRD

Archilochus colubris

Summer

Density (birds/km^2): 22.34 (*n* = 53, 95% CI: ± 6.43)
CT: 22.25
RI: 22.75

Population (birds): 203,627 (95% CI: ± 58,635)
CT: 167,448
RI: 36,179

Density.- Although encountered on only 30% of transects, detections of the Ruby-throated Hummingbird in primarily forested habitats were frequently at 5−10 m, so computed densities were high. Birds were most abundant in northwestern and least abundant in southwestern Connecticut (Kruskal-Wallis χ^2 = 19.3, *n* = 147, *P* = 0.002; Table 1).

While surveying, I encountered non-singing, foraging birds almost exclusively and encountered males and females with about equal frequency. Hence, computed densities are of birds/km^2.

Population variance.- Breeding Bird Survey data showed a concave U.S. (trend = 1.45, *n* = 1938, %CV = 22.7; Kendall's τ = 0.97, *n* = 48, *P* < 0.001) and Northeastern (trend = 2.06, *n* = 114, %CV = 31.7; Kendall's τ = 0.97, *n* = 48, *P* < 0.001) increase in populations. Duplicated density estimates for eastern Connecticut showed a 33−200% increase (Table 1).

On summer line transects through northeastern Connecticut, Craig (1987) incidentally detected the species but did not compute its densities. Elsewhere, densities are reported as 8−12 pairs/km^2 (Wilcove 1988), 15−30 pairs/km^2 (Freedman et al. 1981) and 4.9 birds/km^2 (James and Neal 1986). Computed densities for pairs do not take into account the polygynous nature of the species, however.

TABLE 1. Summer population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	2.84		18.48			
2003−2008	8.53	47.53	24.64	4.11	23.66	22.75
Rank	61.7	96.3	77.2	61.0	74.2	69.5

TABLE 2. Habitat availability vs. use by individual Ruby-throated Hummingbirds. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 53. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.38	2.60	2.08	1.97	2.39	2.41	167.4
P(*U*)	0.94	0.19	<0.01*	0.59	0.10	0.33	0.80

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	30.2	34.0	18.9	1.9	7.5	7.5

Habitat.- Observations of individual Ruby-throated Hummingbirds showed that birds inhabited moister sites than those available, although they otherwise used habitats in about the proportions at which

TABLE 3. Summer population densities vs. habitat characteristics for Ruby-throated Hummingbirds. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.05	0.04	−0.05	<0.01	−0.11	0.06	0.06
P	0.51	0.57	0.44	0.97	0.12	0.35	0.35

they were present (Table 2). I indeed found summering birds principally associated with swamps, riparian areas and other mesic habitats. I found no significant relationships between population density and habitat variables, however (Table 3).

Elsewhere, the species is reported to inhabit mixed woodland, deciduous forest, pine forest, forest edge and forest openings. It is also present frequently in gardens and orchards (Robinson et al. 1996).

History.- Sage et al. (1913) reported that the species was declining in Connecticut. Although still considered common in Connecticut through the 1930s, it was reported to be uncommon into the 1980s (Colwell 1994). Howe and Sturtevant (1899) found the species a common summer resident in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the Ruby-throated Hummingbird was a definite or probable breeder at 18.9% of Massachusetts survey blocks, particularly in the mountainous western part of the state (Arvidson 2003a). In the 1980s, it was a definite or probable breeder at 20.5% of blocks, particularly in similarly mountainous northwestern Connecticut (Colwell 1994). It was also definite or probable at 9.1% of blocks primarily in southern Rhode Island (Enser 1992). By the 2000s, definite and probable breeders increased to 44.2% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Ruby-throated Hummingbird is a rather common, albeit less frequently encountered species in the forests of southern New England. Similarly to the findings of breeding bird atlases, it is most abundant in more mountainous western portions of my region, although annual variance in counts is great. Computed population densities are at the higher end of those reported for elsewhere, which may be due at least in part to previous estimates not taking into account the species' polygnous mating system.

Observations of habitat use indicate that moister locations are used most frequently. The importance of such habitats to the species within the larger forest environment has not previously been noted. I have incidentally observed that, especially in swamp and stream habitats, a procession of flowering by shrubs and herbaceous plants occurs throughout the breeding season, thereby creating a consistent food supply for this nectarivorous bird.

Although the Ruby-throated Hummingbird is typically thought to inhabit forest edge and open forest, I found its relationship to such habitats to be weak. Hence, in primarily forested landscapes, the species appears capable of inhabiting even forest interiors as long as flowers are present consistently.

Conservation.- Despite evidence for a regional decline occurring after the early 20th century, more recent Breeding Bird Survey data as well as duplicated eastern Connecticut and Massachusetts Breeding Bird Atlas data demonstrate that a long term population increase is occurring. Although predominating in northwestern Connecticut during this study, as populations grow their distribution is, based on breeding bird atlas data from Massachusetts, likely to become more uniform.

Sponsored by Ben Williams

RED-BELLIED WOODPECKER

Melanerpes carolinus

Summer

Density (birds/km^2): 2.32 (n = 355, 95% CI: ± 0.43)
CT: 2.52
RI: 1.37
Population (birds): 21,113 (95% CI: ± 3,948)
CT: 18,933
RI: 2,180

Winter

Density (birds/km^2): 2.06 (n = 327, 95% CI: ± 0.41)
CT: 2.20
RI: 1.38
Population (birds): 18,754 (95% CI: ± 3,738)
CT: 16,566
RI: 2,188

Density.- The Red-bellied Woodpecker was a widespread inhabitant of Connecticut and Rhode Island, occurring on 71% of summer and 69% of winter transects. Population estimates are based on detections of males and females.

Summer density was greatest in southwestern and least in northwestern Connecticut (Kruskal-Wallis $\chi^2 = 31.3$, $n = 147$, $P < 0.001$; Table 1). In winter, its density was greatest in central and least in northeastern and northwestern Connecticut (Kruskal-Wallis $\chi^2 = 30.7$, $n = 147$, $P < 0.001$).

Populations showed no significant seasonal change for the region as a whole (Wilcoxon $Z = -0.98$, $n = 147$, $P = 0.33$). However, duplicated data for eastern Connecticut suggested that populations grew slightly from summer to winter in southeastern Connecticut.

Population variance.- Breeding Bird Survey data showed a nearly linear increase in U.S. populations (trend = 1.08, n = 2015, %CV = 15.1; Kendall's $\tau = 0.94$, $n = 48$, $P < 0.001$) and a concave increase in Northeast-

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.95		2.71			
2003−2008	1.47	1.14	2.71	3.89	4.23	1.37
rank	56.2	52.2	90.2	95.0	97.7	61.4
Winter						
2001−2003	0.52		3.60			
2003−2009	1.00	0.97	3.19	2.06	4.05	1.38
rank	54.7	55.6	95.3	77.0	101.9	63.7

TABLE 2. Habitat availability vs. use for individual Red-bellied Woodpeckers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 107 summer, n = 97 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use							
	1.15	1.99	2.18	1.97	2.59	2.34	119.0
$P(U)$	<0.01*	0.05	0.04	0.71	0.53	0.93	<0.01*
Winter use							
	1.13	1.86	2.19	1.99	2.54	2.27	114.8
$P(U)$	<0.01*	<0.01*	0.14	0.53	0.83	0.36	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	51.4	27.1	9.3	6.5	0.0	5.6
Winter use	54.6	29.9	5.2	5.2	1.0	4.1

TABLE 3. Population densities vs. habitat characteristics for Red-bellied Woodpeckers. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.33	−0.23	−0.19	0.09	0.06	−0.06	−0.31
P	<0.01*	<0.01*	<0.01*	0.19	0.33	0.35	<0.01*
Winter							
τ	−0.28	−0.14	−0.18	<0.01	−0.12	−0.02	−0.36
P	<0.01*	0.02	<0.01*	0.99	0.05	0.75	<0.01*
Seasonal change							
τ	−0.04	−0.07	−0.07	0.08	0.17	−0.07	0.07
P	0.54	0.25	0.26	0.20	<0.01*	0.22	0.26

ern populations (trend = 2.44, *n* = 124, %CV = 37.8; Kendall's τ = 0.93, *n* = 48, $P < 0.001$). U.S. (Kendall's τ = 0.94, *n* = 48, $P < 0.001$, %CV = 28.7) and New England (Kendall's τ = 0.93, *n* = 48, $P < 0.001$, %CV = 112.5) Christmas Counts showed similarly accelerating increases.

Duplicated density estimates for eastern Connecticut showed a 0−55% increase in summer and 11−92% change in winter, although populations in northeastern Connecticut grew from the first to second sampling periods at both seasons (Table 1). Elsewhere, nearly 100 birds/km^2 have been reported in Texas (Shackelford et al. 2000).

Habitat.- Summering and wintering Red-bellied Woodpecker individuals used more deciduous, lower elevation forests, particularly oak-dominated forests, than would be predicted from habitat availability (Table 2). Analyses of habitat variables vs. population densities (Table 3) showed similar relationships with deciduous forest and lower elevation, although they also indicated that greater densities of birds were found in forests moister than those available.

Stepwise logistic regression analysis of seasonal shifts in habitat use by individual birds showed no changes in habitats occupied (*n* = 204, *P* = 0.48). Similarly, seasonal shifts in populations showed no correlations with habitat (Table 3). Elsewhere, the species is associated with mature deciduous or mixed forest in either wet (bottomland, floodplain) or dry conditions. In the South, it is typical of pine-oak forest. Comparatively high density tree and understory cover is characteristic of habitats used in much of the East (Shackelford et al. 2000).

History.- The Red-bellied Woodpecker was a rarity in Connecticut before 1960 (Sage et. al 1913, Zeranski and Baptist 1990). Similarly, Howe and Sturtevant (1899) reported only two records from Rhode Island, where it was first found nesting in 1984 (Enser 1992). However, since 1960 the species has increased explosively at this, its northern range limit (Clark 1994e), although in 1975 and 1982, ca. 43 and 53 hours of field observation, respectively, yielded none in northwestern Connecticut (R. Craig pers. obs.). Moreover, Craig (1987) found no Red-bellied Woodpeckers on summer line transects through northeastern Connecticut.

Breeding bird atlas data showed that in the 1970s, the Red-bellied Woodpecker was a definite or probable breeder at only 0.3% of Massachusetts survey blocks (Bates 2003a). In the 1980s, it was a definite or probable breeder at 17.6% of particularly southern Connecticut blocks (Clark 1994e). It was also definite or probable at 1.8% of Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders increased explosively to 54.2% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The multi-year perspective of this study indicates that populations of the uncommon but widespread Red-bellied Woodpecker appear to be largely stable year round, although similarly to that reported by Clark (1994e), densities are greatest in southern portions of the study area. Data from duplicated eastern Connecticut surveys also suggest stable populations in southeastern but growing populations in northeastern portions of the region. Furthermore, at least during some years, populations may grow from summer to winter (see also Craig 2012). Levels of variance in duplicated data were generally similar to those reported for breeding bird and Christmas count surveys.

Evidence for at least some north to south movement of populations from summer to winter may be related to the species' tendency to vacate northern portions of its range during winter (Shackelford et al. 2000). Densities reported here are among the few available, particularly from the northern edge of the range.

The association of the Red-bellied Woodpecker with more deciduous forests of lower elevations year-round may be understood in terms of the more southerly distribution of the species. Such habitats predominate in southern portions of the study area where birds reach their highest densities. However, the species' association with pine-oak habitats characteristic of the South is not generally observed locally, although Craig et al. (2003) initially found evidence of this in eastern Connecticut. Craig (2012) similarly found little seasonal difference in habitat use, although during one winter Red-bellied Woodpeckers were present in forests more open than they were in summer.

Conservation.- Data from the Breeding Bird Survey and Christmas Count show that populations of the Red-bellied Woodpecker have increased dramatically in southern New England. It now ranges even into the highest elevations of Connecticut, where as recently as the 1980s it was largely absent (Craig 1987). However, the species' greatest density, winter and summer, remains in lower elevations of Connecticut.

Sponsored by Philippa Paquette

YELLOW-BELLIED SAPSUCKER

Sphyrapicus varius

Summer

Density (birds/km^2): 2.50 (n = 176, 95% CI: ± 0.94)
CT: 3.03
RI: 0
Population (birds): 22,791 (95% CI: ± 8,579)
CT: 22,791
RI: 0

Density.- The Yellow-bellied Sapsucker summered on 21% of transects in more mountainous portions of Connecticut. Densities are based on detections of call notes uttered by both sexes.

Its greatest density by far occurred in northwestern Connecticut, where it was the commonest woodpecker species, although it also ranged into northeastern and northern portions of southwestern Connecticut (Table 1).

The species normally winters south of New England, although I made one winter observation in central Connecticut. Because of its rarity at this season, I make no winter population estimate.

Population variance.- Breeding Bird Survey data showed a concave increase in U.S. (trend = 2.48, n = 511, %CV = 39.5; Kendall's τ = 0.91, n = 48, $P < 0.001$) and Northeastern populations (trend = 6.87, n = 17, %CV = 88.3; Kendall's τ = 0.97, n = 48, $P < 0.001$). Christmas Counts showed that U.S. populations exhibited a concave, possibly cyclic relationship, with populations increasing since about 1987 (quadratic model r^2 = 0.16, df = 46, P = 0.005, %CV = 14.1). New England populations showed a consistent concave increase (Kendall's τ = 0.69, n = 48, $P < 0.001$, %CV = 71.0).

Duplicated density estimates for eastern Connecticut showed 300% population growth in northeastern Connecticut and continued absence from southeastern Connecticut (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found no birds, although calling individuals were present in the study area until the end of May (R. Craig pers. obs.). Elsewhere, 35 ± 13 pairs/km^2 have been reported (Holmes et al. 1986).

Habitat.- Summering Yellow-bellied Sapsucker individuals used habitats in

TABLE 1. Summer population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001–2002	0.08		0.00			
2003–2008	0.32	12.07	0.00	0.80	0.00	0.00

TABLE 2. Habitat availability vs. use by individual Yellow-bellied Sapsuckers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 84. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.40	2.13	2.15	1.98	2.62	2.27	323.0
$P(U)$	0.31	0.93	0.05	0.96	0.33	0.33	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	40.5	21.4	33.3	3.6	3.6	1.2

approximately the same proportions as their availability, although they occupied areas with much greater elevation than would be predicted from habitat availability (Table 2). My one winter observation was of a bird inhabiting deciduous floodplain forest along the Connecticut River.

During this study, my first observation in northeastern Connecticut was of a bird inhabiting an open beaver swamp with much of the canopy composed of dead trees, similar to the location where Craig (pers. obs.) first observed birds in northwestern Connecticut in 1976. Elsewhere, the Yellow-bellied Sapsucker is reported in summer from young deciduous and mixed conifer-deciduous forests. It is often associated with riparian habitat and selectively logged areas where deciduous trees predominate. In winter, more deciduous and open habitats are used and bottomland forest is frequently inhabited (Walters et al. 2002).

History.- Sage et al. (1913) reported the Yellow-bellied Sapsucker to be rare in summer and winter, although it became increasingly common in Connecticut at all seasons during the 20th century (Zeranski and Baptist 1990). Howe and Sturtevant (1899) knew it only as a migrant in Rhode Island. In 1975, Craig (pers. obs.) found none summering in northwestern Connecticut in 43 hours of field observation, although by 1976 he found one. By 1982, he found 0.13/hr there in 53 hours of observation.

Breeding bird atlas data showed that in the 1970s, the Yellow-bellied Sapsucker was a definite or probable breeder at 13.9% of mostly western Massachusetts survey blocks (Kellogg 2003a). In the 1980s, it was a definite or probable breeder at 10.1% of northwestern Connecticut blocks (Devine and Smith 1994a). It was unreported from Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had expanded eastward in Massachusetts to 27.3% of blocks (Walsh and Peterson 2013).

Synthesis.- Similarly to that noted in breeding bird atlases, breeding populations of the Yellow-bellied Sapsucker are restricted to mountainous portions of northern Connecticut. In these regions, densities are well below those reported for further north—a situation typical for species at their range limit (Pulliam 1988). Habitat data from elsewhere also suggest that the species prefers younger forest, and this also may help to explain the lower densities I found in the primarily mature forests of southern New England.

My observations of birds inhabiting locations of primarily higher elevations correspond with the species' more northerly distribution. Based on previous observations from when birds first began colonizing Connecticut as well as on other reports of birds occupying open, riparian habitats, open swamps may represent preferred habitat here at the southern end of the species' geographic distribution.

Conservation.- The Breeding Bird Survey, Christmas Counts and data from breeding bird atlases indicate that populations of the Yellow-bellied Sapsucker are growing rapidly. Duplicated data from eastern Connecticut also indicate population growth. Hence, we may expect that the species will continue to extend its breeding range across southern New England. Moreover, since the end of this study, it has increased as a winter resident to the point where it now occurs regularly even in upland locations (R. Craig pers. obs.).

Sponsored by Helen Chase Millett-Miller

DOWNY WOODPECKER

Picoides pubescens

Summer

Density (birds/km^2): 9.96 (*n* = 683, 95% CI: ± 1.10)
CT: 10.56
RI: 7.13

Population (birds): 90,760 (95% CI: ± 8,133)
CT: 79,426
RI: 11,334

Winter

Density (birds/km^2): 9.64 (*n* = 584, 95% CI: ± 1.42)
CT: 10.36
RI: 6.19

Population (birds): 87,820 (95% CI: ± 12,955)
CT: 78,031
RI: 9,839

Density.- The Downy Woodpecker occurred on 98% of summer and 93% of winter transects. I used call notes made by both sexes in assessing density.

During the study period, summer density was greatest in central Connecticut and least in northwestern Connecticut and Rhode Island (Kruskal-Wallis χ^2 = 21.0, *n* = 147, *P* = 0.001). In winter, density was also greatest in central Connecticut and least in northwestern Connecticut and Rhode Island (Kruskal-Wallis χ^2 = 31.2, *n* = 147, *P* < 0.001; Table 1).

Populations showed no seasonal change for the region as a whole (Wilcoxon *Z* = −0.81, *n* = 147, *P* = 0.42). Similarly, duplicated data for eastern Connecticut showed no strong evidence of population change or north-south shift in densities (Craig 2012).

Population variance.- Breeding Bird Survey data showed a nominal concave increase in U.S. populations (trend = 0.08, *n* = 2818, %CV = 4.8; exponential model r^2 = 0.39, df = 47, *P* < 0.001) and a weakly concave increase in Northeastern populations

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	8.11		10.33			
2003−2008	10.74	7.84	9.74	10.61	15.17	7.13
rank	78.8	52.6	78.8	76.1	108.4	52.3
Winter						
2001−2003	6.91		9.07			
2003−2009	9.34	6.42	9.20	10.69	17.91	6.19
rank	80.9	58.2	73.6	71.1	103.6	57.7

TABLE 2. Habitat availability vs. use for individual Downy Woodpeckers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 368 summer, *n* = 378 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.20	2.05	2.23	1.99	2.59	2.31	160.3
P(*U*)	<0.01*	0.02	0.23	0.16	0.25	0.69	0.69
Winter use	1.24	2.15	2.19	1.99	2.57	2.38	141.0
P(*U*)	<0.01*	0.07	0.06	0.26	0.67	0.22	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	47.3	30.2	11.4	4.6	1.4	5.2
Winter use	47.9	27.0	10.6	5.6	3.4	5.6

TABLE 3. Population densities vs. habitat characteristics for Downy Woodpeckers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.30	−0.23	−0.11	−0.20	−0.10	−0.08	−0.06
P	<0.01*	<0.01*	0.06	0.77	0.09	0.17	0.33
Winter							
τ	−0.23	−0.13	−0.06	0.01	−0.08	0.04	−0.22
P	<0.01*	0.03	0.30	0.86	0.20	0.48	<0.01*
Seasonal change							
τ	0.95	−0.03	−0.02	−0.03	0.02	−0.11	0.12
P	0.15	0.62	0.68	0.59	0.75	0.06	0.03

(trend = 0.92, n = 133, %CV = 14.3; exponential model r^2 = 0.92, df = 47, $P <$ 0.001). Christmas Counts showed that U.S. populations exhibited little winter trend (exponential model r^2 = 0.01, df = 47, P = 0.51, %CV = 7.2). New England populations also showed no significant trend but may have undergone weak cyclic fluctuations that reached a low point about 1990 (exponential model r^2 = 0.01, df = 47, P = 0.53, %CV = 13.6).

Duplicated density estimates for eastern Connecticut showed a 6−32% change in summer and 1−35% increase in winter and rather consistent populations within and between seasons (Table 1). Craig (1987) found 5.1 birds/km^2 on line transects through northeastern Connecticut, whereas in New Hampshire breeding densities were reported to range from 2.6 (Holmes et al. 1986) to 24.2 birds/km^2 (Holmes and Sherry 1988).

Habitat.- Summering and wintering Downy Woodpecker individuals used forests more deciduous than those available (Table 2). Wintering birds also occupied lower elevation forests. Analyses of habitat variables vs. population densities (Table 3) showed the same relationships with deciduous forest and lower elevation.

Stepwise logistic regression analysis of habitat use by individual birds showed a seasonal decline in elevations occupied (Nagelkerke r^2 = 0.02, % correctly classified = 55.0, n = 746, P = 0.004). Seasonal shifts in populations showed no correlations with habitat, however (Table 3).

Elsewhere, the species is reported to inhabit especially deciduous forests, although it also occurs in coniferous forests, albeit at lower densities. Younger, open forests and riparian forests are thought to be favored. Moreover, it occupies orchards and even suburban landscapes (Jackson and Ouellet 2002).

History.- The Downy Woodpecker was a common summer resident in Connecticut even in the 19th century when forest extent was limited (Sage et al. 1913), and it remained a common breeder throughout the 20th century (Zeranski and Baptist 1990). In Rhode Island, Howe and Sturtevant (1899) described it as common in summer but more abundant in winter.

Breeding bird atlas data showed that in the 1970s, the Downy Woodpecker was a definite or probable breeder at 62.6% of survey blocks throughout Massachusetts (Arvidson 2003b). In the 1980s, it was definite or probable at 80.0% of blocks throughout Connecticut (Smith and Devine 1994h). It was also definite or probable at 48.5% of blocks throughout Rhode Island, although it may have been less common along the coast (Enser 1992). By the 2000s, definite and probable breeders increased to 79.8% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Downy Woodpecker is a common and widespread forest inhabitant in southern New England. Densities reported are within the range reported for elsewhere. Populations appear to be largely stable year round, although densities are much greater in less heavily forested central Connecticut and least in more coniferous northwestern Connecticut and Rhode Island. Duplicated data from eastern Connecticut also indicate reasonably stable year-round populations that exhibit only modest variance, which thereby provides evidence that the geographic patterns noted here are real.

The tendency of birds to inhabit more deciduous forests and to have lower populations in more coniferous regions is consistent with other observations that indicate population densities are greatest in deciduous habitats. Although I observed no substantial geographic shift in seasonal populations, habitat data demonstrate a seasonal shift from use of higher summer to lower winter elevations. In examining duplicated eastern Connecticut data, Craig (2011) similarly found a seasonal decline in elevations occupied. Moreover, Craig et al. (2003) found evidence of summer to winter population growth and a north-south shift in densities. Such observations suggest that at least during some years, birds move into southern New England from further north and concentrate in lower elevation coastal areas. The historic report of Howe and Sturtevant (1899) that greatest Rhode Island populations occur in winter also supports the occurrence of such movement.

Conservation.- Breeding Bird Survey and Christmas Count data show that the Downy Woodpecker has an essentially stable to weakly increasing regional population that exhibits small annual variation and little seasonal change. Duplicated observations for eastern Connecticut also demonstrate limited annual variance and consistent year-round populations. Despite such stability, some population increase appears to have occurred, and this may in part explain the greater densities encountered in this study compared with those of Craig (1987).

HAIRY WOODPECKER

Picoides villosus

Summer

Density (birds/km^2): 3.29 (*n* = 152, 95% CI: ± 0.59)
CT: 3.60
RI: 1.84

Population (birds): 30,021 (95% CI: ± 5,339)
CT: 27,094
RI: 2,927

Winter

Density (birds/km^2): 3.19 (*n* = 186, 95% CI: ± 0.58)
CT: 3.42
RI: 2.13

Population (birds): 29,120 (95% CI: ± 5,288)
CT: 25,730
RI: 3,390

Density.- The Hairy Woodpecker appeared on 70% of summer and winter transects. I used call notes made by both sexes in assessing density.

During the study period, summer density was greatest in central Connecticut and least in Rhode Island (Kruskal-Wallis χ^2 = 15.9, *n* = 147, *P* = 0.007). In winter, density was also greatest in central Connecticut and least in Rhode Island, although differences among regions at this season were not significant (Kruskal-Wallis χ^2 = 5.8, *n* = 147, *P* = 0.32; Table 1).

Populations showed no significant seasonal change for the region as a whole (Wilcoxon *Z* = −1.26, *n* = 147, *P* = 0.21). Similarly, duplicated data for eastern Connecticut showed no strong evidence of population change or north-south shift in densities (Craig 2012).

Population variance.- Breeding Bird Survey data showed a nominal nearly linear increase in U.S. populations (trend = 0.53, *n* = 2589, %CV = 8.5; Kendall's τ = 0.89, *n* = 48, *P* < 0.001) but a weakly concave decline

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	1.69		1.33			
2003−2008	3.68	3.99	3.32	2.88	5.74	1.84
rank	76.3	81.2	65.3	65.3	95.4	53.9
Winter						
2001−2003	2.38		2.72			
2003−2009	3.13	3.61	2.85	3.80	4.17	2.13
rank	72.0	75.2	73.8	81.2	84.6	59.5

TABLE 2. Habitat availability vs. use for individual Hairy Woodpeckers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 104 summer, *n* = 118 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.26	2.18	2.24	1.97	2.62	2.25	160.3
P(*U*)	0.13	0.16	0.71	0.68	0.19	0.26	0.11
Winter use							
	1.26	2.40	2.23	2.01	2.51	2.41	171.8
P(*U*)	0.11	0.73	0.61	0.14	0.49	0.22	0.81

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	52.9	19.2	10.6	7.7	2.9	6.7
Winter use	39.8	29.7	11.0	8.5	3.4	7.6

TABLE 3. Population densities vs. habitat characteristics for Hairy Woodpeckers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.02	<0.01	−0.11	0.05	0.02	−0.06	0.08
P	0.80	0.96	0.09	0.53	0.72	0.32	0.21
Winter							
τ	−0.09	−0.06	−0.02	0.09	−0.10	0.01	−0.05
P	0.20	0.38	0.73	0.19	0.13	0.83	0.39
Seasonal change							
τ	0.05	0.05	−0.05	−0.04	0.06	−0.01	0.07
P	0.45	0.43	0.42	0.55	0.33	0.81	0.21

in Northeastern populations (trend = 0.59, n = 126, %CV = 14.3; Kendall's τ = −0.76, n = 48, $P < 0.001$). Christmas Counts showed that U.S. populations have undergone a concave decline followed by an increase in the past few years (Kendall's $\tau = -0.23$, n = 48, P = 0.02, %CV = 11.8). New England populations showed a more pronounced concave decline followed by an increase since about 1993 (Kendall's $\tau = -0.32$, N 48, P = 0.001, %CV = 112.5).

Duplicated density estimates for eastern Connecticut showed a 118−150% increase in summer and 5−32% increase in winter and rather consistent populations within and between seasons (Table 1). Craig (1987) reported 4.1 birds/km^2 on line transects through northeastern Connecticut. Elsewhere, breeding densities in eastern forests are estimated to average 12.5 pairs/km^2. In Maryland, 15 pairs/km^2 have been estimated (Jackson et al. 2002), and 18 ± 8 birds/km^2 are reported from New Hampshire (Holmes et al. 1986).

Habitat.- Summering and wintering Hairy Woodpecker individuals appeared to use forests in about the proportions at which they were available (Table 2). Analyses of habitat variables vs. population densities (Table 3) also showed no significant departures in use from availability.

Stepwise logistic regression analysis of habitat use by individual birds showed a weak but significant summer to winter increase in the density of understory occupied (Nagelkerke r^2 = 0.02, % correctly classified = 55.4, n = 222, P = 0.05). Seasonal shifts in populations showed no significant correlations with habitat, however (Table 3).

Elsewhere in the Northeast and eastern Canada, the species is described as being primarily an inhabitant of mature forest. However, it also occurs in habitats that are more open and even in suburban landscapes, as long as mature trees are present. It appears to prefer deciduous and mixed over coniferous forest (Jackson et al. 2002).

History.- The Hairy Woodpecker was known as an uncommon summer resident of Connecticut in the 19th century when forest extent was limited (Zeranski and Baptist 1990). However, Sage et al. (1913) believed that numbers increased in winter. Similarly, Howe and Sturtevant (1899) reported that the species rose from being rare in summer to uncommon in winter in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the Hairy Woodpecker was a definite or probable breeder at 50.6% of survey blocks throughout Massachusetts (Forster 2003b). In the 1980s, it was definite or probable at 57.2% of blocks throughout Connecticut (Smith and Devine 1994i). It was also definite or probable at 34.5% of blocks throughout Rhode Island, although it may have been less common along the coast (Enser 1992). By the 2000s, definite and probable breeders increased to 62.7% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Hairy Woodpecker is widespread but about a third as common as the Downy Woodpecker in the forests of southern New England. Population densities appear to be largely stable year-round. As with the Downy Woodpecker, the species appears to reach its greatest density in central Connecticut. Density estimates are a third to a quarter of those reported for elsewhere, but close to those computed for Connecticut with the different technique of Craig (1987). Duplicated data from eastern Connecticut also indicate reasonably stable year-round populations and suggest that the geographic patterns noted above are real.

Earlier authors believed populations grew from summer to winter and Craig et al. (2003) initially found evidence of such an increase as well. Migration from northern areas into Connecticut appears possible, as several lines of evidence indicate that southward movement of Canadian populations occurs during winter (Jackson et al. 2002). However, my multi-year data set found no strong evidence for seasonal population change or geographic movement. Hence, detectable summer−winter movements may occur only in some years.

I found few relationships between habitat variables and either the occurrence of individuals or populations. Similarly, Craig (2012) found no seasonal change in habitat use, which indicates that the Hairy Woodpecker may be best described as a forest habitat generalist. However, the greatest density for both *Picoides* woodpeckers occurred in more lightly forested central Connecticut, suggesting that these open landscapes may offer more suitable habitat conditions for these species.

Conservation.- Evidence from the Breeding Bird Survey and Christmas Count data indicate that the Hairy Woodpecker has undergone a regional population decline, although more recently populations have rebounded. Duplicated data from eastern Connecticut indeed show a consistent rise in densities over time. Hence, patterns observed may be part of longer-term population cycles. Based on the reported preference of the species for mature forest, the large and maturing expanse of forest in southern New England (Alerich 1999, 2000) should provide ample habitat for population expansion.

NORTHERN FLICKER
Colaptes auratus

Summer

Density (birds/km^2): 1.21 (n = 135, 95% CI: ± 0.32)
CT: 1.27
RI: 0.92

Population (birds): 10,993 (95% CI: ± 2,946)
CT: 9,530
RI: 1,463

Winter

Density (birds/km^2): 0.24 (n = 49, 95% CI: ± 0.07)
CT: 0.25
RI: 0.20

Population (birds): 2,183 (95% CI: ± 612)
CT: 1,865
RI: 318

Density.-The Northern Flicker occurred on 51% of summer and 25% of winter transects. Because the species often inhabits less forested environments, densities reported here refer only to that portion of the population associated with primarily forested landscapes. I used call notes made by both sexes in assessing density. Winter estimates are based on <60 detections, so have greater variance.

Summer density was greatest by far in central Connecticut and least in southeastern Connecticut (Kruskal-Wallis χ^2 = 21.0, n = 147, P = 0.001; Table 1). In winter, in contrast, density was greatest in southeastern Connecticut and least in northeastern and northwestern Connecticut, although the species occurred too infrequently at this season to perform statistical tests. Populations showed a strong decline from summer to winter (Wilcoxon $Z = -5.43$, n = 147, P <0.001).

TABLE 1. Population density estimates (birds/km^2) and summer Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.63		0.56			
2003−2008	0.57	0.80	0.31	1.66	2.93	0.92
Rank	63.7	70.2	55.7	80.7	100.8	74.4
Winter						
2001−2003	0.04		0.43			
2003−2009	0.12	0.07	0.69	0.17	0.37	0.20

TABLE 2. Habitat availability vs. use for individual Northern Flickers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 41 summer, 9 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.15	2.17	2.07	1.96	2.30	2.10	147.9
$P(U)$	0.02	0.90	0.02	0.38	<0.01*	0.03	0.37
Winter use	1.11	2.78	2.17	1.94	2.33	2.22	94.1

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	29.3	53.7	7.3	2.4	2.4	4.9
Winter use	44.4	22.2	11.1	0.0	0.0	22.2

Population variance.- Breeding Bird Survey data showed a decline in U.S. populations (trend = −1.80, n = 3251, no data available for further analysis) and a

TABLE 3. Summer population densities vs. habitat characteristics for Northern Flickers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.11	<0.01	−0.06	−0.04	−0.23	−0.07	−0.13
P	0.11	0.99	0.39	0.56	<0.01*	0.28	0.05

stronger decline in Northeastern populations (trend = −3.48, n = 135, no data available for further analysis). Christmas Counts, in contrast, showed that U.S. populations have strongly increased (Kendall's τ = 0.57, n = 47, P < 0.001, %CV = 73.8), albeit in a manner suggestive of population cycles. New England populations showed little pattern, however (Kendall's τ = 0.05, n = 32, P = 0.67, %CV = 76.4).

Duplicated density estimates for eastern Connecticut showed a 10−45% decline in summer and 60−200% increase in winter and a consistent density drop from summer to winter (Table 1). On line transects through northeastern Connecticut, Craig (1987) incidentally found birds but computed no densities. Elsewhere, densities of 25 birds/km^2 and 0.9−10.0 pairs/km^2 have been reported (Moore 1995).

Habitat.- Summering Northern Flicker individuals used forests with more open canopies and also tended to inhabit more mesic, open understoried, deciduous sites with particularly mixed hardwood cover (Table 2). Similarly, analyses of habitat variables vs. summer population densities showed a significant relationship with lower canopy cover, although birds also tended to occupy lower elevations (Table 3).

Wintering Northern Flickers used habitats in proportions similar to those of summer, although the elevations occupied dropped considerably (Table 2). The species' infrequent occurrence on winter transects provided insufficient data for comparing population densities with habitat variables, however.

Elsewhere, the species is associated with forest edge, open woods, and open swamps. Burned-over forest appears particularly suitable, although it is common in suburban areas as well (Moore 1995).

History.- Sage et al. (1913) described the Northern Flicker as a common Connecticut breeder that was infrequent in winter. Its numbers appeared to decline during the 20th century (Zeranski and Baptist 1990). Howe and Sturtevant (1899), in contrast, described it as an abundant Rhode Island resident that was common in winter.

Breeding bird atlas data showed that in the 1970s, the Northern Flicker was a definite or probable breeder at 77.7% of survey blocks throughout Massachusetts (Meservey 2003b). In the 1980s, it was definite or probable at 89.3% of blocks throughout Connecticut (Smith and Devine 1994j). It was also definite or probable at 71.5% of blocks throughout Rhode Island, although it may have been less common along the coast (Enser 1992). By the 2000s, definite and probable breeders declined to 70.3% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Northern Flicker is uncommon in primarily forested landscapes and is most abundant in central portions of the region where there is a lower proportion of forest cover. This strongly migratory species (Moore 1995) declines substantially in abundance from summer to winter, with remaining individuals tending to concentrate in low elevation, more coastal locations. Summer density estimates reported here are at the lower end of those reported for elsewhere, likely because the forests studied here are not the species' principal habitat.

My winter density estimates are among the only available.

Variance in duplicated eastern Connecticut data was greater in winter than summer, similar to that reported for Breeding Bird Survey and Christmas Count data. However, observations were consistent enough to suggest that regional density differences observed at both seasons were real. Moreover, the observed winter shift in populations to southern portions of the study area is consistent with that observed for other permanent resident species (Craig 2012). The species' affiliation with more open forests is also consistent with observations from elsewhere.

Conservation.- Evidence from the Breeding Bird Survey, Massachusetts Breeding Bird Atlas and duplicated eastern Connecticut data indicate that breeding populations of the Northern Flicker are declining nationally and regionally. Christmas Count as well as duplicated eastern Connecticut data, in contrast, show an increase, which may mean that populations are wintering further north than they did previously.

Based on the reported preference of the species for more open landscapes, the large and maturing expanse of forest in southern New England (Alerich 1999, 2000) likely explains regional population declines. This trend may reverse as forest fragmentation due to suburbanization proceeds.

PILEATED WOODPECKER

Dryocopus pileatus

Summer

Density (birds/km^2): 0.25 (n = 103, 95% CI: ± 0.05)
CT: 0.30
RI: 0.0.05

Population (birds): 2,307 (95% CI: ± 487)
CT: 2,227
RI: 80

Winter

Density (birds/km^2): 0.19 (n = 91, 95% CI: ± 0.06)
CT: 0.23
RI: 0.02

Population (birds): 1,773 (95% CI: ± 589)
CT: 1,746
RI: 27

Density.- The Pileated Woodpecker occurred on 44% of summer and 35% of winter transects. I used call notes made by both sexes in assessing density. I regularly heard pairs communicating with calls at even great distances.

Summer density was greatest in western Connecticut and least in Rhode Island (Kruskal-Wallis $\chi^2 = 24.6$, $n = 147$, $P < 0.001$). Winter density was greatest in southwestern Connecticut and least in Rhode Island (Kruskal-Wallis $\chi^2 = 30.1$, $n = 147$, $P < 0.001$; Table 1). Populations also declined significantly from summer to winter (Wilcoxon $Z = -2.21$, $n = 147$, $P = 0.03$). Notably, density in northwestern Connecticut dropped dramatically in winter.

Population variance.- Breeding Bird Survey data showed a weakly concave increase in U.S. populations (trend = 1.10, n = 2061, %CV = 16.3; Kendall's $\tau = 0.96$, n =48, $P < 0.001$) and a stronger one for Northeastern populations (trend = 4.26, n = 85, %CV = 56.7; Kendall's $\tau = 0.99$, $n = 48$, $P < 0.001$). Christmas Counts showed that U.S. (Kendall's $\tau = 0.85$, $n = 48$, $P < 0.001$, %CV = 29.6) and New England (Kendall's τ= 0.82, $n = 48$, $P < 0.001$, %CV = 54.4) populations have increased nearly linearly.

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.13		0.07			
2003−2008	0.20	0.55	0.26	0.34	0.23	0.05
rank	70.5	100.0	73.4	80.7	69.2	50.7
Winter						
2001−2003	0.15		0.20			
2003−2009	0.27	0.11	0.25	0.63	0.12	0.02
rank	78.0	65.8	75.8	108.7	70.4	55.0

TABLE 2. Habitat availability vs. use by individual Pileated Woodpeckers. n = 14 summer, n = 10 winter. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.21	1.71	2.11	1.96	2.71	1.89	167.1
Winter use	1.11	1.33	2.39	2.00	3.00	2.00	176.2

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	50.0	28.6	21.4	0.0	0.0	0.0
Winter use	77.8	11.1	11.1	0.0	0.0	0.0

Duplicated density estimates for eastern

TABLE 3. Population densities vs. habitat characteristics for Pileated Woodpeckers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.01	−0.07	−0.13	0.10	0.10	−0.18	0.27
P	0.89	0.30	0.04	0.19	0.12	<0.01*	<0.01*
Winter							
τ	−0.15	−0.15	−0.15	0.10	0.14	−0.19	0.01
P	0.02	0.02	0.02	0.19	0.04	<0.01*	0.85
Seasonal change							
τ	0.10	0.05	0.02	0.01	<−0.01	<−0.01	0.20
P	0.11	0.43	0.70	0.95	0.95	0.97	<0.01*

Connecticut showed a 54−271% increase in summer and 25−80% increase in winter. They also showed consistent increases within seasons and similar densities between seasons (Table 1). On line transects through northeastern Connecticut, Craig (1987) incidentally found birds but computed no densities. Elsewhere in the East, breeding densities are reported to vary from 0.5 to 7 males/km^2 (Bull and Jackson 1995).

Habitat.- Summering individual Pileated Woodpeckers tended to occupy forests that were more deciduous, mesic, closed canopy and with lower density understory than would be predicted from habitat availability. Wintering individuals used forests that were more deciduous, mesic, closed canopied and with lower density understory than would be predicted from habitat availability (Table 2).

Analyses of habitat variables vs. population densities showed that birds were associated with forests of lower understory densities year-round. Moreover, they were associated with higher elevations in summer, although this effect disappeared in winter. Birds also tended to occupy more mesic sites year-round, with the only significant seasonal shift being for birds to move to lower winter elevations. (Table 3).

Elsewhere, the species is typically associated with mesic, late successional coniferous and deciduous forests, or younger forests with some large, dead trees. In the Southeast, bottomland forest and more mesic forests appear to be preferred (Bull and Jackson 1995).

History.- In the 19th century when Connecticut forest extent was limited, Sage et al. (1913) described the Pileated Woodpecker as rare in winter and very rare in summer. It became more common during the 20th century as forests expanded (Zeranski and Baptist 1990). Howe and Sturtevant (1899) did not know it from Rhode Island, where it was first reported breeding in 1925 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the Pileated Woodpecker was a definite or probable breeder at 13.3% of survey blocks primarily in western Massachusetts (Harrington 2003). In the 1980s, it was definite or probable at 25.2% of particularly western Connecticut blocks (Smith and Devine 1994k). It was also definite or probable at 1.2% of blocks in western Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had spread eastward to 32.2% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Pileated Woodpecker is an uncommon and local forest inhabitant that reaches its greatest density in western Connecticut and declines to its lowest density eastward in Rhode Island. Despite the comparatively high variance in density estimates from duplicated surveys in eastern Connecticut, these patterns are corroborated by Smith and Devine (1994j) and Enser (1992). Densities computed here are at the lower end of those reported for elsewhere in the East.

Despite being thought of as a principally sedentary species (Bull and Jackson 1995), population declines from summer to winter suggest seasonal southward movement. The substantial decline of populations in northwestern Connecticut and concomitant increase in populations in southwestern Connecticut is particularly compelling evidence for such movement. Bull and Jackson (1995) cite additional evidence for southward movement, including evidence from southern New England. Moreover, Craig (2012) demonstrates that other supposedly sedentary species undergo winter population shifts toward southern portions of the state.

Similarly to that reported for elsewhere, my limited data suggest that birds most frequently occupy mesic, closed canopy forests year-round. The suggestion that deciduous, lower density understory forests are differentially occupied is unreported, however. Moreover, Craig (pers. obs.) observed that Pileated Woodpeckers are also regular inhabitants of even agricultural landscapes as long as large trees border fields.

Conservation.- Breeding Bird Survey, Christmas Count, Massachusetts Breeding Bird Atlas and duplicated eastern Connecticut data suggest that the Pileated Woodpecker is undergoing a regional population increase. Such an increase is expected in light of its association with mature forest, because the still extensive forests of southern New England are continuing to mature (Ward and Barsky 2000).

Sponsored by Joan Dash

EASTERN WOOD-PEWEE

Contopus virens

Summer

Density (males/km^2): 15.38 (n = 1280, 95% CI: ± 1.36)
CT: 16.21
RI: 11.43

Population (males): 141,703 (95% CI: ± 12,406)
CT: 123,521
RI: 18,182

Density.- The Eastern Wood-Pewee was present on 97% of forest transects, with population estimates based on detections of singing males. Density was greatest in western Connecticut and least in Rhode Island (Kruskal-Wallis χ^2 = 11.1, n = 147, P = 0.050; Table 1).

Population variance.- Breeding Bird Survey data showed a weakly concave decline in U.S. (trend = −1.43, n = 2161, %CV = 19.2; exponential r^2 = 0.97, df = 47, P < 0.001) and Northeastern populations (trend = −0.42, n = 132, %CV = 7.2; exponential r^2 = 0.93, df = 47, P < 0.001). Duplicated density estimates for eastern Connecticut showed a 2−19% change between sampling periods (Table 1). On line transects through northeastern Connecticut, Craig (1987) found 16.0 ± 15.6 birds/km^2. Elsewhere, densities have been reported to range from 7−86 pairs/km^2 (McCarty 1996).

Habitat.- Eastern Wood-Pewee individuals used more deciduous, particularly oak-dominated forests, with more closed canopies, open understories and lower elevations than would be predicted from habitat availability (Table 2). Data for population densities showed the same patterns except that greater populations were associated with higher elevations (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	15.79		13.56			
2003−2008	15.51	17.02	16.11	18.74	15.29	11.43
Rank	74.7	83.4	79.1	87.7	71.1	51.6

TABLE 2. Habitat availability vs. use for individual Eastern Wood-Pewees. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 628. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.21	1.93	2.27	1.99	2.67	2.22	181.8
$P(U)$	<0.01*	<0.01*	0.58	0.24	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	57.2	18.0	15.0	4.3	0.6	4.9

Elsewhere, the species is reported from deciduous and coniferous forests but particularly forest openings, edge and possibly more xeric environments. However, some studies have found that it predominates in more open forests but others have not. It also has been reported to have greater pop-

TABLE 3. Summer population densities vs. habitat characteristics for Eastern Wood-Pewees. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.18	−0.26	0.06	0.02	0.23	−0.21	0.16
P	<0.01*	<0.01*	0.29	0.76	<0.01*	<0.01*	<0.01*

ulations in forests with reduced understory density and in forests of intermediate age (McCarty 1996).

History.- The Eastern Wood-Pewee has historically been a common Connecticut and Rhode Island breeder despite the deforestation of the landscape in the 19th and early 20th century (Howe and Sturtevant 1899, Sage et. al 1913, Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the Eastern Wood-Pewee was a definite or probable breeder at 60.9% of survey blocks particularly in western Massachusetts (Leahy 2003). In the 1980s, it was definite or probable at 60.9% of blocks throughout Connecticut (Clark 1994f). It was also definite or probable at 43.6% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 70.0% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Eastern Wood-Pewee is a widespread and common species that reaches its greatest density in western Connecticut and declines eastward to its lowest density in Rhode Island. The limited variance of duplicated eastern Connecticut data indicates that this eastward decline is real. Densities computed here are above those of Craig (1987) but within the range reported for elsewhere.

My data provide no evidence for the Eastern Wood-Pewee prefering more open forests and forest edge. Instead, they indicate that the species is most prevalent in closed canopy forest. However, my data support other reports that birds are associated with more open understories. My observation of an association with particularly deciduous forest types is previously unreported. My data on use of elevations are conflicting.

Conservation.- Breeding Bird Survey data indicate that populations are declining. However, Massachusetts Breeding Bird Atlas data provide evidence for a regional increase as do data from northeastern Connecticut (Craig 1987). Although a population decline might be expected to occur due to forest maturation toward old growth and away from mid-maturity forests that the species is said prefer, my data demonstrate that it does not avoid closed canopy interior forest.

ACADIAN FLYCATCHER

Empidonax virescens

Summer

Density (males/km^2): 1.21 (n = 63, 95% CI: ± 0.55)
CT: 1.47
RI: 0.15

Population (males): 10,906 (95% CI: ± 5,008)
CT: 10,675
RI: 231

Density.- The Acadian Flycatcher was present on only 22% of transects. Population estimates are based on detections of singing males.

Density was greatest in southeastern and western Connecticut and least in Rhode Island, where I recorded only one bird at great distance. In density estimation, I truncated this latter bird out of detectability calculations, yielding a density of zero for Rhode Island. Hence, I also computed for Rhode Island an untruncated albeit less accurate detectability function that permitted estimation of species density there (Table 1).

Population variance.- Breeding Bird Survey data showed a weak, nearly linear decline in U.S. (trend = −0.37, n = 1311, %CV = 5.9; Kendall's $\tau = -0.77$, n = 48, $P < 0.001$) populations but a nearly linear increase in northeastern populations (trend = 0.43, n = 82, %CV = 7.2; Kendall's $\tau = -0.73$, n = 48, $P < 0.001$). Duplicated density estimates for eastern Connecticut showed a 25−103% change between sampling periods (Table 1). On line transects through northeastern Connecticut, Craig (1987) found 2.2 birds/km^2. Elsewhere in the East, densities have been reported to range from 12−180 birds/km^2 (Whitehead and Taylor 2002).

Habitat.- Individual Acadian Flycatchers inhabited forests that were more mesic, closed canopied, with lower understory density and with greater coniferous and mixed hardwood cover than would be predicted from habitat availability (Table 2). The species occurred too infrequently to compare population densities with habitat variables, however. Elsewhere, it is reported to inhabit mature, undisturbed forests, particularly in swampy areas and along streams (Whitehead and Taylor 2002).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.32		3.51			
2003−2008	0.65	1.95	2.63	1.87	0.16	0.15

TABLE 2. Habitat availability vs. use for individual Acadian Flycatchers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 47. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.53	2.96	1.94	2.00	2.83	2.00	136.9
$P(U)$	0.11	0.01*	<0.01*	0.29	<0.01*	<0.01*	0.04

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	27.9	27.9	23.5	0.0	13.2	7.4

History.- The Acadian Flycatcher was historically uncommon to rare in Connecticut (Sage et. al 1913, Zeranski and Baptist 1990) and unknown in Rhode Island (Howe and Sturtevant 1899), where it was not recorded breeding until 1976 (Enser 1992).

The species is reported to have declined regionally earlier in the 20th century, but to have increased since the 1960s (Clark 1994g). However, into the 1970s it was still rare in eastern Connecticut. At 19 eastern Connecticut forests surveyed in 1975−1977, R. Craig (pers. obs.) found Acadian Flycatchers at only 5% of sites. By this study, 20% of eastern Connecticut sites had birds.

Breeding Bird Atlas data showed that in the 1970s, the Acadian Flycatcher was a definite or probable breeder at 0.3% of survey blocks in Massachusetts (Kellogg 2003b). In the 1980s, it was definite or probable at 5.4% of blocks, mostly in southeastern and northwestern Connecticut (Clark 1994g). It was also definite or probable at 4.2% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders had increased to 2.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Acadian Flycatcher occurs uncommonly and locally in southern New England. Computed densities are well below those reported for elsewhere but similar to those reported by Craig (1987). As it has historically, it predominates in particularly western and southeastern Connecticut. Duplicated eastern Connecticut data demonstrate that, despite annual variability in estimated density, southeastern Connecticut has consistently higher densities than any other region.

Consistent with data from elsewhere, individual birds show a relationship with more mesic, closed canopy, more coniferous forests. The more fragmented forests of central Connecticut and more xeric conditions in much of Rhode Island may explain their comparative rarity there, although their low densities in northeastern Connecticut, where apparently suitable habitats are common, may be related to larger scale population phenomena—i.e., growing populations are still invading this region.

Conservation.- The Acadian Flycatcher appears to be undergoing a continental population shift away from southeastern locations, where Breeding Bird Survey data indicate decline, to the Northeast, where populations are growing. Maturation of forest has been cited as a factor benefiting this species (Whitehead and Taylor 2002), so it is likely prospering from the aging of regional forests (Ward and Barsky 2000).

LEAST FLYCATCHER
Empidonax minimus

Summer

Density (males/km^2): 0.56 (n = 36, 95% CI: ± 0.31)
CT: 0.53
RI: 0.71

Population (males): 5,140 (95% CI: ± 2,799)
CT: 4,018
RI: 1,122

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.06		0.13			
2003−2008	0.71	1.31	0.25	0.00	0.00	0.71

TABLE 2. Habitat availability vs. use for individual Least Flycatchers. n = 21. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.38	2.90	2.02	2.00	2.14	2.67	213.7

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	33.3	33.3	4.8	4.8	9.5	14.3

Density.- The Least Flycatcher was present on only 15% of transects, with population estimates based on detections of singing males. Although I computed a detection function that fit the data well, estimates are based on less than 60 observations, so have greater variance.

Density was marginally greatest in northwestern Connecticut, although similar numbers appeared in northeastern Connecticut (Table 1). The species was absent on surveys in central and southwestern Connecticut.

Population variance.- Breeding Bird Survey data showed a nearly linear decline in U.S. populations (trend = −1.77, n = 1015, %CV = 25.6; Kendall's $\tau = -0.95$, n = 48, $P < 0.001$) and steeply concave decline in Northeastern populations (trend = −5.60, n = 47, %CV = 78.7; Kendall's $\tau = -1.00$, n = 48, $P < 0.001$). Duplicated density estimates for eastern Connecticut exhibited a 33−92% change between sampling periods (Table 1). On line transects through northeastern Connecticut, Craig (1987) found 8.1 birds/km^2. Elsewhere in the East, densities are reported to range from 140 to 300 pairs/km^2. However, in the Maritime Provinces of Canada, 0.4−0.7 birds/km^2 are reported (Briskie 1994).

Habitat.- Individual Least Flycatchers tended to occupy higher elevation habitats that had mixed forest types and were more mesic, open canopied and denser understoried than would be predicted from habitat availability (Table 2). Elsewhere, reports of habitat use are conflicting, with authors reporting preference for denser forest, open forest, young forest, mature forest, drier microhabitats and wetter microhabitats. The species is most frequently reported to inhabit semi-open and second growth deciduous and mixed forest, swamp and bog edges and shrubby fields. Greatest densities are found in open woodland but in areas of greater forest patch size (Briskie 1994).

History.- The Least Flycatcher was reported to be common in Connecticut (Sage et al. 1913) and Rhode Island (Howe and Sturtevant 1899) in the 19th century when successional habitats were more abundant than at present. It has declined since then (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 33.8% of survey blocks in particularly western Massachusetts (Blodget 2003a). In the 1980s, it was definite or probable at 31.0% of blocks mostly in northern Connecticut (Clark 1994h). It was also definite or probable at 10.9% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, definite and probable breeders had declined to 25.1% of Massachusetts blocks, still primarily in the western part of the state (Walsh and Peterson 2013).

Synthesis.- The Least Flycatcher occurs rather rarely in principally forested landscapes. Populations of this northerly-distributed species reach their greatest density in northern Connecticut, as also described by Clark (1994h), but these are at the lower end of densities reported for the species. Duplicated eastern Connecticut data demonstrate that, despite annual variability in estimated density, such patterns appear consistent. Declining densities toward range limits are also typical for many species (Brown 1984, Pulliam 1988).

Similarly to that reported for elsewhere, data from individual birds show a relationship with mixed habitats that are more mesic, open canopied and denser understoried. However, I also observed several birds in Rhode Island that occupied open, xeric habitats, which suggests that the association of birds with mesic locations may be related more to their presence in the forest openings that are common near swamps and stream borders. When similar openings occur in xeric locations, birds are also present. This observation appears to reconcile some of the conflicting habitat reports from elsewhere.

Conservation.- Data from the Breeding Bird Survey, Massachusetts breeding bird atlases and Craig (1987) indicate that the Least Flycatcher has declined. Any regional decline in Connecticut and Rhode Island may be related to forests maturation (Ward and Barsky 2000), because the species is often described as being associated with earlier successional and more open habitats.

EASTERN PHOEBE

Sayornis phoebe

Summer

Density (males/km^2): 0.92 (n = 114, 95% CI: ± 0.18)
CT: 1.00
RI: 0.54

Population (males): 8,392 (95% CI: ± 1,648)
CT: 7,533
RI: 859

Density.- The Eastern Phoebe was present on 54% of summer transects, with population estimates based on detections of singing males. It also appeared commonly outside of principally forested landscapes. Density was marginally greatest in southwestern Connecticut, although similar numbers appeared throughout the region (Kruskal-Wallis χ^2 = 11.4, n = 147, P = 0.05; Table 1).

The species also occurs as a very rare winter resident, particularly in early winter. I found only one wintering individual on a transect and one other individual incidentally. I attempted no winter density estimate from such limited data.

Population variance.- Breeding Bird Survey data showed a nearly linear increase in U.S. populations (trend = 1.25, n = 2047, %CV = 19.4; Kendall's τ = 0.72, n = 48, P < 0.001). Northeastern populations exhibited no trend, however (trend = 0.14, n = 128, %CV = 9.1; Kendall's τ = 0.07, n = 48, P = 0.49). Christmas Counts showed that U.S. populations have undergone a strong concave increase (Kendall's τ = 0.69, n = 48, P < 0.001, %CV = 22.1). New England populations had a pronounced concave decline followed by an increase since about 1993 (exponential r^2 = 0.30, df = 46, P < 0.001, %CV = 47.3). Duplicated density estimates for eastern Connecticut showed a 60−102% change between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found densities of 2.9 birds/km^2. Elsewhere, 0.01−0.71 pairs/km^2 have been reported from Kansas (Schukman 1993) and 3−13 birds/km^2 have been reported from Connecticut (Curtis 1986).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.20		0.58			
2003−2008	0.48	0.95	1.17	1.30	1.12	0.54
Rank	59.3	79.1	81.6	85.1	82.2	60.5

TABLE 2. Summer habitat availability vs. use for individual Eastern Phoebes. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 44. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.43	2.80	2.08	2.05	2.41	2.05	153.3
$P(U)$	0.53	0.09	0.03	0.04	0.09	<0.01*	0.71

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	27.9	27.9	23.5	0.0	13.2	7.4

TABLE 3. Summer population densities vs. habitat characteristics for Eastern Phoebes. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.04	−0.03	−0.06	0.08	0.02	−0.03	−0.05
P	0.56	0.70	0.35	0.30	0.77	0.69	0.45

Habitat.- Individual summering Eastern Phoebes occupied habitats that had more open understories and tended to be more mesic than would be predicted from habitat availability (Table 2). However, population data showed no correlations with habitat variables (Table 3).

Elsewhere, the species is reported to nest near forest edge, water and forest interiors where suitable nest sites occur, e.g., ledges, banks and other overhangs (Weeks 1994). My two observations of wintering birds occurred at deciduous, mesic, open forests at low elevations.

History.- The Eastern Phoebe was historically common to abundant in Connecticut (Sage et al. 1913) but common only in northern and western portions of Rhode Island (Howe and Sturtevant 1899). Zeranski and Baptist (1990) speculated that it had since declined in Connecticut, but Clark (1994i) suspected that expanding human habitation has increased the number of regional nesting sites.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 69.2% of survey blocks throughout Massachusetts (Baird 2003). In the 1980s, it was definite or probable at 80.2% of blocks throughout Connecticut (Clark 1994i). It was also definite or probable at 44.8% of Rhode Island blocks, mostly away from the coast (Enser 1992). By the 2000s, definite and probable breeders had increased to 82.1% of Massachusetts blocks, but were still primarily in the western part of the state (Walsh and Peterson 2013).

Synthesis.- In summer, the Eastern Phoebe occurs uncommonly and locally in principally forested landscapes and, similarly to that noted for Massachusetts, tends to be less common in eastern portions of the study area. However, high variance in duplicated eastern Connecticut data indicate that this regional pattern should be interpreted with caution. The species is also widespread in non-forested landscapes, and in such locations nests in the eaves of buildings, under bridges and in similar protected situations (R. Craig pers. obs.). It is a very rare winter resident and typically occurs in the vicinity of water at this season.

The densities reported here are at the lower end of those reported for the species, likely because principally forested landscapes are not preferred habitats. However, the extent to which the Eastern Phoebe inhabits interior forest is often not recognized, even though many of my observations were made in such areas. It generally appears to use these environments in proportions similar to those that are available.

Conservation.- Data from the Breeding Bird Survey and Massachusetts breeding bird atlases suggest that populations of the Eastern Phoebe are increasing nationally but generally stable in the Northeast. Data from Craig (1987) indeed show similar population densities to those of this study. The species' ability to inhabit forested and non-forested landscapes may assist in producing population stability.

GREAT CRESTED FLYCATCHER

Myiarchus crinitus

Summer

Density (birds/km^2): 9.38 (*n* = 668, 95% CI: ± 1.29)
CT: 9.53
RI: 8.71

Population (birds): 85,524 (95% CI: ± 11,765)
CT: 71,675
RI: 13,849

Density.- The Great Crested Flycatcher occurred on 93% of transects. Because calls are made by both sexes, population estimates are based on detections of males and females. Density was greatest in southern and central Connecticut and least in northern Connecticut (Kruskal-Wallis χ^2 = 14.7, *n* = 147, *P* = 0.012; Table 1).

Population variance.- Breeding Bird Survey data showed a virtually stable U.S. population (trend = 0.08, *n* = 2310, %CV = 2.4; quadratic r^2 = 0.21, df = 47, *P* = 0.001). Northeastern populations showed a concave decline followed by an increase (trend = 0.35, *n* = 134, %CV = 6.0; quadratic r^2 = 0.22, df = 47, *P* = 0.001).

Duplicated density estimates for eastern Connecticut showed a 0−41% increase between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 9.2 birds/km^2. Elsewhere, 0−55 pairs/km^2 have been reported in New England (Curtis 1986).

Habitat.- Individual Great Crested Flycatchers showed no significant relationships with habitat variables, although they tended to use more deciduous, lower elevation, oak-dominated forests than would be predicted from habitat availability (Table 2). Populations were greater in lower elevation, deciduous cover (Table 3). Elsewhere, the species is typically reported to inhabit open, deciduous and mixed woodland, as well as orchards, maturing old fields and park-like settings (Lanyon 1997).

TABLE 1. Summer population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	7.54		9.32			
2003−2008	7.54	6.41	13.12	10.58	12.70	8.71
Rank	88.5	73.2	114.6	106.4	117.1	95.1

TABLE 2. Habitat availability vs. use for individual Great Crested Flycatchers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 344. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, and at lower elevations (Table 3). The MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.28	2.17	2.28	1.98	2.59	2.29	148.3
P(*U*)	0.02	0.02	0.39	0.77	0.24	0.48	0.02

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	53.2	20.6	9.9	5.2	5.5	5.5

History.- The Great Crested Flycatcher has been described historically as an uncommon to fairly common Connecticut breeder (Sage et. al 1913, Zeranski and Bap-

TABLE 3. Summer population densities vs. habitat characteristics for Great Crested Flycatchers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.17	−0.06	<0.01	<−0.01	−0.07	−0.02	−0.23
P	<0.01*	0.32	0.95	0.99	0.24	0.76	<0.01*

tist 1990). Populations likely increased as forests re-grew during the 20th century (Clark 1994j). It was thought uncommon but increasing in northern Rhode Island by Howe and Sturtevant (1899).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 51.8% of survey blocks throughout Massachusetts (Forster 2003c). In the 1980s, it was definite or probable at 54.9% of blocks throughout Connecticut (Clark 1994j). It was also definite or probable at 50.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 67.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Great Crested Flycatcher is a widespread forest inhabitant, being most common in lower elevation, southern portions of the study area. Duplicated eastern Connecticut data demonstrate limited variance in population estimates, indicating that these regional differences are likely real. Population densities are also similar to those reported by Craig (1987) but at the lower end of those reported for elsewhere.

Although this species is thought to be associated with more open habitats, my data provide no evidence for this. Instead, they suggest that deciduous, lower elevation habitats are differentially occupied.

Conservation.- Breeding Bird Survey data suggest that populations are generally stable to weakly cyclic. The species' ability to inhabit interior forests, as evidenced here, likely contributes to this stability in the extensively forested landscapes of southern New England.

EASTERN KINGBIRD
Tyrannus tyrannus

Summer

Density (birds/km^2): 0.54 (n = 68, 95% CI: ± 0.20)
CT: 0.48
RI: 0.82

Population (birds): 4,930 (95% CI: ± 1,800)
CT: 3,622
RI: 1,308

TABLE 1. Summer population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001-2002	0.82		0.27			
2003-2008	1.01	0.41	0.41	0.18	0.46	0.82
Rank	85.0	69.9	66.5	63.7	73.5	82.1

TABLE 2. Habitat availability vs. use for individual Eastern Kingbirds. n = 30. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.73	2.97	2.37	1.91	2.18	2.32	107.9

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	30.0	13.3	20.0	20.0	16.7	0.0

Density.- The Eastern Kingbird appeared on only 27% of transects, with population estimates based on detections of males and females. Density was greatest in northeastern Connecticut and Rhode Island and least in southwestern Connecticut, although differences among regions were not significant (Kruskal-Wallis $\chi^2 = 8.7$, $n = 147$, $P = 0.123$; Table 1).

Population variance.- Breeding Bird Survey data showed a linear decline in U.S. populations (trend = −0.96, $n = 2748$, %CV = 13.0; Kendall's $\tau = -0.86$, $n = 48$, $P < 0.001$) and a more steeply concave decline in Northeastern populations (trend = −3.18, $n = 134$, %CV = 44.0; Kendall's $\tau = -0.99$, $n = 48$, $P < 0.001$). Duplicated density estimates for eastern Connecticut showed a 23−52% increase between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found no birds, although they were present in the study area (R. Craig pers. obs.). Elsewhere, densities have been reported to vary from 0.7−82.7 birds/km^2 in a variety of non-forest habitats (Murphy 1996).

Habitat.- My limited sample of individual Eastern Kingbirds showed a tendency to occupy lower elevation forests that were more coniferous and open than would be predicted from habitat availability (Table 2). Population data similarly demonstrated that birds were particularly associated with mixed conifer-hardwood forests but they did not corroborate an association with lower elevations (Table 3). Birds often inhabited edges of open wetlands, such as beaver swamps, marsh edges and rivers, although I also observed them in drier upland areas that had been selectively logged or otherwise disturbed. Outside of forest, I found birds in suburban, marsh edge and agricultural landscapes.

Elsewhere, the Eastern Kingbird is con-

TABLE 3. Summer population densities vs. habitat characteristics for Eastern Kingbirds. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.15	0.19	0.1	−0.09	−0.11	0.0	−0.06
P	0.04	<0.01*	0.16	0.21	0.10	0.28	0.41

sidered a savannah species that is often associated with swamps and riparian areas. It is also reported from disturbed forest, burned over forest and early successional landscapes (Murphy 1996).

History.- Sage et al. (1913) and Howe and Sturtevant (1899) described the Eastern Kingbird as a common Connecticut and Rhode Island breeder. Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 80.2% of survey blocks throughout Massachusetts (Meservey 2003c). In the 1980s, it was definite or probable at 91.6% of blocks throughout Connecticut (Clark 1994k). It was also definite or probable at 68.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased slightly to 81.5% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- Although rather common in non-forest habitats, the Eastern Kingbird is very local in principally forested landscapes. Duplicated eastern Connecticut data show that populations are consistently high in northeastern Connecticut, suggesting that the species' tendency to be most common in eastern portions of the study area may be real despite no statistical difference existing among regions.

My density estimates are at the lower end of reported densities, likely because the species is primarily associated with non-forest environments. My observation of the species' tendency to occupy more open forests is consistent with other reports for the species. Its strong association with relatively coniferous habitats is unexpected, but might be related to its tendency to occupy edges of wetlands where conifers are more common.

Conservation.- Breeding Bird Survey data strongly indicate that the Eastern Kingbird is undergoing a long term population decline, although duplicated eastern Connecticut data and Massachusetts breeding bird atlases indicate a local increase.

Because the species is typically associated with forest openings and early successional landscapes, a factor likely driving a large-scale decline is the maturation of northeastern forests (Ward and Barsky 2000). However, its versatility in habitat use should ensure its persistence in this region, and may help explain contrary Massachusetts and eastern Connecticut population trends.

WHITE-EYED VIREO
Vireo griseus

Summer

Density (males/km^2): 0.25 (n = 26, 95% CI: ± 0.23)
CT: 0.12
RI: 0.88

Population (males): 2,280 (95% CI: ± 2,141)
CT: 873
RI: 1,407

Density.- The White-eyed Vireo appeared on only 7% of transects from central Connecticut to Rhode Island. Population estimates are based on detections of singing males.

Although my sample was less than the 60 observations preferred for density estimation, my data fit a detectability curve well, so I believe my estimates are reasonable, albeit with high variance. Densities averaged greatest in Rhode Island and southeastern Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a modest concave increase in U.S. populations (trend = 0.51, n = 1492, %CV = 9.5; Kendall's τ = 0.66, n = 48, P < 0.001). Northeastern populations exhibited a cyclic pattern, however, with a decline beginning about 1980 (trend = −1.62, n = 101, %CV = 21.4; Kendall's τ = −0.72, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 0−20% decline between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) reported no birds. Elsewhere, up to 200−300 pairs/km^2 can occur in perferred habitat (Hopp et al. 1995).

Habitat.- My limited observations of individual White-eyed Vireos showed that they tended to occupy lower elevation habitats that were entirely deciduous, more open and with denser understories than would be predicted from habitat availability. Elsewhere, the species inhabits mid- to late successional deciduous habitats where dense understory is present. Forest borders with dense shrubbery and open, streamside thickets are also used (Hopp et al. 1995).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.07		0.48			
2003−2008	0.07	0.00	0.40	0.00	0.08	0.88

TABLE 2. Habitat availability vs. use by individual White-eyed Vireos. n = 14. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.00	1.64	2.21	1.89	1.85	3.00	26.2

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	35.7	64.3	0.0	0.0	0.0	0.0

History.- The White-eyed Vireo has been most common in southern Connecticut since a least the 19th century (Sage et al. 1913). It appears to fluctuate in density at this, its northern range limit (Zeranski and Baptist 1990). Howe and Sturtevant (1899) described it as a locally common species in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 3.9% of survey blocks almost entirely in southeastern Massachusetts (Lloyd-Evans 2003). In the 1980s, it was definite or probable at 20.3% of blocks primarily in the southern half of Connecticut (Clark 1994l). It was also definite or probable at 21.2% of blocks primarily in southern and eastern Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had declined to 1.3% of blocks primarily in southeastern Massachusetts but with scattered individuals elsewhere (Walsh and Peterson 2013).

Synthesis.- The White-eyed Vireo is very uncommon in mostly forested landscapes. As also noted by breeding bird atlases, it is primarily found in southeastern Connecticut and Rhode Island. Because it approaches its northern range limit in southern New England (Hopp et al. 1995), a pattern of declining density to the north is typical (Brown 1984, Pulliam 1988). Not surprisingly, densities reported here are well below those reported elsewhere.

The species is generally not present in the mostly mature forest surveyed in this study, although my observations of birds inhabiting dense shrubbery are consistent with those from elsewhere. Because it may occur in scrubby, successional habitats, its presence in many locations is likely to be ephemeral.

Conservation.- Data from the Breeding Bird Survey, Massachusetts breeding bird atlases and duplicated eastern Connecticut surveys demonstrate that the White-eyed Vireo is declining in the Northeast. However, the species is likely to persist in coastal locations where salt spray and coastal storms regenerate landscapes with dense shrubbery.

YELLOW-THROATED VIREO
Vireo flavifrons

Summer

Density (males/km^2): 5.99 (n = 289, 95% CI: ± 1.21)
CT: 6.57
RI: 3.25

Population (males): 54,624 (95% CI: ± 11,004)
CT: 49,456
RI: 5,168

Density.- The Yellow-throated Vireo appeared on 73% of transects, with population estimates based on detections of singing males. Density was greatest in southeastern and northwestern Connecticut and least in central Connecticut and Rhode Island (Kruskal-Wallis χ^2 = 13.6, n = 147, P = 0.018; Table 1).

Population variance.- Breeding Bird Survey data showed a modest concave increase in U.S. populations (trend = 1.07, n = 1744, %CV = 16.1; Kendall's τ = 0.96, n = 48, P < 0.001) but a weak concave decline in Northeastern populations (trend = −0.17, n = 106, %CV = 7.5; Kendall's τ = −0.37, n = 48, P < 0.001). Duplicated density estimates for eastern Connecticut showed a 30−49% increase between sampling periods, with all estimates of the same order of magnitude (Table 1). On summer line transects through the extensive, closed forests of northeastern Connecticut, Craig (1987) found 1.3 birds/km^2. Elsewhere, 3−19 males/km^2 have been reported (Rodewald and James 1996).

Habitat.- Data from individual Yellow-throated Vireos demonstrated that they inhabited forests significantly more deciduous—particularly oak dominated forests—than would be predicted from habitat availability. They also tended to inhabit more mesic locations (Table 2). I found no significant relationships between population density and habitat variables, however (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	4.87		6.51			
2003−2008	6.34	8.15	9.68	6.81	4.22	3.25
Rank	68.7	76.7	83.7	53.4	92.1	68.8

TABLE 2. Habitat availability vs. use by individual Yellow-throated Vireos. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 234. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.24	2.00	2.16	1.99	1.56	2.26	175.7
$P(U)$	0.01*	0.01*	0.02	0.38	0.87	0.12	0.23

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	52.1	23.1	14.1	4.3	2.6	3.8

Elsewhere, the species is reported to inhabit forest edge, park-like situations and tree fall gaps. These openings are often associated with mesic stream borders. Although reported absent from closed can-

TABLE 3. Summer population densities vs. habitat characteristics for Yellow-throated Vireos. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.11	−0.10	−0.08	0.10	0.02	−0.06	<0.01
P	0.10	0.11	0.22	0.17	0.76	0.35	0.97

opy and pure coniferous forest, it is associated with mature forest, regions with a high proportion of forest cover and reduced shrub density (Rodewald and James 1996).

History.- The Yellow-throated Vireo was known as a fairly common Connecticut (Sage et al. 1913) and Rhode Island (Howe and Sturtevant 1899) breeder in the 19th century. However, populations appeared to decline from 1910 to the 1960s (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 9.3% of survey blocks in particularly western Massachusetts (Tyning 2003). In the 1980s, it was definite or probable at 40.6% of blocks primarily away from the coast and Connecticut River Valley in Connecticut (Clark 1994m). It was also definite or probable at 18.2% of blocks primarily in western Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 19.0% of blocks, mostly away from southeastern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Yellow-throated Vireo is a fairly common and widespread breeder in the forests of southern New England. Lower populations of the species in Rhode Island are concident with the similar low density in southeastern Massachusetts and may be related to the extensive coniferous forests there. Lower densities in central Connecticut are also reported by Clark (1994m) and may be related to the highly fragmented forests of much of that region. However, the moderate variance encountered between eastern Connecticut sampling periods likely accounts for some of the density difference observed among regions.

Observed habitat associations with deciduous cover and increased soil moisture are consistent with other reports of habitat use. In contrast with other reports, my large sample uncovered no significant association with more open forests, perhaps because the small tree fall gaps occupied do not substantially affect canopy cover.

Conservation.- Evidence from breeding bird atlases, duplicated eastern Connecticut data and previous Connecticut transect studies indicate that populations of the Yellow-throated Vireo are increasing despite contrary Northeastern evidence from the Breeding Bird Survey. Populations are increasing continentally, and may be profiting from forest maturation. (Ward and Barsky 2000). However, the species may be vulnerable to forest fragmentation in the future.

BLUE-HEADED VIREO

Vireo solitarius

Summer

Density (males/km^2): 4.78 (n = 119, 95% CI: ± 1.21)
CT: 5.62
RI: 0.80

Population (males): 43,532 (95% CI: ± 14,359)
CT: 42,260
RI: 1,272

Density.-The Blue-headed Vireo occurred on 33% of transects, with population estimates based on detections of singing males. Density was greatest by far in northwestern Connecticut and least in southwestern Connecticut and Rhode Island (Kruskal-Wallis χ^2 = 51.3, n = 147, P < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a strong concave increase in U.S. (trend = 2.57, n = 664, %CV = 37.8; Kendall's τ = 0.91, n = 48, P < 0.001) and a weaker nearly linear increase in Northeastern populations (trend = 1.30, n = 34, %CV = 19.0; Kendall's τ = 0.88, n = 48, P < 0.001). Duplicated density estimates for eastern Connecticut showed a 23−34% change between sampling periods (Table 1).

On summer line transects through northeastern Connecticut, Craig (1987) reported 24.0 ± 20.5 birds/km^2. Elsewhere, 1−27 males/km^2 have been found in northern conifer habitats and 4−17 males/km^2 have been found in mature hardwoods (James 1998).

Habitat.- Individual Blue-headed Vireos inhabited particularly higher elevation, mixed conifer-northern hardwood forests that were moister, had more closed canopies and had more open understories than would be predicted from habitat availability (Table 2). Population density exhibited the same patterns except that densities were also greater in forests with larger trees (Table 3). However, the species routinely inhabited purely deciduous forests, particularly at locations where it was not present in previous years (R. Craig pers. obs.).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	3.46		1.73			
2003−2008	4.26	16.3	1.15	0.77	2.49	0.80
Rank	74.2	113.7	60.3	62.1	68.1	59.6

TABLE 2. Habitat availability vs. use by individual Blue-headed Vireos. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 109. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.89	3.20	2.08	2.00	2.70	1.93	261.9
$P(U)$	<0.01*	<0.01*	<0.01*	0.27	0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	16.5	8.3	53.2	4.6	13.8	3.7

Elsewhere, the Blue-headed Vireo is reported to inhabit a variety of northern forest types, including coniferous forest,

TABLE 3. Summer population densities vs. habitat characteristics for Blue-headed Vireos. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. $n = 147$. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.38	0.25	−0.19	0.19	0.03	−0.21	0.40
P	<0.01*	<0.01*	<0.01*	<0.01*	0.61	<0.01*	<0.01*

mixed conifer-hardwoods and northern hardwood forest. Forests occupied are characteristically extensive, with closed canopies and without dense understory cover. However, the species also may be found near small forest openings or forests bordering wetlands (James 1998).

History.- The Blue-headed Vireo appears to have increased and decreased at various times in southern New England. Deforestation is presumed to have reduced its numbers during the 19th century, and weather events may have driven several declines since then (Zeranski and Baptist 1990). It was generally considered an uncommon to rare Connecticut (Sage et al. 1913) and Rhode Island (Howe and Sturtevant 1899) breeder in the 19th century.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 19.6% of survey blocks in particularly western Massachusetts (Blodget 2003b). In the 1980s, it was definite or probable at 11.9% of blocks primarily in northeastern and northwestern Connecticut (Clark 1994n). It was also definite or probable at 7.9% of blocks primarily in western Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 31.6% of blocks, still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Blue-headed Vireo is an uncommon to locally common breeder in the forests of southern New England. Similarly to that reported in breeding bird atlases, it is far more abundant in the forests of northwestern Connecticut than in the rest of the region—a difference also supported by the modest variance found for duplicated eastern Connecticut data. It is frequent as well in northeastern Connecticut, where it appears more widespread in this study than in previous decades (R. Craig pers. obs.).

Computed densities fall within the range reported elsewhere for the species. The comparatively low density of birds found in this study compared with Craig (1987) is principally a consequence of this earlier work being performed in the species' center of abundance in northeastern Connecticut, where densities are similar to those found for northwestern Connecticut.

The tendency of the Blue-headed Vireo toward inhabiting mixed conifer-northern hardwood forests of more mesic, closed canopy, higher elevation locations is consistent with observations from elsewhere (James 1998). Its use of deciduous forest is previously undescribed for this area (Clark 1994n) and likely represents either an expansion of habitat choice or movement into suboptimal habitats as populations expand their range.

Conservation.- Breeding Bird Survey and Massachusetts Breeding Bird Atlas data indicate that populations are increasing. Factors potentially driving the increase are the maturation of regional forests and succession of forest stands to northern hardwoods and conifers (Ward and Barsky 2000).

WARBLING VIREO
Vireo gilvus

Summer

Density (males/km^2): 4.78 (*n* = 53, 95% CI: ± 1.09)
CT: 1.26
RI: 0.27
Population (males): 9,942 (95% CI: ± 4,886)
CT: 9,507
RI: 435

Density.- The Warbling Vireo is rather common outside of unbroken forest but appeared on only 26% of transects in the principally forested landscapes of southern New England. Population estimates are based on detections of singing males.

Although my sample was less than the 60 observations preferred for density estimation, my data fit a detectability curve well, so I believe my estimates of density are reasonable, albeit with high variance. Density was greatest in central Connecticut and least in southeastern Connecticut and Rhode Island.

Population variance.- Breeding Bird Survey data showed a weakly concave increase in U.S. populations (trend = 0.70, *n* = 2220, %CV = 11.4; Kendall's τ = 0.90, *n* = 48, *P* < 0.001) but a stronger concave increase in Northeastern populations (trend = 2.75, *n* = 77, %CV = 38.7; Kendall's τ = 0.97, *n* = 48, *P* < 0.001). Duplicated density estimates for eastern Connecticut showed a 0−100% change between sampling periods (Table 1).

On summer line transects through unbroken forests in northeastern Connecticut, Craig (1987) found no birds. Elsewhere, 12−240 pairs/km^2 have been reported from western portions of the species' range (Gardali and Ballard 2000).

Habitat.- Individual birds inhabited more mesic, open canopy forests at lower elevations than would be predicted from habitat availability. They also tended to occupy particularly mixed hardwood forests. There were insufficient samples for assessing habitat vs. population density.

Elsewhere, the species is reported to inhabit mature, deciduous woodlands bordering streams, other wetlands and clearcuts. Woods inhabited typically have

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.09		0.15			
2003−2008	1.09	0.76	0.00	1.19	3.13	0.27

TABLE 2. Habitat availability vs. use by individual Warbling Vireos. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 36. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.19	2.39	1.86	1.97	2.11	2.14	89.8
P(*U*)	0.09	0.17	<0.01*	0.67	<0.01*	0.15	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	13.9	63.9	13.9	0.0	2.8	5.6

open canopies and tract size does not appear to be a limiting factor (Gardali and Ballard 2000).

History.- The Warbling Vireo was described as a common breeder in more open Rhode Island (Howe and Sturtevant 1899) and Connecticut (Sage et al. 1913) habitats. Numbers appear to have declined in the early 20th century but to have rebounded since the 1960s. (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 24.9% of Massachusetts survey blocks and was nearly absent from the southeastern part of the state (Walton 2003a). In the 1980s, it was definite or probable at 40.4% of blocks throughout Connecticut (Clark 1994o). It was also definite or probable at 17.6% of blocks in primarily eastern Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 56.9% of Massachusetts blocks, occurring commonly in all but southeastern regions (Walsh and Peterson 2013).

Synthesis.- The Warbling Vireo occurs infrequently in the extensive forests surveyed in this study. Not surprisingly in light of its habitat preferences, density is greatest in the fragmented forests of central Connecticut. However, reasons for lower populations in southeastern Connecticut and Rhode Island are unclear, although this pattern is also observed in breeding bird atlases. Given also that duplicated data from eastern Connecticut show limited variability, these regional differences appear to be real.

My observations of birds using more open, mesic habitats are consistent with other reports for the species. The association with lower elevations is unreported, however.

Conservation.- Breeding Bird Survey and Massachusetts Breeding Bird Atlas data indicate that populations of the Warbling Vireo are increasing. Regional forest fragmentation may be benefiting this species.

RED-EYED VIREO
Vireo olivaceus

Summer

Density (males/km^2): 50.91 (n = 3,040, 95% CI: ± 3.82)
CT: 55.18
RI: 30.69

Population (males): 464,029 (95% CI: ± 34,825)
CT: 415,214
RI: 48,815

Density.-The Red-eyed Vireo occurred on 100% of transects, with population estimates based on detection of singing males. Densities were greatest in northwestern Connecticut and least in Rhode Island. (Kruskal-Wallis χ^2 = 50.4, n = 147, P < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a weak linear increase in U.S. populations (trend = 0.69, n = 2374, %CV = 11.1; Kendall's τ = 0.87, n = 48, P < 0.001). In contrast, Northeastern populations showed an increase to 1979, a concave decrease until 1996 and stable populations since then. (trend = −0.53, n = 134, %CV = 13.3; Kendall's τ = −0.57, n = 48, P < 0.001). Duplicated density estimates for eastern Connecticut showed a 7−14% change between sampling periods (Table 1).

On summer line transects through northeastern Connecticut, Craig (1987) found 65.2 ± 23.0 birds/km^2. Earlier plot studies have shown densities ranging from 19.0−237.6 birds/km^2 for Connecticut (Craig 1987). Elsewhere, densities of 10−150 pairs/km^2 have been reported (Cimprich et al. 2000).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	38.84		54.69			
2003−2008	44.47	74.80	58.49	55.55	45.08	30.69
Rank	59.9	114.2	87.8	83.1	62.1	38.4

TABLE 2. Habitat availability vs. use by individual Red-eyed Vireos. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 1997. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	166.3
Summer use	1.26	2.05	2.21	2.00	2.68	2.27	182.4
$P(U)$	<0.01*	<0.01*	0.06	0.01*	<0.01*	0.05	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	50.9	22.4	15.6	4.1	2.7	4.4

Habitat.- Data from individual Red-eyed Vireos demonstrated that they inhabited particularly deciduous forests that possessed larger trees, more closed canopies and occurred at higher elevations than would be predicted from habitat availability. They also tended to occupy more mesic forests that had more open understories (Table 2). Examination of population density vs. habitat variables showed similar relationships with moister environments, more closed canopies and greater elevations. Densities also tended to be greater in mixed deciduous forests

TABLE 3. Summer population densities vs. habitat characteristics for Red-eyed Vireos. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.07	−0.13	−0.15	0.13	0.21	−0.11	0.28
P	0.24	0.02	0.01*	0.05	<0.01*	0.05	<0.01*

(Table 3).

Elsewhere, the species inhabits deciduous and mixed forests but is absent from sites where understory is sparse. It is most abundant in the forest interior, but may be found near small forest gaps. Where conifers predominate, it preferentially occurs along streams where deciduous trees are most abundant. Densities have been found to be greater in mesic, bottomland forests than in xeric uplands (Cimprich et al. 2000).

History.- The Red-eyed Vireo has been reported as historically common to abundant in Connecticut (Sage et. al 1913) and Rhode Island (Howe and Sturtevant 1899). During the 19th century, when the regional landscape was largely deforested (Ward and Barsky 2000), the species appears to have remained common within available forest habitat.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 77.3% of survey blocks throughout Massachusetts (Kenneally 2003). In the 1980s, it was definite or probable at 82.7% of blocks throughout Connecticut (Clark 1994p). It was also definite or probable at 62.4% of blocks throughout Rhode Island, although infrequent around metropolitan Providence (Enser 1992). By the 2000s, definite and probable breeders had remained nearly stable at 74.2% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Red-eyed Vireo is one of the most abundant, ubiquitous breeders in the forests of southern New England. Population densities computed here are similar to those reported for elsewhere but somewhat greater than those of Craig (1987).

My earlier investigation of eastern Connecticut populations (Craig et al. 2003) attributed the higher densities of Red-eyed Vireos in southeastern Connecticut to the region's greater deciduous cover. The larger perspective of this study supports this association but also demonstrates that the highest densities by far occur in northwestern Connecticut—a region with substantial conifer cover (Results Table 2). Hence, additional habitat factors like moisture regime, canopy cover and elevation appear to interact with forest type to yield differences in regional densities. In northwestern Connecticut, more mesic conditions and higher elevations likely contribute to producing the greater densities observed there. In Rhode Island, the combination of high conifer cover and more xeric conditions likely produce the lower densities observed there. Given the low variance found in duplicated population estimates from eastern Connecticut, differences among regions appear to be real.

The relationship of the Red-eyed Vireo with mesic, deciduous, closed-canopy forest is consistent with observations of habitat use from elsewhere (Cimprich et al. 2000). The species' predominance in forests with closed canopies also verifies that it is a forest interior inhabitant. Its association with higher elevations is previously unreported, however.

Conservation.- Breeding Bird Survey data show that populations underwent a ca. 18 year decline in the Northeast but are presently stable, as is also suggested by Massachusetts Breeding Bird Atlas and duplicated eastern Connecticut data. Because the species is associated with forest interiors, it is likely vulnerable to forest fragmentation, however.

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GRAY JAY

Perisoreus canadensis

Density.- I found only one wintering Gray Jay during this study—a bird detected at the highest elevations of northwestern Connecticut. I make no population estimate for this extremely rare visitor to southern New England.

Population variance.- Christmas Counts showed a convex increase in U.S. populations, with numbers peaking about 2000 (power function $r^2 = 0.32$, df = 47, $P < 0.001$, %CV = 35.1). New England data suggested the possibility of long-term population cycles, with a decline occurring until about 2000 but with an increase occuring since then (Kendall's $\tau = -0.44$, $n = 48$, $P < 0.001$, %CV = 55.4).

The Gray Jay is known as an occasional irruptive winter migrant to areas south of its breeding range, where it is a permanent resident. In Canada, densities are reported to to range from 1.5−2.9 breeders/km^2 in summer and 1.6−3.5 birds/km^2 outside of the breeding season (Strickland and Ouelett 1993).

Habitat.- My one observation of winter habitat use was of a bird in mature, closed canopy deciduous forest, where it flew from tree to tree actively calling. Elsewhere, it is principally an inhabitant of forests in which spruce is a major constituent (Strickland and Ouelett 1993).

History.- Sage et al. (1913) reported no Gray Jays from Connecticut and Howe and Sturtevant (1899) did not report them from Rhode Island. Zeranski and Baptist (1990) listed 11 Connecticut records.

Synthesis.- Consistent with the Gray Jay's historic status, wintering birds are extremely rare and are likely to occur principally in the mountainous portions of extreme northwestern Connecticut, where they can travel south from their nearest breeding population in the Adirondack Mountains of New York. My one observation of winter habitat use differed from typical habitat use in that it was made in principally deciduous forest.

Conservation.- Evidence from Christmas Counts suggest that long-term population cycles occur in New England. Given that populations are presently rising, the incidence of vagrant wintering Gray Jays may increase.

BLUE JAY

Cyanocitta cristata

Summer
Density (birds/km^2): 4.45 (n = 963, 95% CI: ± 0.37)
CT: 4.31
RI: 5.10
Population (birds): 40,542 (95% CI: ± 3,332)
CT: 32,426
RI: 8,116
Winter
Density (birds/km^2): 1.29 (n = 556, 95% CI: ± 0.25)
CT: 1.35
RI: 1.04
Population (birds): 11,816 (95% CI: ± 2,279)
CT: 10,164
RI: 1,652

Density.- The Blue Jay appeared on 100% of summer and 82% of winter transects. It also appeared rather commonly outside of forest habitats. I used call notes made by both sexes of this flocking species in assessing density.

Summer density was greatest in southwestern Connecticut and least in southeastern Connecticut (Kruskal-Wallis χ^2 = 20.4, n = 147, P = 0.001). In winter, density was greatest in central Connecticut and least in western Connecticut (Kruskal-Wallis χ^2 = 15.0, n = 147, P = 0.01; Table 1).

Populations showed a strong summer−winter decline (Wilcoxon Z = −9.46, n = 147, P < 0.001). Similarly, duplicated data for eastern Connecticut showed strong evidence of a seasonal population decline and a shift in densities to lower elevations (Craig 2012).

Population variance.- Breeding Bird Survey data showed a weakly concave decline in U.S. populations (trend = −0.84, n = 2472, %CV = 11.9; exponential r^2 = 0.98, df = 47, P <0.001). Northeastern populations showed a stronger concave decline (trend =

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	5.10		3.43			
2003−2008	3.78	3.48	3.43	6.14	4.64	5.10
Rank	64.0	59.3	57.5	101.4	78.8	89.9
Winter						
2001−2003	0.56		1.72			
2003−2009	1.32	0.82	1.60	0.74	2.51	1.04
Rank	67.9	60.9	85.7	59.0	96.9	71.9

TABLE 2. Habitat availability vs. use for individual Blue Jays. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 243, winter n = 60. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.49	2.56	2.28	1.99	2.67	2.23	171.1
$P(U)$	<0.01*	0.25	0.55	0.37	<0.01*	0.05	0.25
Winter use	1.20	2.17	2.16	1.98	2.16	2.54	113.2
$P(U)$	0.03	0.70	0.10	0.69	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	43.6	13.2	20.2	9.1	8.6	5.3
Winter use	38.3	41.7	6.7	5.0	3.3	5.0

TABLE 3. Population densities vs. habitat characteristics for Blue Jays. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.05	0.04	0.05	−0.01	0.01	−0.12	−0.03
P	0.11	0.52	0.42	0.92	0.90	0.05	0.66
Winter							
τ	−0.05	0.03	−0.09	−0.0	−0.20	0.11	−0.28
P	0.44	0.65	0.14	0.54	<0.01*	0.06	−0.01*

−2.48, n = 135, %CV = 35.9; power function r^2 = 0.99, df = 47, $P < 0.001$). Christmas Counts showed that U.S. (linear r^2 = 0.48, df = 47, $P < 0.001$, %CV = 29.6) and New England (quadratic r^2 = 0.47, df = 47, $P < 0.001$, %CV = 54.4) populations underwent linear to concave declines.

Duplicated density estimates for eastern Connecticut showed a 0−26% decline in summer and 7−136% change in winter. Notably, winter populations in northeastern Connecticut were the most variable.

On summer line transects through northeastern Connecticut, Craig (1987) found 8.8 birds/km^2. Elsewhere, summer densities reported from forest habitat include 6.5−29 birds/km^2 in Illinois (Tarvin and Woolfenden 1999) and 2 $\pm$ 4 birds/km^2 in New Hampshire (Holmes et al 1986).

Habitat.- Observations of summer habitat use by individual Blue Jays showed that they inhabited significantly more mixed conifer-hardwood forests that had more closed canopies than would be predicted from habitat availability. Wintering individuals used lower elevation forests that tended to be deciduous. These had more open canopies and denser understories than would be predicted from habitat availability (Table 2). Comparison of population densities with habitat features showed no significant summer relationships but significant winter associations with more open canopies and lower elevations (Table 3).

Stepwise logistic regression analysis of habitat use showed that individual birds used forests that were more deciduous, with more open canopies and occurred at lower elevations in winter compared with summer (Nagelkerke r^2 = 0.29, % correctly classified = 83.5, n = 303, $P < 0.001$). Stepwise regression of seasonal population change showed that populations occurred in forests with slightly lower understory density but greater moisture in summer compared with winter (r^2 = 0.08, $f_{2,144}$ = 6.1, standardized coefficients: understory = −0.26, moisture = 0.18, P = 0.003).

Elsewhere, the Blue Jay is reported to inhabit deciduous, mixed and coniferous forest, although the presence of oaks, beeches, hickories and other mast-producing trees appears important to it, as nuts form an important part of the winter diet. It also occurs in wooded suburban habitats and may prefer forest edge (Tarvin and Woolfenden 1999).

History.- The Blue Jay has been a common Connecticut resident since the 19th century (Sage et al. 1913). It was described as abundant in the wooded areas of Rhode Island (Howe and Sturtevant 1899).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 76.9% of survey blocks throughout Massachusetts (Gola 2003). In the 1980s, it was definite or probable at 96.8% of blocks throughout Connecticut (Clark 1994q). It was also definite or probable at 78.2% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had remained stable at 77.0% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Blue Jay is a widespread but uncommon inhabitant of the forests of southern New England, with summer densities reported here similar to those reported for elsewhere. Computed winter densities are among the only available. Density differences among regions are relatively small and, given the variance observed in eastern Connecticut populations, these differences may not occur consistently.

From summer to winter, populations decline and shift to being most prevalent at lower elevations. Craig (2012) similarly found winter population shifts to lower elevations. The winter decline is expected because the species is strongly migratory (Tarvin and Woolfenden 1999). Based on duplicated eastern Connecticut data and Christmas Count coefficients of variation, winter populations are also inherently more variable, as is typical for many permanent resident species.

Although the species is reported to prefer forest edge or non-forest habitats, I found evidence that in summer it is regular in closed canopy forest. Moreover, the summer association I found for habitats containing more conifers is previously unreported. The tendency toward a winter shift to predominantly deciduous forest seems likely related to a winter requirement for oak mast (Tarvin and Woolfenden 1999).

Conservation.- Breeding Bird Survey and Christmas Count data suggest that Blue Jay populations are undergoing a long term decline in southern New England. The occurrence of this decline is further supported by the lower densities reported in this study compared with those of Craig (1987) for northeastern Connecticut. Massachusetts breeding bird atlases indicate stable populations, however.

A decline may be related to the maturation of regional forests with conversion of forests from mast producing trees to maples and birches (Ward and Barsky 2000). However, the species is versatile in habitat use, so its long-term persistence in this region seems assured.

AMERICAN CROW

Corvus brachyrhynchos

Summer

Density (birds/km^2): 0.33 (n = 822, 95% CI: ± 0.04)
CT: 0.31
RI: 0.40
Population (birds): 2,973 (95% CI: ± 381)
CT: 2,334
RI: 639

Winter

Density (birds/km^2): 0.33 (n = 973, 95% CI: ± 0.04)
CT: 0.39
RI: 0.08
Population (birds): 3,047 (95% CI: ± 379)
CT: 2,926
RI: 121

Density.- The American Crow appeared on 98% of summer and 94% of winter transects. It also appeared commonly outside of forest habitats. I used call notes made by both sexes of this flocking species in assessing density. However, many detections were of birds seen or heard at great distances that may not have been in forest habitat. I observed other birds flying overhead, although I also observed individuals perch even on interior forest trees.

Summer density was greatest in southwestern Connecticut and least in central Connecticut (Kruskal-Wallis χ^2 = 45.1, n = 147, $P < 0.001$). In winter, density was again greatest in southwestern Connecticut and least in Rhode Island (Kruskal-Wallis χ^2 = 56.7, n = 147, $P < 0.001$; Table 1). Populations showed little seasonal change for the region as a whole (Wilcoxon $Z = -1.12$, n = 147, $P = 0.26$).

Population variance.- Breeding Bird Survey data showed a weak, nearly linear increase in U.S. populations (trend = 0.35, N = 3210, %CV = 8.4; Kendall's $\tau = 0.73$, n = 48, P <0.001). Northeastern populations showed a stronger convex increase (trend = 0.67, n = 135, %CV = 15.6; power function

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.35		0.33			
2003−2008	0.18	0.40	0.16	0.53	0.17	0.40
Rank	54.9	94.4	49.8	108.6	50.0	92.2
Winter						
2001−2003	0.31		0.37			
2003−2009	0.21	0.40	0.35	0.52	0.44	0.08
Rank	55.6	90.7	80.2	104.9	94.2	27.4

TABLE 2. Habitat availability vs. use for individual American Crows. summer n = 17, winter n = 16. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.53	3.59	2.18	2.00	2.41	2.26	176.5
Winter use	1.31	2.88	2.13	2.00	2.34	2.31	126.6

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	17.6	23.5	17.6	11.8	11.8	17.6
Winter use	12.5	50.0	12.5	12.5	0.0	12.5

TABLE 3. Population densities vs. habitat characteristics for American Crows. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147; * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.04	0.03	0.07	0.07	−0.01	−0.04	0.09
P	0.48	0.56	0.23	0.27	0.90	0.53	0.11
Winter							
τ	−0.17	−0.09	−0.30	0.10	−0.13	−0.12	0.04
P	<0.01*	0.13	<0.01*	0.15	0.03	0.05	0.45

$r^2 = 0.65$, df = 47, $P < 0.001$). However, they also showed a 28% dip in populations after 1999, reaching a low in 2004. Christmas Counts showed that U.S. (power function $r^2 = 0.44$, df = 47, $P < 0.001$, %CV = 19.6) and New England (power function $r^2 = 0.55$, df = 47, $P < 0.001$, %CV = 36.7) populations have had variable but generally increasing populations.

Duplicated density estimates for eastern Connecticut showed a 49−52% decline in summer and 5−32% decline in winter. On summer line transects through northeastern Connecticut, Craig (1987) found no birds. I found no other densities reported for forested eastern landscapes.

Habitat.- Limited observations of summer habitat use by individual American Crows suggested that they occurred in the vicinity of forests with more conifer-hardwoods and mixed cover types than would be predicted from habitat availability. Wintering individuals again tended to inhabit more mixed cover types, although they also occurred in more mesic locations at lower elevations (Table 2).

Comparison of population densities with habitat features showed no significant summer relationships but significant winter associations with more deciduous forests and more mesic conditions (Table 3). Stepwise regression of seasonal population change showed that populations occurred in forests with lower moisture and more coniferous cover in summer compared with winter ($r^2 = 0.28$, $f_{2,144} = 27.5$, standardized coefficients: moisture = 0.45, forest type = 0.24, $P < 0.001$). Elsewhere, the species is reported to inhabit forest edge and open habitats, including human-associated landscapes, but to be less common in habitats with no trees (Verbeek and Caffrey 2002).

History.- The American Crow was a common Connecticut resident in the 19th century (Zeranski and Baptist 1990). Sage et al. (1913) believed that migratory activity occurred in Connecticut. Howe and Sturtevant (1899) considered the species to be abundant in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 57.8% of survey blocks throughout Massachusetts (Forster 2003d). In the 1980s, it was definite or probable at 94.8% of blocks throughout Connecticut (Clark 1994r). It was also definite or probable at 65.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 65.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The American Crow is an uncommon bird in primarily forested landscapes, being only marginally a species of such habitats. Density differences among regions are significant, although given the variance in populations observed in eastern Connecticut, whether the regional differences are consistent is problematic. Populations show little seasonal change in density.

The species is reported to prefer forest edge or non-forest habitats, but within forests I found evidence that in summer it is more frequent in locations with at least some conifers. In winter, it appears to move to more deciduous, mesic, and possibly lower elevation habitats, so there is a summer-winter shift in habitat occupancy.

Conservation.- Breeding Bird Survey, Christmas Count and Massachusetts Breeding Bird Atlas data show that populations are increasing. The temporary dip in northeastern populations after 1999 was apparently the consequence of the arrival of West Nile Virus in the New York metropolitan area in 2000, to which crows were particularly susceptible (LaDeau et al. 2008). My data demonstrate a consistent drop in eastern Connecticut populations from 2001−2002 to 2004−2005. They also suggest that the effects reached Rhode Island by the winter of 2003−2004. Populations remained low in central Connecticut in 2005 and did not return to pre-disease levels until the winter of 2006.

FISH CROW
Corvus ossifragus

Density.- I found only eight summering (5% of transects) and two wintering (1% of transects) Fish Crows during this study, all in southern and particularly coastal Connecticut. I make no estimate for winter populations, but tentatively estimate a summer population density of 0.01 birds/km^2 and a total population of 52 birds in principally forested landscapes. Since the conclusion of this study, in 2014 R. Craig (pers. obs.) also found a pair of summering birds inland at Mansfield.

Population variance.- Breeding Bird Survey data showed a weak concave increase in U.S. populations (trend = 0.54, n = 833, %CV = 8.0; Kendall's τ = 0.69, n = 48, $P <$ 0.001) and a stronger concave increase in Northeastern populations (trend = 3.16, n = 105, %CV = 43.3; Kendall's τ = 0.99, n = 48, $P <$ 0.001). U.S. Christmas Counts showed a nonsignificant convex increase until about 1990 followed by a decline since then (power function r^2 = 0.02, df = 47, P = 0.35, %CV = 27.3). New England populations showed a weak concave increase, however (Kendall's τ = 0.66, n = 48, $P <$ 0.001, %CV = 270.7).

On summer line transects through northeastern Connecticut, Craig (1987) reported no birds, although he found birds present there during May as early as the 1970s (R. Craig pers. obs). I found no other reports of winter or summer population densities in forested landscapes.

Habitat.- I detected most summering and wintering birds at distances beyond 70 m, although all birds were associated with deciduous forest. Elsewhere, the species is known primarily as an inhabitant of a variety of non-forest coastal environments. However, it is also reported present in riverine forests and coastal plain pine forests (McGowan 2001).

History.- The Fish Crow was known as a rare year-round resident to Sage et al. (1913). Howe and Sturtevant (1899) did not report it from Rhode Island. It was first found nesting there 1943, although it continues to be encountered rarely (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 1.4% of eastern Massachusetts survey blocks (Stymeist 2003). In the 1980s, it was definite or probable at 4.7% of blocks in mostly southern but also central Connecticut (Clark 1994s). It was also at 1.2% of blocks in Rhode Island (Enser 1992). By the 2000s, definite and probable breeders had increased to 7.0% of blocks in mostly eastern but also western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Fish Crow remains a rare and local breeder in the forests of southern New England. As with the American Crow, it is a nominal forest inhabitant, although it typically nests in trees. Birds perch in trees even in interior forest and can prey on the nestlings of forest birds (McGowan 2001).

Conservation.- Evidence from the Breeding Bird Survey, Massachusetts Breeding Bird Atlas and Christmas Count indicates that populations are increasing regionally. As populations grow, they are invading inland areas away from their traditional coastal range.

COMMON RAVEN

Corvus corax

Summer

Density (birds/km^2): 0.02 (n = 66 pooled, 95% CI: ± 0.01)
CT: 0.02
RI: 0.00

Population (birds): 268 (95% CI: ± 99)
CT: 268
RI: 0

Winter

Density (birds/km^2): 0.04 (n = 66 pooled, 95% CI: ± 0.02)
CT: 0.05
RI: 0.08

Population (birds): 377 (95% CI: ± 155)
CT: 377
RI: 0

Density.- The Common Raven appeared on 10% of summer and 20% of winter transects. I used call notes made by both sexes of this flocking species in assessing density. Because behavior and vocalizations appeared the same in summer and winter, I pooled all observations in computing densities. However, many detections were of birds seen or heard at great distances that may not have been in forest habitat. I observed other birds flying overhead, although I also observed individuals perch on interior forest trees.

Summer and winter density was greatest in northwestern Connecticut. During the study period, the species was absent in Rhode Island (Table 1), although R. Craig (pers. obs.) has since observed it in the northwestern part of the state. Populations tended to increase from summer to winter.

Population variance.- Breeding Bird Survey data showed a strong concave increase in U.S. (trend = 2.81, n = 1648, %CV = 39.6; Kendall's τ = 0.98, n = 48, P <0.001) and Northeastern populations (trend = 10.55, n = 16, %CV = 144.4; Kendall's τ = 0.89, n = 48, P < 0.001). Christmas Counts showed a linear U.S. (linear r^2 = 0.98, df = 47, P < 0.001, %CV = 46.3) but weakly convex New England increase (power function r^2 = 0.24, df = 47, P < 0.001, %CV = 23.3) in populations.

TABLE 1. Population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.01		0.01			
2003−2008	0.01	0.04	0.01	0.03	0.02	0.00
Winter						
2001−2003	0.03		0.01			
2003−2009	0.06	0.10	0.03	0.05	0.02	0.00

Duplicated density estimates for eastern Connecticut showed no change in summer but a 100−200% increase in winter (Table 1). On summer line transects through eastern Connecticut, Craig (1987) found no birds. Elsewhere, populations are reported as 0.03 pairs/km^2 in Virginia and 0.06−33 birds/km^2 in other parts of the species' extensive range (Boarman and Heinrich 1999).

Habitat.- My three observations of summering Common Ravens at or within 70 m were in deciduous, xeric and closed to semi-open forest. My one winter observation was of a bird in mixed, mesic, closed canopy forest.

Elsewhere, a broad range of open and forested habitats are occupied, although in the Northeast it is most typically associated with wilderness. (Boarman and Heinrich 1999). However, my recent observations of the species in Connecticut (R. Craig pers. obs.) demonstrate that it is a regular inhabitant of agricultural landscapes and even appears on lawns and in urban settings.

History.- The Common Raven was reported to be an extremely rare visitor to Connecticut by Sage et al. (1913). Howe and Sturtevant (1899) did not know it from Rhode Island. Since the 1980s, it has become increasingly common at all seasons (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a probable breeder at 0.2% of northwestern Massachusetts survey blocks (Walsh and Peterson 2013). In the 1980s, it was probable at 1.0% of blocks in northwestern Connecticut (Bevier 1994b). It also appeared in northeastern Connecticut for the first time in 1987 when an apparent pair was present consistently (R. Craig pers. obs). It was absent in Rhode Island in the 1980s (Enser 1992). By the 2000s, definite and probable breeders had exploded to 14.7% of blocks in primarily western Massachusetts but with individuals present across the state (Walsh and Peterson 2013).

Synthesis.- The Common Raven is rare but increasing in southern New England with densities similar to those reported for other southern portions of its range. Even within the context of the large variation observed in eastern Connecticut populations, the present predominance of the species in particularly northern portions of the study area is consistent with breeding bird atlas data and data on population expansion into the region from the north.

Population estimates suggest an increase from summer to winter, perhaps in part due to breeding season recruitment. Moreover, migration into Connecticut from more northern areas may occur, as the species exhibits migatory behavior (Boarman and Heinrich 1999).

Very limited observations of habitat use are in general agreement with the wide range of habitats reported to be used by the species. As local populations expand, the range of habitat occupancy is growing beyond its traditional New England wilderness presence.

Conservation.- The Common Raven has dramatically increased in southern New England, particularly since the early 1980s. It has now extended its range south to Long Island Sound. Based on Breeding Bird Survey, Massachusetts Breeding Bird Atlas and Christmas Count data, this adaptable species appears likely to continue expanding its local populations.

BLACK-CAPPED CHICKADEE

Poecile atricapillus

Summer

Density (birds/km^2): 11.63 (*n* = 924, 95% CI: ± 1.01)
CT: 11.24
RI: 13.42

Population (birds): 105,969 (95% CI: ± 9,236)
CT: 84,632
RI: 21,337

Winter

Density (birds/km^2): 14.86 (*n* = 1,185, 95% CI: ± 1.25)
CT: 14.44
RI: 16.84

Population (birds): 135,434 (95% CI: ± 11,391)
CT: 108,651
RI: 26,783

Density.- The Black-capped Chickadee appeared on 99% of summer and 100% of winter transects. It also appeared rather commonly outside of primarily forested landscapes. I used call notes made by both sexes of this flocking species in assessing density.

Summer density was greatest in Rhode Island and least in western Connecticut (Kruskal-Wallis χ^2 = 12.6, *n* = 147, *P* = 0.03). In winter, density was greatest in central and southeastern Connecticut and Rhode Island and least in southwestern Connecticut (Kruskal-Wallis χ^2 = 15.0, *n* = 147, *P* < 0.001; Table 1). Populations showed a strong summer-winter increase for the region as a whole (Wilcoxon *Z* = −4.27, N = 147, *P* < 0.001).

Population variance.- Breeding Bird Survey data showed a weak but significant linear increase in U.S. (trend = 0.41, *n* = 1555, %CV = 10.2; Kendall's τ = 0.66, *n* = 48, *P* < 0.001) and Northeastern populations (trend = 0.12, *n* = 56, %CV = 2.3; linear r^2 =

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	11.87		11.71			
2003−2008	12.66	10.40	12.44	7.67	12.95	13.42
Rank	82.7	63.0	80.6	48.2	79.2	84.5
Winter						
2001−2003	11.80		15.15			
2003−2009	15.41	12.19	17.63	9.48	19.49	16.84
Rank	67.9	60.9	85.7	59.0	96.9	71.9

TABLE 2. Habitat availability vs. use for individual Black-capped Chickadees. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. Summer *n* = 573, winter *n* = 649. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.47	2.63	2.26	1.99	2.59	2.32	166.7
P(*U*)	<0.01*	<0.01*	0.95	0.40	0.23	0.89	0.64
Winter use	1.49	2.76	2.21	1.98	2.53	2.31	152.8
P(*U*)	<0.01*	<0.01*	0.12	0.83	0.69	0.84	0.04

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	37.9	18.2	20.2	10.3	7.2	6.3
Winter use	33.4	22.7	18.5	8.8	9.7	6.9

TABLE 3. Population densities vs. habitat characteristics for Black-capped Chickadees. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.29	0.21	0.07	−0.05	−0.03	0.01	−0.05
P	<0.01*	<0.01*	0.24	0.48	0.60	0.87	0.43
Winter							
τ	0.19	0.03	−0.04	−0.02	−0.15	0.10	−0.20
P	<0.01*	<0.01*	0.54	0.78	0.02	0.08	<0.01*
Seasonal difference							
τ	0.05	<−0.01	0.10	−0.05	0.09	−0.07	0.13
P	0.40	0.96	0.09	0.45	0.14	0.21	0.02

= 0.53, df = 47, $P < 0.001$). Christmas Counts showed a convex U.S. trend (power function $r^2 = 0.35$, df = 47, $P < 0.001$, %CV = 14.5) with populations peaking about 1996 and declining slightly since then. New England populations also showed a convex trend (power function $r^2 = 0.26$, df = 47, $P < 0.001$, %CV = 16.4) with populations peaking about 1998 and declining since then.

Duplicated density estimates for eastern Connecticut showed a 6−7% increase in summer and a 16−31% increase in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 21.7 ± 8.2 birds/km^2. In New Hampshire, breeding densities are reported as 8 ± 11 birds/km^2 (Holmes et al. 1986). Late winter Canadian woodland populations had a density of 39.2 birds/km^2 (DesRochers et al. 1988).

Habitat.- Observations of summer habitat use by individual Black-capped Chickadees showed that birds occupied forests more coniferous than would be predicted from habitat availability. In winter, birds again inhabited more coniferous forests and tended to inhabit lower elevations (Table 2). Comparison of population densities with habitat features showed similar patterns and a significant relationship with inhabiting lower winter elevations (Table 3).

Stepwise logistic regression analysis of habitat use showed that individual birds used forests with lower elevations in winter compared with summer (Nagelkerke r^2 = 0.01, % correctly classified = 53.3, n = 1222, P = 0.008). Seasonal shifts in populations showed no significant correlations with habitat, although they also trended toward showing greater populations at higher elevations in summer compared with winter (Table 3).

Elsewhere, the species is reported to inhabit deciduous, mixed and coniferous forests. It also occurs in open woodland and other types of disturbed habitats, such as old fields and even suburban areas. It may prefer forest edge (Smith 1993).

History.- The Black-capped Chickadee has been known as a common Connecticut resident since the 19th century (Sage et al. 1913). Howe and Sturtevant (1899) thought it abundant in Rhode Island, particularly in winter. Two declines have been detected in Connecticut since 1968 (Loery 1994a).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 82.0% of survey blocks throughout Massachusetts (Bates 2003b). In the 1980s, it was definite or probable at 97.7% of blocks throughout Connecticut (Loery 1994a). It was also definite or probable at 81.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 89.9% of Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Black-capped Chickadee is a widespread and common inhabitant of southern New England forests, with breeding densities here slightly higher than those reported for northern New England but below those reported by Craig (1987) for northeastern Connecticut. Computed winter densities are well below those listed for elsewhere.

Population densities appear to decline from east to west in summer and, given the low variance in duplicated eastern Connecticut data, these regional differences are likely real. In winter, populations tend to be greatest in southeastern portions of the study area but to increase in numbers over those of summer throughout. Movement from the north into more climatically mild southern regions is well known for the species (Smith 1993) and has been reported previously from eastern Connecticut (Craig 2012). Winter populations are also inherently more variable than those of summer, based on duplicated eastern Connecticut data and Christmas Count coefficients of variation, as is typical for many permanent resident species.

The summer and winter association of Black-capped Chickadees with more coniferous forests is consistent with reports from elsewhere. Their winter movement to lower elevations is unreported except by Craig (2012).

Conservation.- Breeding Bird Survey, Christmas Count, Massachusetts Breeding Bird Atlas and duplicated eastern Connecticut data show that Black-capped Chickadee populations have generally increased in southern New England, although they have fluctuated. Such fluctuations are perhaps a consequence in part of the invasion of the region by the Tufted Titmouse (Loery et al. 1987). Even though the species is largely a forest inhabitant, its versatility in use of habitats suggests that future forest fragmentation may not substantially affect populations.

TUFTED TITMOUSE

Baeolophus bicolor

Summer

Density (birds/km^2): 23.58 (n = 1,580, 95% CI: ± 1.58)
CT: 22.62
RI: 26.52
Population (birds): 202,222 (95% CI: ± 14,444)
CT: 160,044
RI: 42,178

Winter

Density (birds/km^2): 16.39 (n = 853, 95% CI: ± 2.39)
CT: 16.74
RI: 14.75
Population (birds): 132,696 (95% CI: ± 21,768)
CT: 109,236
RI: 23,460

Density.- The Tufted Titmouse appeared on 99% of summer and 90% of winter transects. It also appeared rather commonly outside of primarily forested landscapes. I used call notes made by both sexes of this flocking species in assessing density.

Summer density was greatest in lower elevation and southern regions and least in northwestern Connecticut (Kruskal-Wallis χ^2 = 28.7, n = 147, $P < 0.001$). In winter, density was greatest in central Connecticut and least in northwestern Connecticut (Kruskal-Wallis χ^2 = 37.4, n = 147, $P < 0.001$; Table 1). Populations showed a significant winter decrease for the region as a whole (Wilcoxon $Z = -5.31$, n = 147, $P < 0.001$).

Population variance.- Breeding Bird Survey data showed a significant concave increase in U.S. (trend = 1.08, n = 2008, %CV = 15.5; Kendall's $\tau = 0.77$, n = 48, $P < 0.001$) and Northeastern populations (trend = 2.84, n = 132, %CV = 41.3; quadratic r^2 = 0.95, df = 47, $P < 0.001$). Christmas Counts

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	19.47		24.85			
2003−2008	21.82	14.86	27.52	26.83	27.12	26.52
Rank	64.5	39.0	89.9	82.8	89.0	84.4
Winter						
2001−2003	8.16		19.39			
2003−2009	12.17	9.04	22.65	15.10	29.19	14.75
Rank	62.3	43.7	91.2	68.2	109.2	71.8

TABLE 2. Habitat availability vs. use for individual Tufted Titmice. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 952, winter n = 570. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.30	2.22	2.23	1.99	2.64	2.32	144.3
$P(U)$	0.09	0.10	0.40	0.20	<0.01*	0.78	<0.01*
Winter use							
	1.23	2.22	2.22	1.98	2.50	2.41	126.9
$P(U)$	<0.01*	0.11	0.20	0.92	0.14	0.03	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	48.6	21.3	13.2	7.6	3.9	5.4
Winter use	46.8	28.1	8.6	6.5	2.8V7.2	

TABLE 3. Population densities vs. habitat characteristics for Tufted Titmice. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.12	−0.07	0.05	0.01	0.04	0.01	−0.34
P	0.04	0.25	0.36	0.88	0.49	0.89	<0.01*
Winter							
τ	−0.23	−0.12	−0.06	0.01	−0.13	0.08	−0.33
P	<0.01*	0.04	0.33	0.94	0.03	0.16	<0.01*

showed a linear U.S. (Kendall's $\tau = 0.56$, $n = 48$, $P < 0.001$, %CV = 14.5) and New England increase (linear $r^2 = 0.90$, df = 47, $P < 0.001$, %CV = 16.4).

Duplicated density estimates for eastern Connecticut showed a 11−12% increase in summer and a 17−49% increase in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 2.4 birds/km^2. Elsewhere, 0−19 pairs/km^2 have been reported for southern New England (Curtis 1986). Winter densities of 22.2−32.1 birds/km^2 have been reported for Arkansas (Beddall 1963).

Habitat.- Observations of summer habitat use by individual Tufted Titmice showed associations with more closed canopy, lower elevation forests. In winter, individual birds inhabited lower elevation forests that were more deciduous than would be predicted from habitat availability. Moreover, they tended to inhabit forests with denser understories (Table 2). Comparison of population densities with habitat features showed summer and winter correlations with lower elevations as well as a winter correlation with greater deciduous cover (Table 3).

Stepwise logistic regression analysis of habitat use showed that individual birds used forests that were more deciduous, had more open canopies and were at lower elevations in winter compared with summer (Nagelkerke $r^2 = 0.04$, % correctly classified = 63.2, $n = 1522$, $P < 0.001$). Stepwise regression of seasonal population change showed that populations occurred in forests with greater canopy cover and more coniferous cover in summer compared with winter ($r^2 = 0.11$, $f_{2,144} = 8.9$, standardized coefficients: canopy cover = 0.27, forest type = 0.19, $P < 0.001$).

Elsewhere, the species is reported to inhabit principally deciduous forest, although it also occurs in mixed forests. Diverse, low elevation, closed canopy forests appear to be preferred. It does not occur in regions receiving <61 inches of rain (Grubb and Pravosudov 1994). It also may occupy more open and even suburban areas.

History.- The Tufted Titmouse was rare in Connecticut during the 19th century (Sage et al. 1913) and Howe and Sturtevant (1899) did not report it from Rhode Island. It has been established in Connecticut and Rhode Island only since the late 1940s to 1950s (Enser 1992, Loery 1994b). As recently as the early 1980s, there were comparatively few birds inhabiting interior forests in northern Connecticut (Craig 1987).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 48.5% of Massachusetts survey blocks, although it occurred infrequently in far western parts of the state (Stone 2013). In the 1980s, it was definite or probable at 94.0% of blocks throughout Connecticut (Loery 1994b). It was also definite or probable at 72.7% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 84.0% of locks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Tufted Titmouse is a widespread and common inhabitant of the forests of southern New England, with densities similar to those reported for elsewhere. Population densities are generally greatest year-round in southern, low elevation regions and least in more mountainous northern areas. Given the low variance in particularly duplicated summer data from eastern Connecticut, these regional differences are apparently real.

Populations decline and move to lower elevation forest from summer to winter. These patterns previously have been reported for eastern Connecticut (Craig 2012). Such movement, although weakly documented for the species (Grubb and Pravosudov 1994), is indicative of winter migration into more climatically mild, southern portions of the range. Winter populations are also inherently more variable, based on duplicated eastern Connecticut data and Christmas Count coefficients of variation, as is typical for many permanent resident species.

The summer and winter association of the Tufted Titmouse with lower elevation forests is consistent with the species' more southerly continental distribution (Grubb and Pravosudov 1994). Moreover, its summer association with closed canopy forest is similarly reported by others. However, movement to more deciduous, open forests in winter is not clearly indicated elsewhere except by Craig (2012), although this study has demonstrated that other permanent resident species also engage in similar habitat shifts. Hence, movement to more open winter habitats may have broadly positive effects for permanent residents.

Conservation.- Breeding Bird Survey, Christmas Count, Massachusetts Breeding Bird Atlas and duplicated eastern Connecticut data show that Tufted Titmouse populations are undergoing a long term increase in southern New England—a trend corroborated by comparison of my results with earlier transect studies of Craig (1987). As foretold by Loery (1994b), it has become the most common chickadee relative in this region.

RED-BREASTED NUTHATCH

Sitta canadensis

Summer

Density (birds/km^2): 0.57 (n = 92 pooled, 95% CI: ± 0.28)
CT: 0.39
RI: 1.44

Population (birds): 5,240 (95% CI: ± 2,579)
CT: 2,954
RI: 2,286

Winter

Density (birds/km^2): 0.95 (n = 92 pooled, 95% CI: ± 0.58)
CT: 0.16
RI: 4.64

Population (birds): 8,618 (95% CI: ± 5,261)
CT: 1,233
RI: 7,385

Density.- The Red-breasted Nuthatch appeared on 18% of summer and 14% of winter transects. I used call notes made by both sexes in assessing density and pooled observations of this uncommon, flocking species in computing detectability.

Summer density was greatest in Rhode Island and northern Connecticut and least in southern and lowland areas of Connecticut. In winter, density was again greatest in Rhode Island but generally low throughout the rest of the region (Table 1). Populations tended to be greater in winter than summer although they showed considerable annual variation.

Population variance.- Breeding Bird Survey data showed a weak and variable increase in U.S. populations (trend = 0.32, n = 1047, %CV = 11.4; Kendall's τ = 0.53, n = 48, P < 0.001) but no significant Northeastern trend (trend = 0.08, n = 42, %CV = 15.7; Kendall's τ = 0.15, n = 48, P = 0.15). Christmas Counts showed a weakly exponential U.S. (exponential r^2 =0.35, df = 47, P < 0.001, %CV = 38.9) and convex New England population increase (Kendall's τ = 0.29, n = 48, P = 0.003, %CV = 56.0).

Duplicated density estimates for eastern Connecticut showed a 25−100% change in summer and a 100−700% change in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found

TABLE 1. Population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.88		0.12			
2003−2008	0.66	0.62	0.24	0.00	0.23	1.44
Winter						
2001−2003	0.11		0.12			
2003−2009	0.00	0.10	0.96	0.00	0.11	4.64

TABLE 2. Habitat availability vs. use for individual Red-breasted Nuthatches. Summer n = 27, winter n = 31. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.00	3.89	2.33	1.96	2.56	2.30	168.1
Winter use	2.35	4.68	2.63	1.97	2.50	2.52	106.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	14.8	3.7	25.9	25.9	22.2	7.4
Winter use	9.7	0.0	12.9	25.8	45.2	6.5

5.8 birds/km^2. Elsewhere, breeding densities are reported to range from 11−50 pairs/km^2 (Ghalambor and Martin 1999).

Habitat.- The Red-breasted Nuthatch tended to occupy forests year-round that were much more coniferous than would be predicted from habitat availability. In winter, pure conifer forests appeared to be particularly important (Table 2). I found the species especially in spruce plantations, white and red pine plantations, pine-oak stands and, to a lesser extent, in natural hemlock and conifer-hardwood forests. On occasion, it also appeared in pure deciduous forests. Likely because conifer plantations are often situated in more xeric locations, there was a year-round association with more xeric conditions. In winter, a strong association with lower elevation forests also occurred.

Elsewhere, the species is reported to prefer mature, diverse conifer forest, although it also is present in mixed deciduous-coniferous forest. Mixed stands containing trees such as spruce, fir, pine, hemlock, arborvitae, and larch are used, although pure pine and pure hemlock appear less preferred (Ghalambor and Martin 1999).

History.- The Red-breasted Nuthatch was known from two summer locations in northwestern Connecticut by Sage et al. (1913). They also described it as an irregular winter resident. It became a more common Connecticut breeder during the 20th century (Zeranski and Baptist 1990). It was unknown to Howe and Sturtevant (1899) as a Rhode Island breeder, although they described it as "not uncommon" in winter. It first bred there in 1913 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 20.5% of survey blocks throughout Massachusetts (Berry 2003a). In the 1980s, it was definite or probable at 8.2% of blocks primarily in northwestern Connecticut (Clark 1994t). It was also definite or probable at 6.7% of blocks primarily in western Rhode Island (Enser 1992). By the 2000s, breeders increased to 29.3% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Summer populations are generally greatest in northern portions of the study area. However, they are also present comparatively densely in Rhode Island, where birds inhabit the extensive conifer-dominated forests of the region. Although I found considerable variance in duplicated summer data from eastern Connecticut, these patterns are predicted from the species' primarily northern distribution, its distribution on breeding bird atlases and its known habitat associations (Ghalambor and Martin 1999).

Based on historic reports, generally higher populations in winter than summer that are centered about lowlands are again expected for this northerly distributed species. The great variation I found in duplicated eastern Connecticut winter data is consistent with the species' known irregular migration into the southern portions of its range (Ghalambor and Martin 1999). It is also reflected in the comparatively high coefficients of variation for Christmas Counts.

The summer association of birds with coniferous forests is consistent with other reports of habitat use. The species' occasional occurrence in even deciduous forests is largely unreported, however.

Conservation.- Breeding Bird Survey, Christmas Count and Massachusetts Breeding Bird Atlas data suggest that Red-breasted Nuthatch populations are weakly and variably increasing in southern New England. Craig's (1987) much higher density estimates in northeastern Connecticut as well as the high variation in duplicated eastern Connecticut data appear indicative of this local variability.

Notably, Craig (1987) found that summering Red-breasted far outnumbered White-breasted Nuthatches in northeastern Connecticut, a situation that is no longer true. Indeed, at some of the same locations where birds had been common in this earlier study, none were present during the present investigation. Population fluctuations are typically greatest at the range periphery (Thompson and Nolan 1973, Marti 1997), which includes Connecticut (Ghalambor and Martin 1999).

WHITE-BREASTED NUTHATCH
Sitta carolinensis

Summer

Density (birds/km^2): 7.88 (n = 694, 95% CI: ± 0.94)
CT: 8.13
RI: 6.66
Population (birds): 71,789 (95% CI: ± 8,531)
CT: 61,202
RI: 10,587

Winter

Density (birds/km^2): 9.89 (n = 915, 95% CI: ± 1.01)
CT: 10.06
RI: 9.10
Population (birds): 90,166 (95% CI: ± 9,217)
CT: 75,696
RI: 14,470

Density.- The White-breasted Nuthatch appeared on 97% of summer and 98% of winter transects. It also appeared rather commonly outside of primarily forested landscapes, particularly in winter. I used call notes made by both sexes of this flocking species in assessing density.

Summer density was greatest in northeastern and central Connecticut and least in northwestern Connecticut (Kruskal-Wallis χ^2 = 26.4, n = 147, P < 0.001). In winter, density was greatest in central and least in northwestern Connecticut (Kruskal-Wallis χ^2 = 23.4, n = 147, P < 0.001; Table 1). Populations showed a summer to winter increase (Wilcoxon Z = −3.50, n = 147, P < 0.001).

Population variance.- Breeding Bird Survey data showed a concave increase in U.S. (trend = 1.58, n = 2312, %CV = 26.5; Kendall's τ = 0.90, n = 48, P < 0.001) and Northeastern populations (trend = 2.63, n = 113, %CV = 38.0; Kendall's τ = 0.94, n = 48, P < 0.001). Christmas Counts also showed a concave U.S. (quadratic r^2 = 0.54, n = 48, P < 0.001, %CV = 14.1) and New England

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	7.28		7.50			
2003−2008	11.54	5.11	9.04	6.79	11.08	6.66
Rank	96.2	48.3	81.1	64.1	92.8	61.0
Winter						
2001−2003	7.55		8.35			
2003−2009	10.39	7.08	12.04	9.85	14.52	9.09
Rank	74.4	49.7	89.0	66.9	100.4	64.9

TABLE 2. Habitat availability vs. use for individual White-breasted Nuthatches. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 383, winter n = 442. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.22	2.02	2.24	1.99	2.63	2.22	166.5
$P(U)$	<0.01*	<0.01*	0.46	0.26	0.03	0.01*	0.55
Winter use							
	1.31	2.33	2.22	1.99	2.59	2.32	159.7
$P(U)$	0.24	0.80	0.25	0.50	0.30	0.81	0.54

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	53.0	22.5	13.3	4.4	1.3	5.5
Winter use	44.1	24.0	13.8	7.9	3.8	6.3

TABLE 3. Population densities vs. habitat characteristics for White-breasted Nuthatches. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.06	−0.09	0.03	0.05	0.05	−0.10	−0.04
P	0.31	0.15	0.67	0.42	0.38	0.10	0.53
Winter							
τ	−0.22	−0.11	0.09	0.03	−0.06	0.08	−0.20
P	<0.01*	0.06	0.15	0.64	0.31	0.15	<0.01*

increase (quadratic $r^2 = 0.31$, df = 47, $P < 0.001$, %CV = 18.4).

Duplicated density estimates for eastern Connecticut showed a 21−59% increase in summer and a 38−44% increase in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 1.7 birds/km^2. Elsewhere, breeding densities reported from forest habitat are 1−19 pairs/km^2 (Pravosudov and Grubb 1993), and 23 ± 17 birds/km^2 in New Hampshire (Holmes et al 1986). Winter populations are reported as 11.6−19 birds/km^2 (Pravosudov and Grubb 1993).

Habitat.- Observations of summer habitat use by individual White-breasted Nuthatches showed that they inhabited more deciduous forests—particularly oak-dominated forests—with more open understories than would be predicted from habitat availability. I found no significant winter relationships, however (Table 2). Comparison of population densities with habitat features showed, in contrast, no significant summer relationships but significant winter relationships with more deciduous, lower elevation forests (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed that the species used forests with a greater proportion of conifer-containing associations and more dense understories in winter than in summer, although the relationships were rather weak (Nagelkerke r^2 = 0.02, % correctly classified = 55.8, n = 825, P = 0.002). Similarly, in eastern Connecticut, Craig (2012) found a winter habitat shift to forest associations that included conifers and toward occupying lower elevations. Stepwise regression of seasonal population change showed that populations occurred in forests with lower understory density and soil moisture in summer compared with winter (r^2 = 0.08, $f_{2,144}$ = 6.5, standardized coefficients: understory density = −0.26, moisture = 0.19, P = 0.002).

Elsewhere, the White-breasted Nuthatch is reported to inhabit mature, deciduous forest, although it also is present in mixed deciduous-coniferous forest. It is believed to prefer forest edge (Pravosudov and Grubb 1993).

History.- The White-breasted Nuthatch has been known as a fairly common Connecticut resident since the 19th century (Sage et al. 1913). Zeranski and Baptist (1990) speculate that its numbers increased during the 20th century as forest extent expanded. Howe and Sturtevant (1899) described it as a local breeder but "not uncommon" in winter.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 55.5% of survey blocks throughout Massachusetts (Roth 2003). In the 1980s, it was definite or probable at 70.1% of blocks throughout Connecticut (Clark 1994u). It was also definite or probable at 44.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 79.7% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Computed summer and winter densities tend toward the lower end of those reported for elsewhere, although they are much higher than those reported by Craig (1987), who found the Red-breasted Nuthatch to be the more abundant of the two nuthatch species. During the years of Red-breasted Nuthatch abundance, it is possible that this species depressed populations of its congener, much like the appearance of the Tufted Titmouse initially appeared to depress populations of the Black-capped Chickadee (Loery et al. 1987).

Summer and winter densities are consistently greatest in lightly forested central Connecticut and least in heavily forested northwestern Connecticut. Although these patterns may be related to the species' reported preference for forest edge, the comparatively high variance found in duplicated eastern Connecticut data suggest that they be interpreted with caution. Populations also grow from summer to winter—a pattern corroborated by Craig for eastern Connecticut (2012) and by historical reports. Although weakly documented for the species (Pravosudov and Grubb 1993), this pattern is indicative of winter migration from the north into more climatically mild, southern portions of the range.

Observed habitat associations show some consistency toward occupying more open understories in summer, but they are otherwise inconsistent at the scales of measurement employed here. This inconsistency suggests that the species has no strong habitat affiliations and may be thought of, as also noted by Craig (2012), as a habitat generalist. Its status as a generalist may indeed better explain its presence in edge habitats than the notion that it prefers such locations. The at best weak winter association with lower elevations also suggests that the White-breasted Nuthatch does not require the locally higher average temperatures of those elevations in balancing its energetic needs, as appears to be the case for other permanent resident species.

Conservation.- Breeding Bird Survey, Christmas Count, Massachusetts breeding bird atlas, duplicated eastern Connecticut data and data from Craig (1987) for northeastern Connecticut indicate that White-breasted Nuthatch populations are increasing. Whether this increase is related to the expansion of mature forest in southern New England (Alerich 1999, 2000) is unclear in light of the species' habitat generalist tendencies.

BROWN CREEPER

Certhia americana

Summer

Density (males/km^2): 1.52 (n = 60, 95% CI: ± 0.52)
CT: 1.54
RI: 1.47
Population (males): 13,895 (95% CI: ± 4,766)
CT: 11,551
RI: 2,344

Winter

Density (birds/km^2): 9.84 (n = 87, 95% CI: ± 2.76)
CT: 9.93
RI: 9.40
Population (birds): 89,691 (95% CI: ± 25,138)
CT: 74,738
RI: 14,953

Density.- The Brown Creeper appeared on 27% of summer and 35% of winter transects. Summer population estimates are based on detections of singing males, whereas winter estimates are based on those of vocalizing males and females.

Summer density varied substantially among years and differences among regions were not significant (Kruskal-Wallis χ^2 = 5.1, n = 147, P = 0.40). In winter, density also varied greatly among years, although differences among regions were significant (Kruskal-Wallis χ^2 = 16.4, n = 147, P = 0.006; Table 1). Because methods for assessing populations differed between seasons, I did not statistically test seasonal change in density, although density clearly grew in winter.

Population variance.- Breeding Bird Survey data showed a weak concave increase in U.S. (trend = 0.16, n = 798, %CV = 4.9; Kendall's τ = 0.32, n = 48, P = 0.003) but weak nearly linear decline in Northeastern populations (trend = −0.90, n = 46, %CV = 16.3; Kendall's τ = −0.76, n = 48, P < 0.001).

TABLE 1. Population density estimates (males/km^2 summer, birds/km^2 winter) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	4.21		1.37			
2003−2008	1.89	1.76	0.68	0.30	1.09	1.47
Rank	73.8	82.7	70.3	65.2	73.2	75.9
Winter						
2001−2003	8.55		5.56			
2003−2009	4.27	7.08	21.30	9.85	14.52	9.09
Rank	60.8	65.4	92.7	66.8	88.1	70.5

TABLE 2. Habitat availability vs. use for individual Brown Creepers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 42, winter n = 99. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.02	3.64	2.26	2.05	2.56	2.08	179.9
$P(U)$	<0.01*	<0.01*	0.87	0.03	0.98	0.03	0.47
Winter use	1.46	2.54	2.13	2.03	2.59	2.22	144.2
$P(U)$	0.09	0.13	0.03	0.03	0.65	0.12	0.04

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	16.7	9.5	23.8	21.4	0.0	28.6
Winter use	34.3	24.2	21.2	9.1	7.1	4.0

TABLE 3. Population densities vs. habitat characteristics for Brown Creepers. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.26	0.23	−0.06	0.04	−0.11	−0.09	0.03
P	<0.01*	<0.01*	0.37	0.57	0.07	0.07	0.14
Winter							
τ	0.01	−0.02	−0.09	−0.04	−0.05	0.03	−0.15
P	0.91	0.78	0.20	0.63	0.44	0.63	0.02

Christmas Counts showed a weak convex U.S. (Kendall's $\tau = -0.34$, $n = 48$, $P = 0.001$, %CV = 13.5) and non-significant New England decline (quadratic $r^2 = 0.06$, df = 47, $P = 0.10$, %CV = 21.0).

Duplicated density estimates for eastern Connecticut showed a 50−55% decline in summer and 50−283% change in winter populations (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found 17.4 ± 20.8 birds/km^2. Elsewhere, breeding densities are reported to be 8.6−105 pairs/km^2 (Hejl et al. 2002). In New Hampshire, 4 ± 7 birds/km^2 are reported (Holmes et al. 1986). Winter densities are 20−42 birds/km^2 in Missouri (Kendrick 2012).

Habitat.- Observations of summer habitat use by individual Brown Creepers demonstrated that birds occupied forests more coniferous than would be predicted from habitat availability. They were present particularly in conifer-deciduous and mixed associations. Winter observations showed no differences with habitat availability, although like many permanent residents they tended to occupy lower elevation forests at this season (Table 2). Comparison of population densities with habitat features showed a significant summer relationship with increasing coniferous cover and a tendency to occupy lower elevation habitats in winter (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed that birds used forests with less conifer cover in winter than in summer (Nagelkerke $r^2 = 0.17$, % correctly classified = 73.8, $n = 141$, $P < 0.001$). Elsewhere, the species is reported to prefer mature, primarily coniferous forest, although it also is present in deciduous forest in the Northeast. (Hejl et al. 2002).

History.- Neither Sage et al. (1913) nor Howe and Sturtevant (1899) reported breeding Brown Creepers in Connecticut or Rhode Island, although both described them as fairly common in winter. The species has increased as a Connecticut breeder since the 19th century (Zeranski and Baptist 1990) and was first confirmed nesting in Rhode Island in 1959 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the Brown Creeper was a definite or probable breeder at 23.4% of survey blocks throughout Massachusetts (Blodget 2003c). In the 1980s, it was definite or probable at 30.2% of blocks mostly in more mountainous portions of northern Connecticut (Devine and Smith 1994b). It was also definite or probable at 11.5% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, breeders increased to 33.0% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Breeding populations of the northerly distributed Brown Creeper appear generally greatest in northern Connecticut. However, interpretation of regional patterns is problematic because considerable variation occurs in annual density estimates. Moreover, population swings are typical for species at their southern range limit (Thompson and Nolan 1973, Marti 1997).

Breeding densities reported here are lower than those in the heart of the species' range, as is typical for many species (Sauer et al. 2014), and winter densities are also lower than those reported for elsewhere. Furthermore, densities are far below those reported by Craig (1987) for northeastern Connecticut, where the Brown Creeper is much less common now than in the 1980s (R. Craig pers. obs.). This latter fact illustrates further that population fluctuations routinely occur at the southern edge of a breeding range.

Despite being unable to compare directly seasonal shifts in densities, the great seasonal difference observed indicates that populations are greatest in winter. Indeed, populations have been historically known to increase in winter and are otherwise reported to increase to the south during winter (Hejl et al. 2002).

The summer association of birds with more coniferous forests is consistent with other reports of habitat use. Notably, however, this association disappears in winter. The winter trend toward inhabiting lower elevations is similarly noted for other permanent residents and likely relates to species seeking less energetically expensive landscapes at this season (Craig and Klaver 2013).

Conservation.- Breeding Bird Survey, Christmas Count, data from Craig (1987) and duplicated eastern Connecticut data suggest that Brown Creeper populations are at least weakly declining regionally. Massachusetts Breeding Bird Atlas data contradict these trends, although the frequency with which atlas data show species increases suggests that intensity of observer effort may be a confounding variable in assessing Massachusetts population trends.

Sponsored by Juan and Diane Sanchez

HOUSE WREN

Troglodytes aedon

Summer

Density (males/km^2): 0.67 (n = 47, 95% CI: ± 0.36)
CT: 0.77
RI: 0.21

Population (males): 6,125 (95% CI: ± 3,273)
CT: 5,789
RI: 336

Density.- The House Wren appeared on 18% of summer transects, with population estimates based on detections of singing males. Population estimates rely on <60 detections, so have reduced accuracy, although my computed detectability function fit data well. Summer densities in principally forested landscapes averaged greatest in central and southwestern Connecticut and least in northwestern Connecticut and Rhode Island (Table 1).

Population variance.- Breeding Bird Survey data showed a weak, linear increase in U.S. populations (trend = 0.15, n = 2457, %CV = 5.9; linear $r^2 = 0.53$, n = 48, $P < 0.001$) but a concave decline in Northeastern populations (trend = −0.85, n = 133, %CV = 12.9; Kendall's $\tau = -0.87$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 21−62% change between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) reported 7.1 birds/km^2. Elsewhere, an average of 30.3 pairs/km^2 has been found in isolated Illinois woodlots (Johnson 1998).

Habitat.- Individual House Wrens appeared to use more deciduous, particularly mixed hardwood forests that were more mesic, open and low elevation than would be predicted from habitat availability. Insufficient data existed to evaluate population responses to habitat variables.

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.84		0.57			
2003−2008	0.32	0.29	0.69	1.83	0.88	0.21

TABLE 2. Habitat availability vs. use for individual House Wrens. n = 22. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.09	2.05	2.11	2.00	2.00	2.41	121.1

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	31.8	54.5	4.5	4.5	0.0	4.5

Elsewhere in the East, the species is reported to inhabit forest edge, forest fragments and open woodland, such as wooded swamps and disturbed forest. It is generally not found in extensive forests, except in areas opened through disturbance. It also inhabits residential and agricultural areas (Johnson 1998).

History.- Sage et al. (1913) described the House Wren as common in Connecticut in the early 19th century but declining by the late 19th century. Similarly, Howe and Sturtevant (1899) thought it formerly common but to occur only locally by the close of the 19th century. During the early 20th century, it appears to have again increased (Sage et al. 1913, Smith and Devine 1994l).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 73.7% of survey blocks throughout Massachusetts (Berry 2003b). In the 1980s, it was definite or probable at 87.1% of blocks throughout Connecticut (Smith and Devine 1994l). It was also definite or probable at 73.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders remained essentially stable at 73.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Although common outside of forest, the House Wren is uncommon to absent in the forests of southern New England. Densities reported here for forest habitat are much lower than those from more optimal habitats. The species appears to reach its greatest densities in the more fragmented landscapes of central and southwestern Connecticut.

My observation that the House Wren appears associated with moister, more open forests is consistent with evidence from elsewhere. Its apparent association with more deciduous, lower elevation habitats is unreported, however.

Conservation.- Breeding Bird Survey data show that the House Wren is declining regionally, a trend corroborated by comparison of my results with earlier transect studies of Craig (1987). The maturing forests of Connecticut (Ward and Barsky 2000) are likely responsible for any decline, because forest maturation eliminates the more open habitats occupied by the species. Massachusetts breeding bird atlases contrast with these observations, however.

WINTER WREN
Troglodytes hiemalis

Summer

Density (males/km^2): 0.40 ($n = 44$, 95% CI: ± 0.15)
CT: 0.49
RI: 0.00

Population (males): 3,673 (95% CI: ± 1,356)
CT: 3,673
RI: 0

Winter

Density (birds/km^2): 0.38 ($n = 23$, 95% CI: ± 0.21)
CT: 0.37
RI: 0.44

Population (birds): 3,506 (95% CI: ± 1,921)
CT: 2,804
RI: 702

Density.- The Winter Wren appeared on 19% of summer and 14% of winter transects. Summer population estimates are based on detections of singing males, whereas winter estimates are based on those of vocalizing males and females. Estimates use <60 detections, so have reduced accuracy.

Summer densities averaged greatest in more mountainous, northern regions and least in southern locations. Winter densities, in contrast, averaged greatest in southern locations (Table 1). Densities appeared greater in summer than winter but were not statistically testable because samples were small and seasonal differences existed in method of estimation.

Population variance.- Breeding Bird Survey data showed a convex increase in U.S. populations (trend = 0.91, $n = 404$, %CV = 26.6; power function $r^2 = 0.32$, df = 47, $P < 0.001$). Northeastern populations, in contrast, showed a nonsignificant decline (trend = −0.01, $n = 26$, %CV = 12.6; Kendall's $\tau = -0.17$, $n = 48$, $P = 0.13$). Christmas Count data were insufficient for conducting analyses.

TABLE 1. Population density estimates (males/km^2 summer, birds/km^2 winter) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.99		0.23			
2003−2008	0.28	0.72	0.23	0.31	0.44	0.00
Winter						
2001−2002	0.74		0.64			
2003−2008	0.15	0.00	0.96	0.64	0.15	0.44

TABLE 2. Habitat availability vs. use for individual Winter Wrens. Summer $n = 16$, winter $n = 17$. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.19	4.00	1.97	2.14	2.44	1.72	266.6
Winter use	1.59	2.82	1.91	2.06	2.56	2.12	112.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	6.3	18.8	31.3	0.0	0.0	43.8
Winter use	29.4	17.6	35.3	0.0	11.8	5.9

Duplicated density estimates for eastern Connecticut showed a 0−72% decline in summer populations and a 50−80% change in winter populations (Table 1). On summer line transects through northeastern

Connecticut, Craig (1987) found 2.8 birds/km^2. Elsewhere, breeding densities are reported as 5−57.5 pairs/km^2 (Hejl et al. 2002).

Habitat.- Individual summering Winter Wrens appeared to use more coniferous and mixed cover forests that were more mesic, open-understoried, mature and higher elevation than would be predicted from habitat availability. In winter, birds also appeared to choose habitats that were more mesic and coniferous. Moreover, birds appeared to shift seasonally from sites of higher to lower elevation.

Elsewhere, the species is reported to occupy a variety of habitats, although coniferous forests achieve highest population densities. Wetlands are frequently preferred, as is old growth with abundant fallen logs. Denser understories associated with small forest openings are also used (Hejl et al. 2002).

History.- Sage et al. (1913) described the Winter Wren from only one Connecticut summer location and also reported few winter records. Howe and Sturtevant (1899) knew the species as only a rare Rhode Island winter resident. The species has increased as a Connecticut breeder since the 19th century (Zeranski and Baptist 1990) and first appeared breeding in Rhode Island in 1908 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 11.7% of primarily western Massachusetts survey blocks (McClellan 2003). In the 1980s, it was definite or probable at 5.4% of blocks mostly in northernwestern Connecticut (Ellison 1994a). It was present at only one possible block in western Rhode Island (Enser 1992). By the 2000s, breeders increased to 21.1% of blocks, still primarily in northwestern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Winter Wren is a rather rare summer and winter resident of southern New England, with densities far lower than those reported for elsewhere. The presence of greater numbers of summering birds in northern Connecticut is supported by breeding bird atlas data and is to be expected for this northerly-distributed species (Hejl et al. 2002). Greater winter density but lower overall populations in lower elevation, southern areas appears related to the species' occurrence primarily in the Southeast during this season (Hejl et al. 2002).

My observation that birds are associated with more coniferous, mature, mesic habitats is consistent with other reports of habitat use. My finding that birds use more open understories in summer is contrary to other reports, however.

Conservation.- Breeding Bird Survey, duplicated eastern Connecticut data and data from Craig (1987) indicate that Winter Wren populations may have declined at least in summer in southern New England. Indeed, forest fragmentation and loss of hemlock due to disease are potential threats to long-term population stability. Contrary data from Massachusetts breeding bird atlases suggest that such atlas data may be too confounded with survey effort to represent accurately population trends.

CAROLINA WREN

Thryothorus ludovicianus

Summer

Density (males/km^2): 1.17 (n = 122, 95% CI: ± 0.31)
CT: 1.23
RI: 0.85
Population (males): 10,647 (95% CI: ± 2,747)
CT: 9,287
RI: 1,360

Winter

Density (birds/km^2): 0.64 (n = 92, 95% CI: ± 0.28)
CT: 0.73
RI: 0.21
Population (birds): 5,837 (95% CI: ± 2,520)
CT: 5,507
RI: 330

Density.- The Carolina Wren appeared on 38% of summer and 33% of winter transects. Summer population estimates are based on detections of singing males, whereas winter estimates are based on those of vocalizing males and females.

Summer densities in principally forested landscapes averaged greatest in southern and low elevation regions and least in northern areas (Kruskal-Wallis χ^2 = 41.6, n = 147, P < 0.001). Winter densities also averaged greatest in southern and low elevation regions and least in northern areas (Kruskal-Wallis χ^2 = 26.0, n = 147, P <0.001; Table 1). Because methods for assessing populations differed between seasons, I did not assess seasonal change in density, although density appeared to drop substantially in winter.

Population variance.- Breeding Bird Survey data showed a cyclicly variable increase in U.S. populations (trend = 1.35, n = 1755, %CV = 20.3; quadratic r^2 = 0.72, df = 47, P < 0.001). Northeastern populations showed a stronger but also variable increase

TABLE 1. Population density estimates (males/km^2 summer, birds/km^2 winter) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.28		3.47			
2003−2008	0.00	0.00	0.69	2.47	2.07	0.85
Rank	53.5	53.5	74.1	97.5	97.5	75.9
Winter						
2001−2003	0.21		0.96			
2003−2009	0.10	0.10	1.24	0.75	1.67	0.21
Rank	61.6	61.0	84.9	79.8	95.8	64.6

TABLE 2. Habitat availability vs. use for individual Carolina Wrens. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 54, winter n = 37. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.33	2.56	2.21	1.97	2.35	2.38	83.2
$P(U)$	0.60	0.41	0.55	0.96	0.02	0.30	<0.01*
Winter use							
	1.14	2.22	1.96	1.95	2.22	2.35	69.0
$P(U)$	0.03	0.97	<0.01*	0.10	<0.01*	0.76	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	35.2	33.3	9.3	7.4	7.4	7.4
Winter use	32.4	48.6	8.1	2.7	0.0	8.1

TABLE 3. Population densities vs. habitat characteristics for Carolina Wrens. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.22	0.05	−0.11	0.07	−0.13	0.05	−0.36
P	<0.01*	0.43	0.11	0.37	0.06	0.47	<0.01*
Winter							
τ	−0.20	0.06	−0.20	0.03	−0.09	0.02	−0.34
P	<0.01*	0.15	<0.01*	0.73	0.19	0.81	<0.01*

that had cycles of 5−15 years (trend = 4.16, n = 129, %CV = 50.8; quadratic r^2 = 0.59, df = 47, P < 0.001). Christmas Counts showed a similarly cyclic U.S. (quadratic r^2 = 0.60, df00 = 47, P < 0.001, %CV = 32.7) and New England increase (Kendall's τ = 0.82, n = 48, P < 0.001, %CV = 90.4).

Duplicated density estimates for eastern Connecticut showed a 80−100% decline in summer and a 29−52% change in winter (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) found no birds. Elsewhere, 64.2−148.3 summering birds/km^2 have been reported in Arkansas (Beddall 1963) and 8−120 wintering birds/km^2 have been reported in Missouri (Kendrick 2012).

Habitat.- Summer observations of individual Carolina Wrens demonstrated that they inhabited lower elevation forests and also suggested that birds occupied forests with lower canopy cover than would be predicted from habitat availability. In winter, individuals were associated with lower elevation forests that were more mesic and open than availability would predict (Table 2). Population data indicated that birds inhabited more deciduous, lower elevation forests in summer and winter, although birds also used more mesic sites in winter (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed that they used more mesic forests in winter than summer (Nagelkerke r^2 = 0.09, % correctly classified = 61.5, n = 91, P = 0.01).

Elsewhere, the Carolina Wren is reported to occupy a variety of habitats, particularly ones with dense understories. More mesic sites appeared to be preferred. The species also inhabits residential areas with trees and shrubs (Haggerty and Morton 1995).

History.- The Carolina Wren was known to Sage et al. (1913) as a rare, erraticly-occurring, primarily coastal Connecticut resident. It was also thought to be a rare, primarily coastal Rhode Island resident (Howe and Sturtevant 1899). It has increased as a Connecticut breeder since the 19th century (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 5.4% of primarily southeastern Massachusetts survey blocks (Emerson 2003). In the 1980s, it was definite or probable at 21.1% of blocks mostly in southern Connecticut (Devine and Smith 1994c). It was also definite or probable at 29.1% of mostly southeastern Rhode Island blocks (Enser 1992). By the 2000s, breeders dramatically increased to 53.1% of primarily eastern Massachusetts blocks (Walsh and Peterson 2013).

Synthesis.- The Carolina Wren is an uncommon to locally common species that, despite the considerable annual fluctuation in numbers that I found, typically appears to reach its highest densities near the coast year round. This distribution is corroborated by breeding bird atlases. Population densities here, near its northern range limit, are much lower than those reported for the species in the heart of its range—a phenomenon typical for many species (Sauer et al. 2014).

The population decline that appears to occur from summer to winter in this supposedly non-migratory species may be a consequence of extensive winter mortality (Haggerty and Morton 1995). However, undetected migration from the northern periphery of the range also may occur after the breeding season. Supporting evidence for possible migration is that in northeastern Connecticut, R. Craig (pers. obs.) has repeatedly observed that birds disappear from breeding sites each fall and re-appear at the same sites in spring.

The observed asociation of birds with more open canopy forest and, at least in winter, more mesic habitats, is consistent with other reports of habitat use. Occurrence at lower elevations appears related to being near the species' northern range limit.

Conservation.- Breeding Bird Survey and Christmas Count data suggest that Carolina Wren populations are increasing in southern New England and continentally. However, populations have historically fluctuated in Connecticut due to winter conditions at this, its northern range limit (Sage et al. 1913, Haggerty and Morton 1995). Indeed, during this study, populations declined during three of four duplicated surveys in eastern Connecticut.

BLUE-GRAY GNATCATCHER
Polioptila caerulea

Summer

Density (birds/km^2): 11.56 (*n* = 340, 95% CI: ± 2.01)
CT: 11.47
RI: 12.00

Population (birds): 105,396 (95% CI: ± 18,349)
CT: 86,304
RI: 19,092

Density.- The Blue-gray Gnatcatcher appeared on 68% of summer transects, with population estimates based on detections of vocalizing males and females. Density of this southerly-distributed species was greatest in southeastern Connecticut and least in central Connecticut (Kruskal-Wallis χ^2 = 11.7, *n* = 147, *P* = 0.039; Table 1).

Population variance.- Breeding Bird Survey data showed a weak concave increase in U.S. populations (trend = 0.39, *n* = 2154, %CV = 9.1; Kendall's τ = 0.67, *n* = 48, *P* < 0.001) and a stronger concave increase in Northeastern populations (trend = 1.70, *n* = 110, %CV = 29.6; Kendall's τ = 0.82, *n* = 48, *P* < 0.001).

Duplicated density estimates for eastern Connecticut showed a 9−34% decline between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) reported 7.1 birds/km^2. Ellison (1994b) reviewed plot studies showing densities ranging from 10−11 birds/km^2 for Connecticut. In the southeastern U.S., populations to 331 pairs/km^2 have been found (Ellison 1992).

Habitat.- Data from individual Blue-gray Gnatcatchers showed that they inhabited lower elevation forests that were more deciduous than would be predicted from habitat availability (Table 2). Birds also tended to use more mesic locations. In contrast, population densities showed no strong relationship with forest type or moisture, although they were also greater in lower elevation forests (Table 3).

TABLE 1. Summer population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2003	16.47		17.54			
2003−2009	10.89	9.33	16.03	10.89	7.26	12.00
Rank	73.0	68.8	95.3	70.8	57.1	79.4

TABLE 2. Habitat availability vs. use for individual Blue-gray Gnatcatchers. *P*(*U*) = probability level of mmMann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 306. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.22	2.04	2.17	1.98	2.56	2.40	137.2
P(*U*)	<0.01*	0.02	0.02	0.78	0.84	0.19	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	49.0	27.1	11.4	6.5	1.0	4.9

Elsewhere, the species is reported to occupy a broad range of habitats from shrublands to mature forest. It is present in

TABLE 3. Summer population densities vs. habitat characteristics for Blue-gray Gnatcatchers. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.09	−0.06	−0.02	−0.03	−0.01	0.07	−0.21
P	0.17	0.31	0.75	0.72	0.87	0.22	<0.01*

deciduous and pine-oak forests, swamps, riparian habitats, and upland forests. More mesic habitats appear to be preferred (Ellison 1992). It also occupies even agricultural and garden landscapes in southern New England as long as some trees are present (R. Craig pers. obs.).

History.- Sage et al. (1913) described the Blue-gray Gnatcatcher as a rare summer visitor to Connecticut. Its first recorded nesting attempt there was in 1947 (Zeranski and Baptist 1990). Similarly, Howe and Sturtevant (1899) thought it a casual summer visitor to Rhode Island, where it first nested in 1961 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 7.1% of survey blocks throughout Massachusetts (Coyle 2003). In the 1980s, it was definite or probable at 33.2 Connecticut blocks mostly outside of the Connecticut River valley (Ellison 1994b). It was also definite or probable at 20.0% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, breeders increased to 22.3% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Blue-gray Gnatcatcher is a fairly common breeder in the forests of southern New England. Computed population densities are greater than those of earlier transect estimates of Craig (1987) but like those reported for elsewhere in the Northeast. Although significant differences exist among regions, the population variance found for duplicated eastern Connecticut data, although limited, appears great enough to suggest that these differences be interpreted with caution. However, like Ellison (1994b), I found lowest densities in the highly fragmented forests of central Connecticut.

Evidence for the Blue-gray Gnatcatcher inhabiting forests more deciduous and moist than those available is consistent with other reports of habitat use. The species' presence in lower elevation forests likely relates to its more southerly distribution and to its approaching its northern range limit in southern New England.

Conservation.- Breeding Bird Survey, Massachusetts breeding bird atlases and earlier data of Craig (1987) indicate that populations are increasing. However, duplicated eastern Connecticut data do not provide additional support. Forest fragmentation may not be a long-term threat to the species' continued expansion in this region, as it also occupies habitats with even limited tree growth.

GOLDEN-CROWNED KINGLET

Regulus satrapa

Winter

Density (birds/km^2): 29.83 (n = 362, 95% CI: ± 4.64)
CT: 22.16
RI: 66.12

Population (birds): 271,918 (95% CI: ± 3,273)
CT: 166,763
RI: 105,155

Density.-The Golden-crowned Kinglet appeared on 80% of winter transects. Winter population estimates are based on the occurrence of vocalizing flocks of males and females. This northerly-distributed species also appeared once in summer on a northwestern Connecticut transect, although I make no summer estimate for it. Winter density was greatest in Rhode Island and least in southwestern Connecticut (Kruskal-Wallis χ^2 = 23.38, n = 147, P < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −2.68, n = 594, %CV = 37.9; power function r^2 = 0.97, df = 47, P < 0.001) although insufficient data were available to compute trends in Northeastern populations. Christmas Counts showed cyclic U.S. (power function r^2 = 0.23, df = 47, P = 0.001, %CV = 27.8) and New England increases (power function r^2 = 0.24, df = 47, P < 0.001, %CV = 50.9).

Duplicated density estimates for eastern Connecticut showed a 24−56% change in winter populations (Table 1). Elsewhere, winter densities have been reported to be 10.3−70.0 birds/km^2 (Ingold and Galati 1997).

TABLE 1. Winter population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001-2003	43.07		10.51			
2003-2009	32.76	24.22	16.43	9.64	20.82	66.12
Rank	84.4	71.1	55.0	40.9	62.2	119.6

TABLE 2. Habitat availability vs. use for individual Golden-crowned Kinglets. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 367. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.63	2.88	2.34	1.98	2.60	2.38	162.7
$P(U)$	<0.01*	<0.01*	0.03	0.51	0.28	0.24	0.66

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	36.5	12.8	17.4	14.4	15.5	3.3

A major influx of Golden-crowned Kinglets occurred during the winter of 2001−2002. During those years, the species was the region's most abundant, ubiquitous wintering species. Based on qualitative resurvey of several of the same sites the following winter, this influx was not repeated. Another major incursion occurred during the winter of 2003−2004. In other winters, particularly that of 2007−2008, birds

TABLE 3. Winter population densities vs. habitat characteristics for Golden-crowned Kinglets. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.36	0.27	0.21	−0.11	0.04	0.12	−0.09
P	<0.01*	<0.01*	<0.01*	0.11	0.52	0.06	0.15

appeared to be comparatively infrequent throughout the study area.

Habitat.- Observations of habitat use by individual Golden-crowned Kinglets showed that they used forests more coniferous than would be predicted from habitat availability. They also tended to inhabit more mesic locations (Table 2). Moreover, population densities were significantly greater in more coniferous, mesic forests (Table 3). My one observation of a summering bird occurred in mesic, mature conifer-hardwood forest.

Elsewhere, breeding birds are known to tolerate a variety of conditions, including coniferous, mixed and deciduous forests, open to closed forests and forests with dense to open understories. However, the species is most typical of coniferous forests. In winter, it also uses varied habitats, including ones like those used during the breeding season (Ingold and Galati 1997).

History.- The Golden-crowned Kinglet was unknown to Sage et al. (1913) as a Connecticut breeder, although they described it as a fairly common winter resident. It was similarly described as a common Rhode Island winter resident (Howe and Sturtevant 1899). It was first reported breeding in western Connecticut in 1934 and in eastern Connecticut in 1974 (Clark 1994v). Nesting has been suspected in Rhode Island since the 1960s (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 3.0% of primarily western Massachusetts survey blocks (Anderson 2003a). In the 1980s, it was definite or probable at 1.0% of blocks mostly in western Connecticut (Clark 1994v). Remarkably, it was also definite or probable at 1.2% of blocks in Rhode Island (Enser 1992). By the 2000s, breeders increased to 4.7% of blocks, still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Golden-crowned Kinglet is extremely rare in summer but common albeit variably occurring in winter. Winter densities found are within the range reported for elsewhere, but the species' variable winter occurrence, as noted in qualitative observations, duplicated eastern Connecticut data and Christmas Count data, makes population differences found among regions likely due in large part to this variability.

Despite its variabile occurrence, an association with coniferous forest at all scales examined suggests that regions with greater coniferous cover should host larger winter populations. Indeed, northern Connecticut and Rhode Island have higher conifer cover than other regions and contain the largest populations recorded during the study period.

My observations of a winter association with more coniferous forests are consistent with other reports. The association with more mesic habitats also appears to be typical for the species.

Conservation.- The Golden-crowned Kinglet is a rare breeder in southern New England. Historical evidence and data from Massachusetts breeding bird atlases suggest that populations have increased, but Breeding Bird Survey data indicate that populations have declined over the past 40 years. Hence, it is unclear what may be expected for future population trends in this region.

Winter numbers of this northerly-distributed species are characteristically variable and likely related to the state of conditions in its breeding range, which may or may not drive individuals south after the breeding season. However, populations appear to be generally increasing, so I expect that the Golden-crowned Kinglet will continue to be a common winter resident.

EASTERN BLUEBIRD

Sialia sialis

Summer

Density (birds/km^2): 0.35 (n = 77 pooled, 95% CI: ± 0.23)
CT: 0.35
RI: 0.33

Population (birds): 3,149 (95% CI: ± 2,126)
CT: 2,629
RI: 520

Winter

Density (birds/km^2): 0.74 (n = 77 pooled, 95% CI: ± 0.30)
CT: 0.76
RI: 0.65

Population (birds): 6,752 (95% CI: ± 2,773)
CT: 5,713
RI: 1,039

Density.- The Eastern Bluebird appeared on 12% of summer and 25% of winter transects. Although I detected singing males even outside the breeding season, I found that the frequent call notes made by family groups and winter flocks made males and females similarly detectable. Hence, population estimates are based on detections of flocks of vocalizing males and females.

Summer densities in principally forested landscapes averaged slightly greater in lowland and southern locations. Winter densities showed little pattern, however (Table 1). Although populations appeared to grow substantially from summer to winter, samples were insufficient for performing statistical tests. Duplicated density estimates for eastern Connecticut showed a 51−100% summer increase and 28−38% winter change between sampling periods (Table 1).

TABLE 1. Population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	0.11		0.35			
2003−2008	0.22	0.20	0.71	0.63	0.34	0.33
Winter						
2001−2003	0.87		0.83			
2003−2009	0.54	0.61	1.06	0.63	0.91	0.65

TABLE 2. Habitat availability vs. use for individual Eastern Bluebirds. Summer n = 16, winter n = 25. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.37	2.31	2.19	1.97	2.22	1.75	160.0
Winter use	1.24	2.76	2.02	2.08	2.48	2.06	147.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	43.8	12.5	31.3	6.3	0.0	6.3
Winter use	20.0	48.0	12.0	4.0	4.0	12.0

Population variance.- Breeding Bird Survey data showed a concave increase in U.S. populations (trend = 1.92, n = 2305, %CV = 32.2; quadratic r^2 = 0.72, df = 47, P < 0.001). Northeastern populations showed a similar concave increase (trend = 4.76, n = 118, %CV = 67.0; quadratic r^2 = 0.59, df =47, P < 0.001). Christmas Counts showed a weakly convex U.S. (quadratic r^2 = 0.60, df = 47, P < 0.001, %CV = 48.0) and concave New England increase (Kendall's τ = 0.82, n = 48, P < 0.001, %CV = 79.0).

On summer line transects through northeastern Connecticut, Craig (1987) reported no birds. Elsewhere, 0−6 pairs/km^2 have been reported in Connecticut (Curtis 1986) and 2−5 winter birds/km^2 have been reported in Missouri (Kendrick 2012).

Habitat.- In summer, the Eastern Bluebird tended to occupy more open, lower elevation forests with open understories. In winter, it occurred in more deciduous, particularly mixed hardwood forests, but also in more heterogeneous habitats (more than one cover type) that were more mesic, low elevation and with open understories (Table 2). Elsewhere, it uses orchards, clear-cuts, open, swampy habitats, savannah and xeric forest openings at ridge tops (Gowaty and Plissner 1998).

History.- In Connecticut, the Eastern Bluebird was reported by Sage et al. (1913) to be abundant in summer and common in winter. In Rhode Island, Howe and Sturtevant (1899) described it as common in summer and occasional in winter. During the 20th century, populations declined although more recently they have increased (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 21.6% of survey blocks particularly in central and western Massachusetts (Files 2003). In the 1980s, it was definite or probable at 43.6% of Connecticut blocks mostly outside of the Connecticut River valley (Clark 1994w). It was also definite or probable at 21.8% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, definite or probable occurrences increased to 59.1% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Eastern Bluebird is largely a species of more open landscapes, so it is an uncommon resident of forested environments. Not surprisingly, densities in such habitats are at the lower end of those reported for more typical habitats. The species shows little clear pattern in regional distribution in either summer or winter and its low population densities likely contribute to the variable annual occurrence observed in duplicated eastern Connecticut data.

As with some other permanent resident species, winter populations appear greater than those of summer. A seasonal increase is likely driven by migration of northern individuals into the study area, as populations north of southern New England are largely migratory (Gowaty and Plissner 1998). The strong, long term increase in winter populations demonstrated by Christmas count data also indicates that winter populations are now substantial in this region.

My limited observations of habitat use are consistent with reports from elsewhere in that the species predominates in more open habitats. My findings of a year-round association with lower elevations and open understories are unreported.

Conservation.- Breeding Bird Survey, Christmas Count and Massachusetts breeding bird atlases indicate that populations are increasing in southern New England. This increase is occurring despite the maturation of regional forests (Ward and Barsky 2000), which might be expected to affect populations negatively.

Sponsored by Ron and Gwenyth Tillen

VEERY

Catharus fuscescens

Summer

Density (males/km^2): 24.04 (n = 1,457, 95% CI: ± 2.10)
CT: 24.25
RI: 23.07

Population (males): 219,139 (95% CI: ± 19,199)
CT: 182,446
RI: 36,693

Density.- The Veery appeared on 93% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northern, more mountainous regions and least in lowlands (Kruskal-Wallis $\chi^2 = 39.7$, $n = 147$, $P < 0.001$; Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −1.86, $n = 874$, %CV = 25.6; power function $r^2 = 0.99$, df = 47, $P < 0.001$). Northeastern populations showed a less steep concave decline (trend = −0.95, $n = 63$, %CV = 12.9; Kendall's $\tau = -0.77$, $n = 48$, $P < 0.001$). Duplicated density estimates for eastern Connecticut showed a 27−30% increase between sampling periods, however (Table 1).

On summer line transects through northeastern Connecticut, Craig (1987) reported 71.3 ± 38.3 birds/km^2. Earlier plot studies in Connecticut have shown densities ranging from 95.0 to 247.0 birds/km^2 (Craig 1987), whereas plot studies in New Hampshire have shown densities of 23 ± 11 birds/km^2 (Holmes et al. 1986).

Habitat.- Observations of habitat use by individual Veeries showed that they inhabited higher elevation forests that were more moist than would be predicted from habitat availability (Table 2). Moreover, birds tended to inhabit forests with denser understories. Population densities were also greater at sites with greater understory density and elevation as well as at sites with more coniferous forests, and tended to be greater at more mesic sites (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	25.09		18.44			
2003−2008	31.77	36.53	23.90	15.30	15.34	23.07
Rank	115.2	146.2	87.2	66.8	65.8	94.6

TABLE 2. Habitat availability vs. use for individual Veeries. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 987. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.40	2.46	2.18	1.99	2.59	2.40	185.5
P(*U*)	0.18	0.25	<0.01*	0.38	0.24	0.05	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	41.0	21.3	18.8	6.6	5.9	6.2

The species is typically reported to inhabit moist, deciduous forest, particularly disturbed and second growth forest. It prefers denser understory in disturbed for-

TABLE 3. Population densities vs. habitat characteristics for Veeries. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.15	0.11	−0.11	0.06	−0.08	0.19	0.21
P	0.01*	0.05	0.06	0.35	0.17	<0.01*	<0.01*

ests. In mature forest, moisture is thought to be the key feature in habitat selection (Moskoff 1995).

History.- The Veery was described as a common Connecticut (Sage et al. (1913) and an abundant Rhode Island breeder (Howe and Sturtevant 1899). Zeranski and Baptist (1990) speculated that it had increased during the 20th century with the regrowth of forest.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 55.7% of survey blocks particularly in western Massachusetts (Landry 2003). In the 1980s, it was definite or probable at 66.9% of blocks throughout Connecticut (Bertin 1994a). It was also definite or probable at 53.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 60.8% of blocks in Massachusetts away from Cape Cod (Walsh and Peterson 2013).

Synthesis.- The Veery is a common to abundant breeder in the forests of southern New England. The species' greater density in northern portions of the study area, even considering annual variation in duplicated eastern Connecticut data, is not surprising given its northerly distribution (Moskoff 1995). Declining densities toward range limits are typical for many species (Brown 1984, Pulliam 1988). Otherwise, densities found here are below those reported in previous Connecticut plot studies, although they are similar to values reported for New Hampshire.

The association of the Veery with more mesic locations and greater understory density is consistent with reports from elsewhere. Moreover, the tendency of birds to inhabit higher elevations is expected in light of the species' northerly distribution. The tendency of populations to be greater in locations with greater conifer cover is unreported, but fits with the species' northerly distribution because conifer forests are more common to the north. I found no evidence for an affiliation of birds with younger forests even though others have reported such a preference.

Conservation.- Based on the Breeding Bird Survey and data of Craig (1987), Veery populations appear to be undergoing a long term decline, although Massachusetts breeding bird atlases and duplicated data from eastern Connecticut contradict this trend. If younger forest is indeed the preferred habitat of the species, then forest maturation of the type occurring in southern New England (Ward and Barsky 2000) might be driving a decline. However, such a decline may not be universal across the region.

HERMIT THRUSH

Catharus guttatus

Summer

Density (males/km^2): 1.57 (n = 288, 95% CI: ± 0.34)
CT: 1.42
RI: 2.29

Population (males): 14,303 (95% CI: ± 3,085)
CT: 10,662
RI: 3,641

Density.- The Hermit Thrush appeared on 57% of summer and 6% of winter transects. Summer population estimates are based on detections of singing males. Densities averaged greatest in northern, more mountainous regions and least in lowlands, although they were also frequent in the xeric, conifer-dominated forests of Rhode Island (Kruskal-Wallis χ^2 = 60.3, n = 147, P < 0.001; Table 1).

The species appeared in winter primarily at more southern locations. From my few observations, I tentatively estimate a winter density of 0.82 birds/km^2 and total population of 7474. Although I detected birds infrequently at this season, they were present at close range, which led to this comparatively high density estimate.

Population variance.- Breeding Bird Survey data showed a nominal concave decline in U.S. populations (trend = −0.15, n = 949, %CV = 4.8; quadratic r^2 = 0.08, df = 47, P = 0.05). Northeastern populations showed a steeper, nearly linear decline (trend = −3.49, n = 44, %CV = 43.7; Kendall's τ = −0.79, n = 48, P < 0.001). Christmas Counts, in contrast, showed a convex U.S. increase that leveled off about 2000 (power function r^2 = 0.43, df = 47, P < 0.001, %CV = 27.9) and a linear New England increase (Kendall's τ = 0.52, n = 48, P < 0.001, %CV = 64.0).

Duplicated density estimates for eastern Connecticut showed a 16−31% change between sampling periods (Table 1). On summer line transects through northeastern Connecticut, Craig (1987) reported 6.1 birds/

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	2.21		0.29			
2003−2008	1.86	3.50	0.38	0.39	0.16	2.29
Rank	80.8	112.4	46.5	56.8	45.3	92.9

TABLE 2. Habitat availability vs. use for individual Hermit Thrushes. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. summer n = 88, winter n = 9. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.63	2.58	2.44	1.99	2.62	2.28	255.2
$P(U)$	<0.01*	0.14	<0.01*	0.36	0.30	0.36	<0.01*
Winter use	1.33	2.22	2.00	1.89	2.22	2.67	79.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	40.9	5.7	31.8	10.2	10.2	1.1
Winter use	22.2	44.4	22.2	11.1	0.0	0.0

TABLE 3. Summer population densities vs. habitat characteristics for Hermit Thrushes. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.32	0.17	0.15	0.04	0.03	0.04	0.39
P	<0.01*	<0.01*	0.02	0.58	0.66	0.50	<0.01*

km^2. Elsewhere, density estimates are 7−63 pairs/km^2 (Jones and Donovan 1996).

Habitat.- Data from individual Hermit Thrushes demonstrated that birds were associated with more coniferous, xeric, higher elevation forests than would be predicted from habitat availability (Table 2). Population densities also were greater in higher elevation, more coniferous, particularly pine-oak forests that tended to be more xeric. In winter, birds appeared to move to more deciduous, particularly mixed hardwood associations and mesic, more open-canopied forests that had denser understories (Table 3).

The species is reported to inhabit a variety of northern forest types in summer, but particularly drier forests and areas of interior forest edge. Coniferous and mixed forests are most frequently occupied (Jones and Donovan 1996).

History.- The Hermit Thrush appears to have first ranged south into Connecticut in the late 19th century (Zeranski and Baptist 1990), although Sage et al. (1913) reported it as a regular breeder in northwestern Connecticut. Since then, it has been considered an uncommon to locally common breeder of primarily northern Connecticut (Zeranski and Baptist 1990, Proctor 1994a). In Rhode Island, Howe and Sturtevant (1899) knew it only as a migrant. It was not known to breed there until 1900 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 29.6% of survey blocks, particularly in western and southeastern Massachusetts (Nikula 2003). In the 1980s, it was definite or probable at 23.2% of blocks primarily in more mountainous portions of northern Connecticut (Proctor 1994a). It was also definite or probable at 23.6% of mostly western Rhode Island blocks (Enser 1992). By the 2000s, breeders increased to 44.3% of blocks still primarily in western and southeastern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Hermit Thrush is an uncommon breeder and winter resident of southern New England. Even in light of annual variation in densities documented for eastern Connecticut, summer densities are clearly greatest in northern, more mountainous locations, although birds are also frequent in the xeric, conifer-dominated forests that cover much of Rhode Island. Declining north-south densities for this northerly-distributed bird are typical for species approaching range limits (Brown 1984, Pulliam 1988). Hence, it is not surprising that densities recorded here are below those reported for elsewhere.

Consistent with other reports, breeding birds use habitats that are more coniferous, xeric and high elevation than those available. However, contrary to descriptions from elsewhere, I found no evidence that the species is associated with forest edge. My limited data on habitat use by wintering birds indicate a major summer-winter habitat shift to more deciduous, mesic, open, low elevation locations. These latter observations are among the only available for the species.

Conservation.- Breeding Bird Survey data indicate that populations of the Hermit Thrush are undergoing a long term decline in New England—a trend corroborated by earlier transect data of Craig (1987), although contradicted by data from Massachusetts breeding bird atlases. This contradiction suggests that breeding bird atlas data may be insufficient for judging population trends. Despite any summer decline and as with other overwintering species, winter populations are increasing, perhaps in response to a warming climate.

WOOD THRUSH

Hylocichla mustelina

Summer

Density (males/km^2): 14.32 (n = 1,425, 95% CI: ± 1.48)
CT: 15.83
RI: 7.21

Population (males): 130,545 (95% CI: ± 13,522)
CT: 119,071
RI: 11,474

Density.- The Wood Thrush appeared on 98% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in lowlands and least at higher elevations and in the xeric, conifer-dominated forests of Rhode Island (Kruskal-Wallis $\chi^2 = 51.2$, $n = 147$, $P < 0.001$; Table 1).

Population variance.- Breeding Bird Survey data showed a nearly linear decline in U.S. populations (trend = −2.10, $n = 1926$, %CV = 28.3; Kendall's $\tau = -0.92$, df = 47, $P < 0.001$). Northeastern populations showed a similar, slightly concave decline (trend = −2.84, $n = 134$, %CV = 38.1; Kendall's $\tau = -0.99$, $n = 48$, $P < 0.001$).

Duplicated density estimates for eastern Connecticut demonstrated a 3−12% change between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) reported 1.2 birds/km^2. Elsewhere, densities of 23−150 pairs/km^2 are reported (Roth et al. 1996).

Habitat.- Data from individual Wood Thrushes showed that they inhabited forests significantly more deciduous and moist than would be predicted from habitat availability (Table 1). Similarly, population data showed that the species predominated in forests more mesic and deciduous than those available.

The Wood Thrush is typically reported to inhabit forest interiors and, to a lesser extent, forest edges and parks. It uses deciduous and mixed forests, especially mature, mesic forest (Roth et al. 1996).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	11.31		14.42			
2003−2008	11.01	11.95	16.20	18.05	23.75	7.21
Rank	56.6	63.2	88.2	93.5	112.2	38.6

TABLE 2. Habitat availability vs. use for individual Wood Thrushes. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 575. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.22	2.13	2.11	1.99	2.61	2.30	160.1
$P(U)$	<0.01*	0.13	<0.01*	0.18	0.09	0.34	0.47

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	43.8	30.8	14.4	3.5	1.7	5.7

History.- The Wood Thrush was reported by Sage et al. (1913) to be a common Connecticut breeder. Howe and Sturtevant (1899) also considered it a common in Rhode Island. Zeranski and

TABLE 3. Summer population densities vs. habitat characteristics for Wood Thrushes. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.17	−0.05	−0.25	0.04	0.03	0.04	−0.06
P	<0.01*	0.38	<0.01*	0.58	0.66	0.50	0.34

Baptist (1990) speculated that it increased during the 20th century with the regrowth of forest.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 72.9% of survey blocks throughout Massachusetts (Dowd 2003a). In the 1980s, it was definite or probable at 82.4% of blocks throughout Connecticut (Bertin 1994b). It was also definite or probable at 58.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders decreased to 62.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Wood Thrush is a common breeder in the forests of southern New England. Its predominance in lowlands and its lower densities at higher, northern locations, particularly in light of low annual variation demonstrated by duplicated eastern Connecticut data, is to be expected due to its more southerly distribution. Declining densities toward range limits are typical for many species (Brown 1984, Pulliam 1988).

The Wood Thrush's association with more deciduous, mesic forests is consistent with other reports of habitat use. Its comparative absence from the xeric, more coniferous forests that cover much of Rhode Island is likely related to its avoidance of such conditions.

Conservation.- Populations of the Wood Thrush appear to be undergoing a long term decline—a trend corroborated by Massachusetts breeding bird atlases and density reports from elsewhere. However, data from Craig (1987) are contradictory. To the extent that this species is associated with mature interior forest, it is possible that forest fragmentation is driving any decline.

AMERICAN ROBIN
Turdus migratorius

Summer

Density (birds/km^2): 16.03 (n = 749, 95% CI: ± 2.66)
CT: 16.26
RI: 14.95

Population (birds): 150,484 (95% CI: ± 24,279)
CT: 126,712
RI: 23,772

Winter

Density (birds/km^2): 4.46 (n = 289, 95% CI: ± 0.30)
CT: 4.73
RI: 3.23

Population (birds): 40,694 (95% CI: ± 7,606)
CT: 35,555
RI: 5,139

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	8.06		9.37			
2003−2008	9.53	10.21	13.81	25.40	28.38	14.95
Rank	54.7	63.0	72.4	86.0	102.1	70.5
Winter						
2001−2003	1.12		7.94			
2003−2009	4.72	4.85	8.75	3.77	3.75	3.23
Rank	77.2	66.5	105.7	68.3	68.0	59.3

TABLE 2. Habitat availability vs. use for individual American Robins. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 562, winter n = 211. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.23	2.28	2.15	1.98	2.45	2.27	145.4
$P(U)$	<0.01*	0.77	<0.01*	0.97	<0.01*	0.23	<0.01*
Winter use	1.27	2.41	2.24	1.98	2.46	2.41	149.3
$P(U)$	0.10	0.85	0.62	0.67	0.10	0.11	0.03

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	38.9	37.0	9.6	3.8	3.9	6.8
Winter use	45.0	24.6	10.0	7.6	3.3	9.5

Density.- The American Robin appeared on 97% of summer and 74% of winter transects. Although it occurred frequently even in interior forests, population estimates computed here do not account for birds of non-forest habitats.

Even though males sang from late winter into summer, I observed that males and females were conspicuous and appeared to be about equally detectable. In winter, birds generally occurred in flocks. Hence, summer density estimates are based on detections of males and females and winter estimates are based on the occurrence of flocks.

Summer densities averaged greatest in lowlands and least at higher elevations (Kruskal-Wallis χ^2 = 20.1, n = 147, P = 0.001). Winter densities averaged greatest in southeastern Connecticut but were otherwise similar throughout (Kruskal-Wallis χ^2 = 19.5, n = 147, P = 0.002; Table 1).

Populations showed a significant winter decrease for the region as a whole (Wilcoxon $Z = -7.93$, n = 147, $P < 0.001$). Similarly, duplicated data from eastern Connecticut

TABLE 3. Population densities vs. habitat characteristics for American Robins. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.16	−0.08	−0.09	−0.15	−0.24	−0.06	−0.14
P	<0.01*	0.16	0.12	0.02	<0.01*	0.35	0.02
Winter							
τ	−0.07	−0.01	−0.02	−0.09	−0.05	−0.01	−0.13
P	0.27	0.84	0.78	0.22	0.43	0.83	0.04
Difference							
τ	−0.09	−0.05	−0.07	−0.11	0.18	−0.07	−0.08
P	0.14	0.35	0.21	0.08	<0.01*	0.20	0.14

showed evidence of a seasonal population decline, although the decline was weaker in southeastern Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a nominal, nearly linear increase in U.S. populations (trend = 0.32, n = 3204, %CV = 5.4; Kendall's $\tau = -0.92$, n = 48, $P < 0.001$). Northeastern populations, in contrast, showed a nominal convex decline (trend = −0.29, n = 135, %CV = 3.1; exponential $r^2 = 0.50$, df = 47, $P < 0.001$). Christmas Counts showed little change in U.S. populations (Kendall's $\tau = -0.02$, n = 48, $P = 0.85$, %CV = 60.4), although New England populations experienced a concave increase (Kendall's $\tau = 0.70$, n = 48, $P < 0.001$, %CV = 120.3).

Duplicated density estimates for eastern Connecticut showed an 18−47% summer and 10−321% winter increase in numbers between sampling periods. Craig (1987) recorded birds incidentally on forest transects through northeastern Connecticut, but generated no density estimates for them. Elsewhere, summer densities are reported to vary from 0−83 birds/km^2 in woodlands (Curtis 1986) and winter densities are reported to be 20 birds/km^2 in forest (Kendrick 2012).

Habitat.- Individual American Robins inhabited more deciduous, mesic, open-canopied, lower elevation forests in summer than would be predicted from habitat availability. Birds were associated particularly with mixed hardwoods. Wintering birds showed no significant habitat relationships, although they also tended to occupy lower elevation forests (Table 2).

Comparison of summer populations with habitat features similarly showed that densities were greatest in more deciduous, open-canopied forests that tended to be at lower elevations. No significant winter associations occurred, although birds again tended to use lower elevation habitats (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed that they had a weak but significant tendency to use forests that had lower moisture and denser understories in winter compared with summer (Nagelkerke $r^2 = 0.02$, % correctly classified = 72.6, n = 771, $P = 0.002$). Seasonal shifts in populations showed a significant correlation with increasing canopy cover from summer to winter (Table 3).

Elsewhere, forest-associated birds occur in selectively logged forest, early successional forest and forest openings. However, quantitative assessments of habitat affiliations appear to be surprisingly limited (Sallabanks and James 1999).

History.- The American Robin was known as an abundant year-round Connecticut and Rhode Island resident in the 19th century (Howe and Sturtevant 1899, Sage et al. 1913). The species likely increased regionally during the deforestation of the 18th and 19th centuries (Zeranski and Baptist 1990, Clark 1994x).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 93.6% of survey blocks throughout Massachusetts (Blodget 2003d). In the 1980s, it was definite or probable at 99.5% of blocks throughout Connecticut (Clark 1994x). It was also definite or probable at 94.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders had remained about stable at 93.8% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- An abundant summer resident of more open environments, the American Robin is also a common forest inhabitant, although populations decline from summer to winter. Winter migration occurs out of southern New England in this strongly migratory species (Sallabanks and James 1999). Moreover, populations concentrate in lowlands during summer but, unlike a number of permanent residents, seem to do so to a lesser extent in winter. The summer distribution pattern appears to be general even considering annual variation in duplicated eastern Connecticut data, although the winter pattern may be inconsistent due to great population variation at this season.

The extent to which the American Robin inhabits interior forests is often not recognized. Within such habitats, it occupies more deciduous, mesic, open-canopied sites in summer, although it shows few winter associations. However, individual birds appear to shift to more xeric habitats with denser understories from summer to winter although, with a much smaller sample, Craig (2012) found no such habitat shifts. The species' association with more open forests is consistent with other reports, but most of my habitat finding are new.

Conservation.- Breeding Bird Survey data indicate that summer populations have declined slightly in the Northeast. This may be related to the maturation of regional forests (Ward and Barsky 2000), which might be expected to reduce the amount of habitat for a species often associated with more open habitats. Massachusetts breeding bird atlases and duplicated data from eastern Connecticut contradict this trend, however.

Christmas Count data indicate that, like a number of permanent resident species, populations are increasing, likely as a consequence of more birds wintering further north than in previous decades. Duplicated eastern Connecticut data corroborate this trend but show that substantial variation occurs during this season—a situation typical for many overwintering species, as may be observed by comparison of coefficients of variation for breeding bird surveys and Christmas counts.

GRAY CATBIRD

Dumatella carolinensis

Summer

Density (males/km^2): 24.90 (n = 530, 95% CI: ± 4.96)
CT: 21.58
RI: 40.62
Population (males): 226,995 (95% CI: ± 45,219)
CT: 162,392
RI: 64,603

Density.- The Gray Catbird appeared on 82% of summer and 5% of winter transects. Although the species occurs commonly in nonforest habitats, population estimates computed here refer only to those birds inhabiting primarily forested landscapes. Summer population estimates are based on detections of singing males.

Summer densities averaged greatest in the lowlands of southeastern Connecticut and Rhode Island and least in more mountainous northwestern Connecticut (Kruskal-Wallis χ^2 = 20.4, n = 147, P = 0.001; Table 1). The species appeared in winter primarily at more southern locations. From my few observations, I tentatively estimate a winter density of 0.94 birds/km^2 and total population of 8,568. Although I detected birds infrequently at this season, they were usually found at close range, which led to this comparatively high density estimate.

Population variance.- Breeding Bird Survey data showed a nominal decline in U.S. populations (trend = −0.04, n = 2348, %CV = 3.4; quadratic r^2 = 0.003, df = 47, P = 0.75). Northeastern populations, in contrast, showed a slightly concave increase (trend = 0.34, n = 135, %CV = 5.3; exponential r^2 = 0.95, df = 47, P < 0.001).

U.S. Christmas Counts showed a population decline until about 1985, followed by an increase since then (quadratic r^2 = 0.24 df =47, P < 0.001, %CV = 31.4). New England populations have, in contrast, shown a nearly linear increase (Kendall's τ = 0.55, n = 48, P < 0.001, %CV = 66.8).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	16.75		30.50			
2003−2008	20.67	9.93	31.65	21.62	28.91	40.62
Rank	71.04	45.80	92.1	74.6	73.54	89.6

TABLE 2. Habitat availability vs. use for individual Gray Catbirds. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 493, winter n = 9. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.30	2.62	2.12	1.93	2.19	2.60	110.6
$P(U)$	0.06	0.06	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*
Winter use	1.11	2.56	2.17	1.78	1.44	2.67	43.4

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	35.5	33.7	7.7	6.9	5.1	11.2
Winter use	22.2	55.6	0.0	11.1	0.0	11.1

Duplicated density estimates for eastern

TABLE 3. Summer population densities vs. habitat characteristics for Gray Catbirds. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.16	0.03	−0.05	−0.25	−0.31	0.24	−0.35
P	<0.01*	0.58	0.36	<0.01*	0.01*	<0.01*	<0.01*

Connecticut showed a 4−23% summer increase in numbers between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 5.6 birds/km^2. In Georgia floodplain forest, 30 pairs/km^2 have been reported, although the greatest densities are found in non-forested habitats (Cimprich and Moore 1995). I found no reports of winter densities.

Habitat.- Data from individual summering Gray Catbirds showed that they occupied lower elevation forests that were moister, with younger trees, more open canopies and denser understories than would be predicted from habitat availability. They also tended to inhabit more deciduous, particularly mixed hardwood forests. In winter, my small sample suggested that birds inhabited similar locations with even lower elevations than in summer (Table 2). Summer population densities were similarly greatest in more deciduous, young, open-canopied, denser understoried forests of lower elevations (Table 3).

The species is typically reported to inhabit dense shrubs, the shrub-sapling stage in secondary successional forests and forest edge. Smaller populations are found in interior forest (Cimprich and Moore 1995).

History.- The Gray Catbird has been an abundant summer and rare winter resident in Connecticut and Rhode Island since the 19th century (Howe and Sturtevant 1899, Sage et al. 1913). Despite the reforestation of the region that has occurred since this time, the species has remained abundant (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 91.2% of survey blocks throughout Massachusetts (Stokes and Stokes 2003a). In the 1980s, it was definite or probable at 99.5% of blocks throughout Connecticut (Purnell 1994). It was also definite or probable at 92.1% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders showed a nominal increase to 93.3% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- An abundant summer resident of more open environments, the Gray Catbird is also a common summer inhabitant of the region's forests, with densities similar to those reported for other forested habitats. Densities are greatest year-round in lower elevation, southern portions of the study area and least in more mountainous, northern portions of the study area—patterns that appear real in light of low population variation recorded in duplicated eastern Connecticut surveys. Although also present in winter, the species is uncommon at this season.

The extent to which the Gray Catbird inhabits interior forest is often not recognized. In forests, its association with forest gaps, early successional forest and open canopy wetlands with dense understories is consistent with other reports for the species. Its apparent retreat to the lowest elevation coastal locations in winter likely occurs because such sites offer the least energetically challenging environments at this season.

Conservation.- Breeding populations of the Gray Catbird are undergoing an increase in this region—a pattern corroborated by duplicated eastern Connecticut data, earlier transect data of Craig (1987) and, to a lesser extent, data from Massachusetts breeding bird atlases. This increase has occurred despite the maturation of regional forests (Ward and Barsky 2000), which suggests that the species is extending its habitat use to include such situations. Winter population increases are also occurring, as they are for other overwintering species near their northern range limits. Such increases may be related to a warming climate.

CEDAR WAXWING

Bombycilla cedrorum

Summer

Density (birds/km^2): 9.34 (n = 247, 95% CI: ± 1.82)
CT: 9.80
RI: 7.13
Population (birds): 85,085 (95% CI: ± 16,555)
CT: 73,740
RI: 11,345

Winter

Density (birds/km^2): 1.08 (n = 32, 95% CI: ± 0.59)
CT: 0.89
RI: 2.00
Population (birds): 9,853 (95% CI: ± 5,342)
CT: 6,670
RI: 3,183

Density.- The Cedar Waxwing appeared on 69% of summer and 16% of winter transects. Although winter detections were below the recommended 60, the data fit a detection function well, so I still report my density estimates for this season. Population estimates are based on detections of flocks and refer only to that portion of the population inhabiting primarily forested landscapes.

Summer densities averaged greater in some lowlands but were variable and showed little clear pattern (Kruskal-Wallis χ^2 = 5.9, n = 147, P = 0.31; Table 1). Winter populations were too sparse and annually variable to evaluate.

Population variance.- Breeding Bird Survey data showed a small concave increase in U.S. populations (trend = 0.69, n = 1923, %CV = 13.6; quadratic r^2 = 0.86, df = 47, P < 0.001). Northeastern populations, in contrast, showed a strongly concave increase (trend = 4.17, n = 125, %CV = 58.6; Kendall's τ = 0.94, n = 48, P < 0.001).

U.S. Christmas Counts showed a convex population increase that has leveled off and possibly declined since about 1993 (power

TABLE 1. Population density estimates (birds/km^2) and summer Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	6.27		16.07			
2003−2008	5.42	10.07	9.89	5.36	13.65	7.13
Rank	69.5	77.6	82.3	67.8	69.7	75.8
Winter						
2001−2003	0.25		1.08			
2003−2009	0.50	1.39	2.17	0.36	0.52	2.00

TABLE 2. Habitat availability vs. use for individual Cedar Waxwings. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. Summer n = 225, winter n = 29. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.34	2.46	2.21	1.94	2.38	2.45	152.1
$P(U)$	0.45	0.76	0.26	0.04	<0.01*	0.01*	0.02
Winter use							
	1.51	2.79	2.29	1.93	2.28	2.60	118.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	47.6	20.8	9.3	6.7	7.1	8.4
Winter use	28.6	25.0	10.7	21.4	10.7	3.6

TABLE 3. Summer population densities vs. habitat characteristics for Cedar Waxwings. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.07	−0.01	−0.08	−0.19	−0.15	0.09	−0.07
P	0.30	0.85	0.22	<0.01*	0.02	0.14	0.28

function $r^2 = 0.52$, df = 47, $P < 0.001$, %CV = 25.1). New England populations, in contrast, showed a sigmoid increase until about 2010 and a decline since then (Kendall's $\tau = 0.59$, $n = 48$, $P < 0.001$, %CV = 84.6).

Duplicated density estimates for eastern Connecticut showed a 14−38% summer decline in numbers between sampling periods. Winter numbers, in contrast, showed a 100−101% increase between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) incidentally encountered Cedar Waxwings but did not compute densities. Elsewhere in summer, 10 birds/km^2 have been reported in forest (Somershoe et al. 2006), although up to 2150 nests/km^2 have been reported by Rothstein (1972). I found no reports of winter densities.

Habitat.- Observations of summer habitat use by individual Cedar Waxwings showed that they inhabited more mesic, open canopied, denser understoried forests than would be predicted from habitat availability. They also tended to inhabit lower elevation forests with younger trees. Wintering birds tended to use more coniferous, younger, open-canopied, denser understoried, lower elevation forests than those available (Table 2).

Comparison of summer population densities with habitat features showed that birds used younger forests that tended to have more open canopies than those available (Table 3). Data were insufficient for judging winter habitat associations. I generally found the species at all seasons in forest openings and edge, particularly open swamps and along larger streams.

Elsewhere, the species is reported to inhabit especially open woods, second growth and old fields in winter and summer. It avoids forest interiors and is frequently present in riparian areas and other locations where fruiting shrubs and trees are present (Witmer et al. 1997).

History.- The Cedar Waxwing was known as a common Connecticut resident by Sage et al. (1913), although winter populations are variable (Zeranski and Baptist 1990). Howe and Sturtevant (1899) described Rhode Island birds as common in summer and occasional in winter.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 42.9% of survey blocks throughout Massachusetts (Hill 2003). In the 1980s, it was definite or probable at 81.7% of blocks throughout Connecticut (Clark 1994y). It was also definite or probable at 49.1% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 75.7% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Cedar Waxwing is a fairly common summer but uncommon and, based on duplicated eastern Connecticut data, irregularly-occurring winter resident. Populations show no clear patterns of density across the study area. Breeding densities are similar to those reported elsewhere for forested habitats but much less than those reported for other habitats. My winter density estimates appear to be among the only available.

My observation of a summer species association with younger, more open forests with denser understories is consistent with other reports of habitat use. A continued winter association with younger, open-canopied, denser understoried forests is also expected. The species' year-round tendency to inhabit lower elevations, particularly in winter, is unreported but similar to that of other permanent residents examined in this study.

Conservation.- The Breeding Bird Survey and Massachusetts breeding bird atlases indicate that Cedar Waxwing populations are undergoing a regional increase, although duplicated eastern Connecticut data show a consistent summer decline. Christmas counts show increasing but cyclic populations and duplicated eastern Connecticut data support the occurrence of this increase.

Sponsored by Barbara Lussier

OVENBIRD

Seiurus aurocapilla

Summer

Density (males/km^2): 66.43 (n = 4,067, 95% CI: ± 5.02)
CT: 62.74
RI: 83.94

Population (males): 605,524 (95% CI: ± 45,716)
CT: 472,028
RI: 133,496

Density.- The Ovenbird appeared on 99% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northwestern Connecticut and Rhode Island and least in southwestern and central Connecticut (Kruskal-Wallis χ^2 = 36.0, n = 147, $P < 0.001$; Table 1).

Population variance.- Breeding Bird Survey data showed a weak but essentially linear increase in U.S. populations (trend = 0.33, n = 1382, %CV = 6.5; Kendall's τ = 0.76, n = 48, $P < 0.001$). Northeastern populations, in contrast, showed a strong, slightly concave decline (trend = 0.78, n = 131, %CV = 11.6; exponential r^2 = 0.94, df = 47, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 4−16% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 149.2 ± 45.7 birds/km^2. Plot studies have shown densities ranging from 19.0−237.6 birds/km^2 for Connecticut (Craig 1987).

Habitat.- Individual Ovenbirds inhabited higher elevation forests with more closed canopies than would be predicted from habitat availability (Table 2). Examination of population density vs. habitat variables demonstrated an association with greater cover by conifers, more dense understories and higher elevations. Populations also tended to be greatest in more closed canopy forests (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	66.07		58.35			
2003−2008	68.78	83.21	67.57	48.25	44.99	83.94
Rank	72.8	97.3	75.4	47.7	43.9	97.9

TABLE 2. Habitat availability vs. use for individual Ovenbirds. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 2662. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.39	2.34	2.29	1.99	2.69	2.32	184.8
$P(U)$	0.29	0.16	0.06	0.07	<0.01*	0.76	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	47.1	17.4	16.1	8.5	6.8	4.2

Elsewhere, the Ovenbird is reported to inhabit a broad range of deciduous and mixed forest types. Only pure coniferous forests appear to be inhabited less frequently. It occupies young to climax forest, although studies suggest a preference for mature,

TABLE 3. Summer population densities vs. habitat characteristics for Ovenbirds. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.26	0.22	0.07	0.01	0.14	0.14	0.22
P	<0.01*	<0.01*	0.21	0.82	0.02	0.01*	<0.01*

closed canopy forests. The presence of extensive, unbroken forest tracts also appears to be an essential habitat feature (van Horne and Donovan 1994).

History.- The Ovenbird has been reported as historically common to abundant in Connecticut (Sage et. al 1913, Zeranski and Baptist (1990) and Rhode Island (Howe and Sturtevant (1899).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 65.0% of survey blocks throughout Massachusetts (Dowd 2003b). In the 1980s, it was definite or probable at 74.0% of blocks throughout Connecticut (Clark 1994z). It was also definite or probable at 53.9% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 73.3% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Ovenbird is the most abundant breeding species in the forests of southern New England. Greater populations in northwestern Connecticut and Rhode Island, which in light of low variance recorded in duplicated eastern Connecticut surveys appear real, may be related to greater conifer cover in these regions. Lower densities recorded from southwestern and central Connecticut, in contrast, likely reflect the lower forest cover and less canopy cover (hence, more fragmented forests) in these regions (Table 4).

My observations of habitat use vary somewhat between scales, but overall correspond well with the prevailing view that the species occupies closed canopy forest. The association particularly with forests in which at least some conifers are present is unreported, however, as is the association with higher elevations.

Conservation.- Breeding Bird Survey data suggest a long term decline in regional populations, although earlier transect data of Craig (1987) suggest little population change and data from Massachusetts breeding bird atlases and duplicated eastern Connecticut data suggest a population increase. Populations are certainly large at present, although they appear vulnerable to forest fragmentation based on their present density distribution across the region.

WORM-EATING WARBLER

Helmitheros vermivorum

Summer

Density (males/km^2): 7.30 (n = 405, 95% CI: ± 1.58)
CT: 8.38
RI: 2.16

Population (males): 66,513 (95% CI: ± 14,367)
CT: 63,085
RI: 3,428

Density.- The Worm-eating Warbler appeared on 56% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in lowland areas and least in more mountainous portions of northern Connecticut (Kruskal-Wallis χ^2 = 48.5, n = 147, P < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a weak concave decline in U.S. populations that ended about 1991. It has increased since then (trend = 0.46, n = 617, %CV = 10.8; Kendall's τ = 0.40, n = 48, P < 0.001). Northeastern populations showed a stronger concave increase (trend = 2.55, n = 69, %CV = 37.1; Kendall's τ = 0.93, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 24−43% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported no birds. Moreover, at 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R.Craig (pers. obs.) found only 11% with Worm-eating Warblers, compared with 65% of the (in many cases same) sites surveyed in this study. Elsewhere, 1.5−150 males/km^2 have been reported. Furthermore, 44 males/km^2 have been reported from southwest Connecticut (Hanners and Patton 1998).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	5.03		12.46			
2003−2008	2.87	2.94	15.41	13.49	10.31	2.16
Rank	56.7	55.4	109.2	103.4	80.1	50.8

TABLE 2. Habitat availability vs. use for individual Worm-eating Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 318. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.15	1.89	2.31	2.00	2.72	2.25	141.9
$P(U)$	<0.01*	<0.01*	0.10	0.07	<0.01*	0.07	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	63.8	17.3	7.2	3.5	1.9	6.3

Habitat.- Individual Worm-eating Warblers inhabited lower elevation forests that were more deciduous, closed canopied and open understoried than would be predicted from habitat availability. Birds were particularly associated with oak-dominated forests where I most typically encountered birds on slopes. Population densities were greatest in more deciduous, closed canopied forests that also tended to be

TABLE 3. Summer population densities vs. habitat characteristics for Worm-eating Warlers. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.25	−0.22	0.08	−0.01	0.23	−0.11	−0.13
P	<0.01*	<0.01*	0.20	0.88	<0.01*	0.08	0.04

at lower elevations (Table 3).

Elsewhere, the species is reported to inhabit mesic to xeric mature deciduous and mixed conifer-deciduous forest on hillsides with dense shrubbery. Unfragmented, extensive forests appear to be favored (Hanners and Patton 1998).

History.- The Worm-eating Warbler was described as a fairly common breeder of southern Connecticut by Sage et al. (1913). However, Howe and Sturtevant (1899) did not report it from Rhode Island. It appears to have expanded its range during the 20th century (Zeranski and Baptist 1990) and first appeared as a Rhode Island breeder in 1976 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at only 0.6% of survey blocks in Massachusetts (Gagnon 2003). In the 1980s, it was definite or probable at 24.0% of blocks primarily in southern Connecticut (Askins 1994). It was also definite or probable at 4.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 2.2% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Worm-eating Warbler is fairly common in the forests of southern New England. Its predominance at lower elevations and infrequency in more mountainous, northern locations appears related to its more southerly continental distribution (Hanners and Patton 1998), as populations tend to decline toward range limits (Brown 1984, Pulliam 1988). Its comparatively low densities in Rhode Island may be related to the high density of conifers found there.

The observed association of the Worm-eating Warbler with deciduous, closed canopy forest is consistent with other reports of habitat use. However, I did not find the association with greater understory density that has been reported for elsewhere.

Conservation.- Breeding Bird Survey data, Massachusetts breeding bird atlases, the species' earlier absence from earlier line transects of Craig (1987) and data of R. Craig (pers. obs.) indicate that a regional increase has occurred since the 1970s. A factor potentially driving the increase is the maturation of regional forests (Ward and Barsky 2000).

LOUISIANA WATERTHRUSH
Parkesia motacilla

Summer

Density (males/km^2): 2.64 (*n* = 148, 95% CI: ± 0.61)
CT: 3.17
RI: 0.14

Population (males): 24,094 (95% CI: ± 5,559)
CT: 23,877
RI: 217

Density.- The Louisiana Waterthrush appeared on 49% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in southwestern Connecticut, although it was similarly frequent in much of the study area outside of Rhode Island, where it was least common by far (Kruskal-Wallis χ^2 = 26.0, *n* = 147, *P* < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a weak concave increase in U.S. populations (trend = 0.55, *n* = 939, %CV = 9.4; Kendall's τ = 0.62, *n* = 48, *P* < 0.001). Northeastern populations showed a weaker concave increase (trend = −1.13, *n* = 79, %CV = 5.2; Kendall's τ = 0.34, *n* = 48, *P* = 0.002).

Duplicated density estimates for eastern Connecticut showed a 0−28% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 8.1 birds/km^2. Elsewhere, densities of pairs/km along streams are reported to vary from 1.0 to 2.8 in Connecticut (Robinson 1995).

Habitat.- Individual Louisiana Waterthrushes inhabited forests that were dominated by mixed hardwood and more coniferous associations. They were also moister, older and with less dense understories than would be predicted from habitat availability (Table 2). Comparison of population densities with habitat features demonstrated an association with wetter, more closed canopy forests with more open understories (Table 3). I most frequently encountered birds along rushing or swampy streams in mesic coves. Such locations tended to be unlogged and dominated by among the largest trees in the forest, partic-

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	2.45		3.39			
2003−2008	1.77	3.41	3.39	5.11	2.41	0.14
Rank	68.2	88.1	81.5	93.6	73.6	44.3

TABLE 2. Habitat availability vs. use for individual Louisiana Waterthrushes. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 93. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.49	2.82	1.92	2.08	2.48	2.09	154.2
P(*U*)	0.13	0.01*	<0.01*	<0.01*	0.23	<0.01*	0.48

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	29.0	28.0	20.4	3.2	12.9	6.5

TABLE 3. Summer population densities vs. habitat characteristics for Louisiana Waterthrushes. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
T	−0.03	−0.07	−0.19	0.01	0.18	−0.22	0.10
P	0.66	0.31	<0.01*	<0.01*	<0.01*	<0.01*	0.11

ularly Eastern Hemlock, Yellow Poplar, White Ash, and Red Oak.

Elsewhere, the species is reported to breed along gravel-bottomed streams through hilly, deciduous forest and in bottomland swamps (Robinson 1995). In Connecticut, analyses of territory features demonstrated that compared with Northern Waterthrushes, birds inhabited wetlands with more flowing water, lower shrub density, less evergreen cover by moss, shrubs, and trees, and fewer swamp-related features like ferns and hummocks. An examination of 26 sites in eastern Connecticut further showed that Louisiana Waterthrush habitats were dominated by conifer-deciduous cover to the north, whereas deciduous cover was more frequent to the south (Craig 1985).

History.- Sage et al. (1913) found the Louisiana Waterthrush most common in southern Connecticut. Howe and Sturtevant (1899) considered it rare in Rhode Island, where it was present particularly in the southwestern part of the state. It appears to have expanded its range north during the late 19th century (Clark 1994za) and has been in contact with the range of the Northern Waterthrush for ca. 100 years (Craig 1985).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 9.4% of survey blocks particularly in western Massachusetts (Blodget 2003e). In the 1980s, it was definite or probable at 40.3% of blocks particularly in the Connecticut uplands (Clark 1994za). It was also definite or probable at 11.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 20.4% of blocks, still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Lousiana Waterthrush is an uncommon but widespread breeder in the forests of southern New England. Its greater densities in southwestern Connecticut, likely real in light of the relatively low variance in duplicated eastern Connecticut data, appear related to its approaching its northern range limit in this region (Robinson 1995). The much lower densities in Rhode Island mirror historic and breeding bird atlas evidence for distribution the species, which indicate lower densities in Rhode Island since at least the late 19th century.

The significant association of the Louisiana Waterthrush with moist forest and more open understories is consistent with existing reports of habitat use. Moreover, the species' association with mature forest may explain in part its northward range expansion in a region where forests are maturing (Ward and Barsky 2000).

Conservation.- The Breeding Bird Survey and Massachusetts breeding bird atlases indicate that the Louisiana Waterthrush is continuing a population expansion in southern New England that dates from at least the late 19th century. However, data from duplicated eastern Connecticut surveys and from Craig (1987) suggest that populations have undergone a modest decline in at least northeastern Connecticut.

Sponsored by David Fiorio

NORTHERN WATERTHRUSH

Parkesia noveboracensis

Summer

Density (males/km^2): 0.85 (n = 60, 95% CI: ± 0.32)
CT: 0.66
RI: 1.73
Population (males): 7,707 (95% CI: ± 2,909)
CT: 4,961
RI: 2,746

Density.- The Northern Waterthrush appeared on 24% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northwestern Connecticut and Rhode Island and least in southwestern and central Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a weak concave decline in U.S. populations (trend = −0.69, n = 448, %CV = 11.1; Kendall's $\tau = -0.77$, n = 48, $P < 0.001$). Based on a small sample, Northeastern populations showed a stronger concave decline (trend = −1.13, n = 28, %CV = 16.3; Kendall's $\tau = -0.93$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 0−69% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 9.2 birds/km^2. Elsewhere, densities are reported as 0.2−10 pairs/km^2 in Ontario (Eaton 1995).

Habitat.- Individual Northern Waterthrushes tended to occupy higher elevation habitats that were more coniferous, mesic, open-canopied and denser understoried than would be predicted from habitat availability (Table 2). I most frequently encountered birds in conifer-dominated swamps, although they were occasionally present in deciduous swamps. Birds were present at insufficient transects to assess population densities vs. habitat characteristics.

TABLE 1. Population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.40		0.82			
2003−2008	0.43	1.20	0.82	0.16	0.00	1.73

TABLE 2. Habitat availability vs. use for individual Northern Waterthrushes. n = 24. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.71	3.29	1.75	2.02	2.40	2.63	194.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	8.3	25.0	45.8	12.5	0.0	8.3

Elsewhere, the species is reported to breed in wooded swamps, particularly those with evergreen canopies and understories. They are also reported from bog thickets and shrubby margins of rivers, streams and lakes. Dense understory cover and presence of water are characteristic habitat features in most of its range (Eaton 1995).

In Connecticut, analyses of territory features demonstrated that compared with Louisiana Waterthrushes, birds inhabited wetlands with more standing water, higher shrub density, more evergreen cover by moss, shrubs, and trees, and more swamp-related features like ferns and hummocks. An examination of 26 sites in eastern Connecticut further showed that Northern Waterthrush habitats were typically hemlock-deciduous swamps to the north, whereas deciduous swamps and Atlantic white-cedar swamps were more frequent to the south (Craig 1985).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) did not know the Northern Waterthrush as a nester in Rhode Island or Connecticut. The species appears to have extended its range south into the region during the early 20th century (Zeranski and Baptist 1990). It was first found nesting in Rhode Island in 1906 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 10.7% of survey blocks particularly in western Massachusetts (Arvidson 2003c). In the 1980s, it was definite or probable at 14.4% of blocks primarily in northern Connecticut (Clark 1994zb). It was also definite or probable at 13.3% of blocks primarily in western Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 17.3% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Northern Waterthrush is a very uncommon breeder in the forests of southern New England. Greater populations in northwestern Connecticut and Rhode Island may be related to greater conifer cover in these regions. Lower densities recorded from southwestern and central Connecticut are likely related to lower conifer cover there, although the generally lower elevation of these regions also may be involved in reducing populations of this northerly-distributed species. In light of modest variance recorded in duplicated eastern Connecticut surveys, these distributional patterns appear real.

My observations of an association with wetter coniferous forests with denser understories are in general agreement with reports from elsewhere, including the previous Connecticut investigations of Craig (1985). The species' association with higher elevations is likely related to its more northerly distribution. Although it tends to occupy these higher elevation locations, its presence also in lower elevation Rhode Island suggests that habitat structure plays an additional role in determining geographic distribution.

Conservation.- Breeding Bird Survey, duplicated eastern Connecticut and earlier transect studies of Craig (1987) provide evidence that populations are undergoing a long term decline. Massachusetts breeding bird atlases contrast with these, however, as they do for other apparently declining species, which suggests that atlas data are not always a reliable indicator of population trends.

Sponsored by Gerard Gagne

BLUE-WINGED WARBLER

Vermivora cyanoptera

Summer

Density (males/km^2): 0.97 (n = 77, 95% CI: ± 0.39)
CT: 0.85
RI: 1.55

Population (males): 8,881 (95% CI: ± 3,548)
CT: 6,409
RI: 2,472

Density.- The Blue-winged Warbler appeared on 24% of summer transects. Population estimates are based on detections of singing males and refer only to that portion of the population inhabiting primarily forested landscapes. Densities averaged greatest in southeastern Connecticut and Rhode Island and generally greater in lowlands than in mountainous portions of the study area (Table 1).

Population variance.- Breeding Bird Survey data showed a small concave decline in U.S. populations (trend = −0.64, n = 698, %CV = 8.8; power function r^2 = 0.62, df = 47, P < 0.001). Northeastern populations showed a stronger concave decline (trend = −2.47, n = 72, %CV = 34.2; power function r^2 = 0.98, df = 47, P < 0.001).

Duplicated density estimate for eastern Connecticut showed a 0−23% summer decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) incidentally detected the species but did not compute its densities. Elsewhere, populations are reported to vary depending on habitat size and successional stage of habitats. Density estimates vary from 15−71 males/km^2 (Gill et al. 2001).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.49		1.79			
2003−2008	0.49	0.63	1.37	0.70	0.91	1.55

TABLE 2. Habitat availability vs. use for individual Blue-winged Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 44. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.23	2.41	2.19	1.88	1.89	2.75	115.2
$P(U)$	0.16	0.32	0.45	<0.01*	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	25.0	50.0	9.1	6.8	2.3	6.8

Habitat.- Observations of habitat use by individual Blue-winged Warblers showed that they inhabited lower elevation forests that were younger, more open canopied and denser understoried than would be predicted from habitat availability (Table 2). I had an insufficient sample to evaluate populations vs. habitat variables.

I typically found birds inhabiting selectively logged areas, early successional woodlands and borders of open swamps. The species occupied even small (ca. two ha) forest openings. Elsewhere, it is reported to inhabit forest clearcuts, old fields, early to mid-successional woodlands and wetland borders. Dense shrubs are a typical habitat feature (Gill et al. 2001).

History.- The Blue-winged Warbler, a primarily Southeastern species, expanded its populations north after the deforestation of the East in the late 18th and early 19th centuries (Bledsoe 1994, Gill et al. 2001). However, Sage et al. (1913) already considered it common in southern Connecticut, although Howe and Sturtevant (1899) thought it very rare in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 22.0% of survey blocks primarily in southern Massachusetts (Meservey 2003d). In the 1980s, it was definite or probable at 82.7% of blocks throughout Connecticut (Bledsoe 1994). It was also definite or probable at 48.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders increased to 30.9% of blocks primarily in eastern Massachusetts away from Cape Cod (Walsh and Peterson 2013).

Synthesis.- The Blue-winged Warbler is a very uncommon but regular breeder in the forests of southern New England, although it is present more commonly outside of principally forested landscapes. Densities are generally greater in lowlands than in more mountainous portions of the study area—a pattern corroborated by the limited variability in duplicated eastern Connecticut data as well as by the principally southern distribution of the species. Breeding densities reported here are much less than those reported from more optimal habitat elsewhere.

My observations that the Blue-winged Warbler is associated with forests that are younger, more open-canopied and with denser understory are consistent with other reports of habitat use. The additional association with lower elevations is expected given the southern distribution of the species (Gill et al. 2001). Populations of many species decline toward their range limit (Brown 1984, Pulliam 1988).

Conservation.- Breeding Bird Survey data suggest that populations are declining regionally—a pattern somewhat corroborated by duplicated eastern Connecticut data. The occurrence of a decline is expected because the forests of southern New England are maturing and preferred successional habitats are disappearing (Ward and Barsky 2000). Massachusetts breeding bird atlases contradict the trend toward decline, which suggests that atlas data may be inadequate for assessing population trends because survey effort is confounded with counts.

Despite this decline, populations continue to inhabit forests where disturbance has occurred. Logging and natural disturbance, such as tree attrition in wetlands, seem likely to continue supplying suitable habitat for the species. This and other successional species may be returning to population levels more historically typical for them.

BLACK-AND-WHITE WARBLER
Mniotilta varia

Summer

Density (males/km^2): 11.74 (n = 530, 95% CI: ± 1.70)
CT: 11.12
RI: 14.67

Population (males): 106,996 (95% CI: ± 15,510)
CT: 83,663
RI: 23,333

Density.- The Black-and-white Warbler appeared on 87% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northwestern Connecticut and Rhode Island and least in central Connecticut (Kruskal-Wallis χ^2 = 24.0, n = 147, $P < 0.001$; Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −1.04, n = 1255, %CV = 14.7; power function r^2 = 0.94, df = 47, $P < 0.001$). Northeastern populations showed a steeper concave decline (trend = −3.38, n = 117, %CV = 46.7; Kendall's τ = −0.96, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 14−15% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 35.1 ± 20.6 birds/km^2. Earlier plot studies in Connecticut have shown densities ranging from 0 to 100 birds/km^2 (Craig 1987).

Habitat.- Individual Black-and-white Warblers inhabited higher elevation forests with greater understory density than would be predicted from habitat availability (Table 2). Examination of population density vs. habitat variables showed no significant correlations, although populations tended to be greatest in habitats with denser understories (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	11.48		8.98			
2003−2008	9.89	19.25	7.60	8.52	6.80	14.67
Rank	65.4	103.9	61.9	65.0	56.7	86.1

TABLE 2. Habitat availability vs. use for individual Black-and-white Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 454. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.38	2.28	2.28	1.98	2.56	2.46	203.5
$P(U)$	0.37	0.75	0.38	0.87	0.87	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	45.8	17.0	21.4	7.7	4.2	4.0

Elsewhere, mature to second growth, deciduous to mixed forests are used and a possible preference exists for swampy forest. Studies have shown a strong preference for mature over second growth forest and for dense understory vegetation. However, var-

TABLE 3. Summer population densities vs. habitat characteristics for Black-and-white Warblers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
T	−0.01	−0.02	0.03	−0.06	−0.06	0.14	0.08
P	0.85	0.77	0.66	0.36	0.30	0.02	0.20

ious and conflicting habitat affiliations have been reported (Kricher 1995).

History.- The Black-and-white Warbler was reported as common in Connecticut even during the early 20th century (Sage et al. 1913) when much of the state was deforested (Ward and Barsky 2000). Howe and Sturtevant (1899) similarly reported the species as common in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 59.6% of survey blocks throughout Massachusetts (Kricher 2003a). In the 1980s, it was definite or probable at 41.4% of blocks throughout Connecticut (Clark 1994zc). It was also definite or probable at 48.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders had decreased to 46.4% of blocks that were primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Black-and-white Warbler is a common and widespread breeder in southern New England. Aside from low forest cover limiting central Connecticut populations, other reasons responsible for the observed density patterns are unclear. However, in light of the small variance observed in duplicated eastern Connecticut data, these patterns are likely real.

The association of the Black-and-white Warbler with denser understories is consistent with other reports of habitat preference, although the differential use of higher elevations is unreported. In most respects, this species appears to be a forest habitat generalist in that its use of habitats is generally similar to habitat availability.

Conservation.- The Breeding Bird Survey, Massachusetts breeding bird atlases, previous transect studies of Craig (1987) and duplicated eastern Connecticut surveys demonstrate that Black-and-white Warbler populations are declining. The species is thought to be an area sensitive and associated with forest interiors (Kricher 1995), so populations may be responding to regional forest fragmentation. However, an alternate hypothesis is that overpopulation by deer is reducing the amount of high density understory, thereby limiting the amount of preferred habitat.

NASHVILLE WARBLER
Oreothlypis ruficapilla

Density.- The Nashville Warbler was among the rarest summer inhabitants of southern New England forests. It appeared only twice—in southeastern Connecticut and Rhode Island. Because of its rarity, I make no population estimate for it.

Population variance.- Breeding Bird Survey data showed a cyclic but overall decline in U.S. populations, with cycles lasting about 10 years (trend = −0.59, n = 634, %CV = 12.2; exponential $r^2 = 0.34$, df = 47, $P < 0.001$). Northeastern populations showed a stronger, less cyclic, concave decline (trend = −5.61, n = 24, %CV = 89.9; Kendall's $\tau = -0.86$, $n = 48$, $P < 0.001$).

On line transects through northeastern Connecticut, Craig (1987) reported no birds, although summering individuals were present in the study area (R. Craig pers. obs.). Elsewhere, 4.9 pairs/km^2 have been reported from California (Bock and Lynch 1970).

Habitat.- My two observations of summering Nashville Warblers were of birds in a xeric oak forest and a redcedar-dominated old field bordering xeric oak forest. The latter habitat was similar to ones where R. Craig (pers. obs.) has encountered other locally summering birds.

Elsewhere, the species is reported from forest edge, coniferous bog borders, second growth forest and open deciduous or mixed woods with dense understories. It is absent from unbroken, mature forest. Habitats at the southern end of the range include drier, cut-over forest and deciduous second growth (Williams 1996). In Connecticut, males also routinely advertise at hydric to xeric forest edge in spring, but they usually do not remain at these locations into summer (R. Craig pers. obs).

History.- The Nashville Warbler appears to have been more common as a Connecticut and Rhode Island nester in the 19th century (Howe and Sturtevant 1899, Sage et al. 1913). Since 1900, its breeding range has receded northward (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 12.2% of survey blocks throughout Massachusetts (Cassie 2003b). In the 1980s, it was definite or probable at 4.7% of blocks primarily in northern Connecticut (Clark 1994zd). It was also definite or probable at 6.7% of blocks primarily in western Rhode Island (Enser 1992). By the 2000s, breeders declined to 4.8% of blocks primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Nashville Warbler is at the southern fringe of its breeding range in southern New England (Williams 1996) and is generally not present in the mostly mature forest habitats surveyed in this study. As a species associated with successional habitats, its presence at any one location is likely to be ephemeral.

My observations of habitat use are somewhat atypical for the species, although it is regularly reported from successional and xeric habitats elsewhere (Williams 1996). Selection of atypical habitats may be expected in individuals present at the fringe of their range where favored conditions may be largely absent.

Conservation.- Breeding Bird Survey and Massachusetts breeding bird atlases indicate that populations are declining, particularly in southern New England. As regional successional habitats continue to mature (Ward and Barsky 2000), populations are likely to decline further.

COMMON YELLOWTHROAT

Geothlypis trichas

Summer

Density (males/km^2): 4.57 (n = 541, 95% CI: ± 0.93)
CT: 4.17
RI: 6.43

Population (males): 41,617 (95% CI: ± 8,444)
CT: 31,392
RI: 10,225

Density.- The Common Yellowthroat appeared on 74% of summer transects, with population estimates based on detections of singing males. Because the species inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested regions. Densities averaged greatest in Rhode Island and least in southwestern Connecticut (Kruskal-Wallis $\chi^2 = 13.9$, $n = 147$, $P = 0.02$; Table 1).

During the study period, I also observed a single wintering bird near a transect in Connecticut coastal scrub. As the species is essentially accidental at this season, I make no winter population estimate for it.

Population variance.- Breeding Bird Survey data showed a weak, nearly linear decline in U.S. populations (trend = −0.96, n = 2915, %CV = 12.7; Kendall's $\tau = -0.93$, n = 48, $P < 0.001$). Northeastern populations showed a stronger concave decline (trend = −2.09, n = 135, %CV = 30.6; Kendall's $\tau = -0.98$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 0−2% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 12.2 birds/km^2. Elsewhere, densities are reported to range from 35 to 355 males/km^2 (Guzy and Ritchison 1999).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	5.63		4.38			
2003−2008	5.77	3.88	4.88	1.53	4.41	6.43
Rank	85.8	67.2	81.0	46.0	72.0	85.2

TABLE 2. Habitat availability vs. use for individual Common Yellowthroats. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 271. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.44	3.07	2.00	1.94	2.11	2.55	139.5
$P(U)$	<0.01*	<0.01*	<0.01*	0.01	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	22.9	35.1	15.5	2.6	9.6	14.4

Habitat.- Individual Common Yellowthroats inhabited more coniferous, lower elevation forests that were moister, younger, more open and with greater understory density than would be predicted from habitat availability. Birds also occupied less oak-dominated and more mixed hardwood forest than would be predicted (Table 2). Comparison of population densities with habitat features

TABLE 3. Summer population densities vs. habitat characteristics for Common Yellowthroats. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.09	0.18	−0.11	−0.11	−0.32	0.15	−0.21
P	0.17	<0.01*	0.05	0.11	<0.01*	0.01*	<0.01*

similarly showed relationships with more low elevation, coniferous, open canopied habitats with denser understories. Birds also tended to occur more frequently in mesic environments (Table 3). I most often encountered birds in open, shrubby swamps, along rivers and in forest openings created by natural disturbance or logging.

Elsewhere, the species is reported to inhabit a wide variety of open habitats. Greatest densities are reached in shrubby wetlands, including swamps and riparian areas. In addition, a variety of mesic to xeric scrubby, successional habitats are occupied, including areas disturbed by fire and logging (Guzy and Ritchison 1999).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) described the Common Yellowthroat as a common to abundant breeder in Rhode Island and Connecticut. Zeranski and Baptist (1990) asserted that the species had undergone no historical change in Connecticut population status.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 89.6% of survey blocks throughout Massachusetts (Anderson 2003b). In the 1980s, it was definite or probable at 94.8% of blocks throughout Connecticut (Clark 1994ze). It was also definite or probable at 84.2% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had declined slightly to 88.2% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Common Yellowthroat is an uncommon to fairly common breeder in the forests of southern New England, inhabiting even small forest openings caused by the loss of a few trees. Given the minimal variance recorded in duplicated eastern Connecticut data, regional differences in densities within forest habitat appear to be real, although reasons for these differences are unclear.

The tendency of the Common Yellowthroat toward inhabiting more open, younger, densely shrubby, more mesic forest is consistent with other reports of habitat use. Its association with more conifer cover appears related to the local frequency of white pine and hemlock in wetter environments. Its association with lower elevations is unclear, as it ranges far to the north of the study area.

Conservation.- As with other species associated with successional environments, the Breeding Bird Survey indicates that the Common Yellowthroat is declining. However, Massachusetts breeding bird atlases and earlier transect data of Craig (1987) indicate at most a nominal decline. Despite this decline, I found that populations continue to inhabit forest environments, particularly open swamps, but also areas where disturbance has occurred. Logging and natural disturbance seem likely to continue supplying suitable habitat for populations.

HOODED WARBLER

Setophaga citrina

Summer

Density (males/km^2): 1.07 (n = 92, 95% CI: ± 0.39)
CT: 1.01
RI: 1.32

Population (males): 9,717 (95% CI: ± 3,599)
CT: 7,610
RI: 2,107

Density.- The Hooded Warbler appeared on 26% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in southeastern Connecticut and least in northeastern Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a concave increase in U.S. populations (trend = 1.45, n = 985, %CV = 25.3; Kendall's τ = 0.88, n = 48, P < 0.001). In contrast, Northeastern populations showed a weak, nearly linear decline (trend = −0.85, n = 62, %CV = 12.4; Kendall's τ = −0.91, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 17−31% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported no birds. Elsewhere, densities range from 7−70 males/km^2 (Evans-Ogden and Stutchbury 1994).

Habitat.- Individual Hooded Warblers inhabited forests more deciduous than would be predicted from habitat availability, although they otherwise used habitats in about the proportions at which they were present (Table 2). They appeared on too few transects to assess population densities vs. habitat variables.

Elsewhere, the species is reported to inhabit forest edge, tree fall gaps and selectively logged forests that have developed a dense shrub layer. Mesic, deciduous forest appears to be preferred. Although thought to be a forest gap species, greatest populations are found in more extensive forests (Evans-Ogden and Stutchbury 1994).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.26		2.20			
2003−2008	0.18	0.57	1.82	1.02	1.38	1.32

TABLE 2. Habitat availability vs. use for individual Hooded Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 48. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.12	2.10	2.22	1.98	2.44	2.48	139.3
$P(U)$	<0.01*	0.16	0.73	0.91	0.16	0.06	0.10

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	52.1	29.2	6.3	2.1	0.0	10.4

History.- The Hooded Warbler was thought to be a fairly common breeder of southern Connecticut by Sage et al. (1913). However, Howe and Sturtevant (1899) knew it from only a single Rhode Island specimen.

It appears to have expanded its range in Connecticut since the mid-20th century (Zeranski and Baptist 1990), and first nested in Rhode Island in 1934 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at only 0.3% of survey blocks solely in southeastern Massachusetts (Fernandez and Fernandez 2003). In the 1980s, it was definite or probable at 11.6% of blocks primarily in southern Connecticut (Szantyr 1994). It was also definite or probable at 6.1% of blocks in southern Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 0.9% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Hooded Warbler is an uncommon and local breeder in the forests of southern New England. Higher densities found in southern and lowland portions of the study area are consistent with historical distributions and appear related to the species being near its northern range limit in southern New England (Evans-Ogden and Stutchbury 1994). Given the modest variance recorded in duplicated eastern Connecticut data, these regional differences appear real.

The observed association of the Hooded Warbler with deciduous forest is consistent with other reports of habitat affiliation. Its lack of association with forest openings or denser understories differs from other reports, however.

Conservation.- The Breeding Bird Survey and duplicated eastern Connecticut data indicate that the Hooded Warbler is undergoing a weak decline in southern New England. Massachusetts breeding bird atlases, in contrast, suggest a small increase, which may illustrate that distributions and survey effort are too confounded in atlas data to draw conclusions about population trends.

Sponsored by Aaron Dollar

AMERICAN REDSTART

Setophaga ruticilla

Summer

Density (males/km^2): 7.47 (n = 382, 95% CI: ± 2.01)
CT: 8.44
RI: 2.88
Population (males): 68,130 (95% CI: ± 18,275)
CT: 63,537
RI: 4,593

Density.- The American Redstart appeared on 60% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northwestern Connecticut and least in Rhode Island (Kruskal-Wallis χ^2 = 14.3, n = 147, P = 0.014; Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −1.43, n = 1410, %CV = 22.8; Kendall's τ = −0.92, n = 48, P < 0.001). Northeastern populations showed a weaker concave decline (trend = −0.57, n = 106, %CV = 9.35; Kendall's τ = −0.83, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 14−34% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) found 4.3 birds/km^2. Plot studies in young forests and old fields have shown densities of 30−43 birds/km^2 for Connecticut (Ellison 1994c). Elsewhere, densities of 50−440 birds/km^2 have been reported (Sherry and Holmes 1997).

Habitat.- Individual American Redstarts inhabited forests more deciduous, mesic, open-canopied and denser understoried than would be predicted from habitat availability. This relationship was reflected in their much more frequent presence in mixed deciduous forests and less frequent presence in conifer-containing forests (Table 2). Population densities were greatest in more deciduous, open canopied, mesic forests (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	6.79		8.76			
2003−2008	4.48	13.41	7.51	7.51	6.61	2.89
Rank	66.6	93.7	81.8	77.1	69.8	55.6

TABLE 2. Habitat availability vs. use for individual American Redstarts. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 309. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.12	2.04	2.08	2.00	2.39	2.46	182.0
$P(U)$	<0.01*	0.06	<0.01*	0.20	<0.01*	<0.01*	0.51

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	41.1	43.7	6.8	1.0	1.0	6.5

I typically found birds associated with forest gaps. Elsewhere, the species is associated with more deciduous, mesic forests with more open canopies and denser

TABLE 3. Summer population densities vs. habitat characteristics for American Redstarts. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.20	−0.11	−0.23	0.05	−0.12	0.04	0.05
P	<0.01*	0.08	<0.01*	0.46	0.07	0.52	0.42

understories (Sherry and Holmes 1997).

History.- The American Redstart has been reported in Connecticut and Rhode Island as historically common (Howe and Sturtevant 1899, Sage et al. 1913) to abundant (Bent 1953), although more recently it has been described as uncommon (Zeranski and Baptist 1990). The species' comparative abundance before 1950 probably reflects its frequent occurrence in younger forest (Sherry and Holmes 1997). Such habitats developed rapidly from the 1920s to the 1950s as abandoned farmland succeeded to young forest (Ward and Barsky 2000).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 46.9% of survey blocks particularly in western Massachusetts (Meservey 2003e). In the 1980s, it was definite or probable at 63.1% of blocks throughout Connecticut (Ellison 1994c). It was also definite or probable at 40.6% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders had remained essentially stable at 46.6% of blocks, although it was less common in southeastern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The American Redstart is a fairly common breeder in the forests of southern New England. Densities are greatest by far in northwestern Connecticut and lowest in Rhode Island—patterns that in light of breeding bird atlas data and modest variance recorded in duplicated eastern Connecticut data appear to be real. These patterns are likely related to the species' avoidance of the comparatively xeric, coniferous forests found across Rhode Island and its affinity for the more mesic conditions found in mountainous northwestern Connecticut (Table 4).

My finding that the American Redstart is associated with more deciduous, mesic, open canopied, denser understoried forest is consistent with other reports. It may be characterized as a forest gap/ forest disturbance-related species, although it also has been characterized as being area-sensitive and preferring forest interior (see also Sherry and Holmes 1997).

Conservation.- Breeding Bird Survey and duplicated eastern Connecticut data indicate that populations are declining. Population declines in maturing forest have also been noted in northern New England (Sherry and Holmes 1997). However, densities computed here are similar to those of Craig (1987). Moreover, Massachusetts breeding bird atlases also suggest no population change. In light of the weak decline reported for the Northeast overall, population patterns at more local levels may be complex.

CERULEAN WARBLER

Setophaga cerulea

Summer

Density (males/km^2): 0.68 (n = 43, 95% CI: ± 0.56)
CT: 0.83
RI: 0.00

Population (males): 6,229 (95% CI: ± 5,088)
CT: 6,229
RI: 0

Density.- The Cerulean Warbler appeared on only 5% of summer transects, with population estimates based on detections of singing males. Although detections were below the recommended 60, the data fit a detection function well, so I report my tentative density estimates here. I found birds only in eastern and northwestern Connecticut, with greatest densities consistently occurring in southeastern Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −2.91, n = 432, %CV = 44.4; Kendall's $\tau = -0.96$, $n = 48$, $P < 0.001$). A small sample from northeastern populations showed an increase, however (trend = 2.91, n = 7, %CV = 45.5; Kendall's $\tau = 0.77$, $n = 48$, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 20−38% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) found no birds, although he found an individual immediately outside a transect (R. Craig pers. obs.). Moreover, in 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found Cerulean Warblers at 5% of sites, compared with 15% of (in many instances the same) sites in this study. Elsewhere, studies have found mean densities on Breeding Bird Census plots to be 43 ± 42 pairs/km^2. Maximum densities of 82−290 pairs/km^2 were reported for such plots (Hamel 2000).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.22		1.65			
2003−2008	0.76	1.13	1.98	0.00	0.00	0.00

TABLE 2. Habitat availability vs. use for individual Cerulean Warblers. n = 24. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.13	2.46	2.00	1.75	2.79	2.19	167.4

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	87.5	12.5	0.0	0.0	0.0	0.0

Habitat.- Limited data from individual Cerulean Warblers indicated that they inhabited primarily oak-dominated and mixed deciduous forests, although they were also present in conifer-hardwood associations. Forests were typically more mesic, closed canopied and with more open understories than would be predicted from habitat availability (Table 2).

Elsewhere, extensive tracts of mesic, mature, deciduous forests with open understories are occupied. Historically, large populations have been reported from old growth bottomland forests (Hamel 2000).

History.- Sage et al. (1913) thought that the Cerulean Warbler was a possible summer resident in Connecticut, although it did not appear to begin nesting there until the 1930s (Zeranski and Baptist 1990). Howe and Sturtevant (1899) knew it from Rhode Island only as an accidentally-occurring species, with nesting not confirmed there until 1986 (Enser 1992). It was still considered a rare and local Connecticut breeder into the 1990s (Ellison 1994d).

Breeding bird atlas data showed that in the 1970s, the species was unknown as a Massachusetts breeder (Walsh and Peterson 2013). In the 1980s, it was definite or probable at 3.4% of blocks mostly in western and eastern Connecticut (Ellison 1994d). It was also definite or probable at 1.2% of blocks in western Rhode Island (Enser 1992). By the 2000s, breeders had increased to 0.9% of blocks mostly in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Cerulean Warbler is a very uncommon and local breeder in regional forests. Its distribution during this study appears to be the same as it was in the 1980s (Ellison 1994d), with a center of abundance continuing to be southeastern Connecticut. The modest absolute variance recorded in duplicated eastern Connecticut data suggests that populations are reasonably stable. Observations of habitat use are consistent with reports from elsewhere, with birds appearing to occupy more deciduous, mesic, closed canopy forests with more open understories.

Conservation.- Even though data from the Breeding Bird Survey indicate significant continental population declines for the Cerulean Warbler, limited evidence from Northeastern surveys suggest substantial population increases. Similarly, evidence from long term distributional surveys in eastern Connecticut (R. Craig pers. obs.) suggests that a population expansion has occurred since the 1970s. Population growth has also been noted for southern Ontario (Oliarnyk and Robertson 1996). Forest fragmentation has been associated with regional population declines (Hamel 2000) but forests in southern New England are maturing (Alerich 1999, 2000).

Sponsored by Anthony Zemba

NORTHERN PARULA
Setophaga americana

Density.- The Northern Parula was a rare summer inhabitant of southern New England forests. I found only two summering birds, both in coastal Rhode Island, although several clear migrants were also present on another transect. Because of the species' rarity, I make no population estimate for the region.

Population variance.- Breeding Bird Survey data showed a small concave decrease, ending about 1986, followed by an increase in U.S. populations (trend = 0.36, n = 1431, %CV = 8.3; Kendall's $\tau = 0.37$, n = 48, $P < 0.001$). Northeastern populations showed a nearly linear increase (trend = 1.11, n = 69, %CV = 16.1; Kendall's $\tau = 0.86$, n = 48, $P < 0.001$).

On line transects through northeastern Connecticut, Craig (1987) reported no birds. Elsewhere in the Northeast, Vermont densities are reported to be 44.4 birds/km^2 (Moldenhauer and Regelski 1996).

Habitat.- My two observations of individual Northern Parulas occurred in open, mesic, deciduous coastal forest with a dense understory of briars and with abundant *Usnea* lichens on tree branches.

Elsewhere in the northern part of its range, the species is reported from particularly mature, moist conifer forest in which *Usnea* is abundant. It is also present in hardwoods of moderate age and presence is positively related to canopy cover and tree density (Moldenhauer and Regelski 1996).

History.- The Northern Parula was more common as a Connecticut nester in the 19th century (Sage et al. 1913). Howe and Sturtevant (1899) described it as a local Rhode Island nester, particularly in coastal areas. Since 1900, its breeding range has receded northward (Zeranski and Baptist 1990). The pollution sensitive *Usnea* lichen largely disappeared from this region in the early 20th century as local air pollution levels rose and this is thought to have eliminated local breeding populations (Bull 1974).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 1.0% of survey blocks in southeastern Massachusetts (Pease 2003). In the 1980s, it was definite or probable at 1.0% of blocks in eastern and western Connecticut (Clark 1994zf). It was also definite or probable at 1.2% of blocks in western Rhode Island (Enser 1992). By the 2000s, breeders were at 0.9 blocks in southeastern and western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The northern population of the Northern Parula is at its southern range limit in southern New England (Moldenhauer and Regelski 1996). My few observations of habitat use are typical for the species in that birds are present in mesic woods with abundant *Usnea*. However, its local association with open forest appears atypical.

Conservation.- Breeding Bird Survey data indicate that populations are presently increasing. As *Usnea* reclaims habitats in southern New England, the species appears to be extending its range south from northern New England.

MAGNOLIA WARBLER

Setophaga magnolia

Summer

Density (males/km^2): 0.96 ($n = 23$, 95% CI: ± 0.73)
CT: 1.16
RI: 0.00

Population (males): 8,716 (95% CI: ± 6,648)
CT: 8,716
RI: 0

Density.- The Magnolia Warbler appeared on 10% of summer transects. Although detections were below the recommended 60, the data fit a detection function well, so I report my tentative density estimates here. Estimates are based on detections of singing males and refer only to that portion of the population inhabiting primarily forested landscapes. Densities averaged greatest in more mountainous northwestern Connecticut, although no clear distributional patterns emerged (Table 1).

During the survey period, I found a single wintering bird near a Connecticut transect in a coastal scrub thicket. I consider this bird to be of accidental occurrence, so make no winter population estimate for the species.

Population variance.- Breeding Bird Survey data showed a weakly concave and somewhat cyclic increase in U.S. populations (trend = 0.14, $n = 397$, %CV = 9.6; power function $r^2 = 0.30$, df = 47, $P < 0.001$). Northeastern populations showed a weak, nearly linear decline, however (trend = −0.51, $n = 18$, %CV = 58.3; Kendall's $\tau = -0.43$, $n = 48$, $P < 0.001$).

Craig (1987) reported no birds on line transects through northeastern Connecticut, although summering individuals were present in the study area (R. Craig pers. obs.). Elsewhere, densities vary from 12−131 males/km^2 in preferred habitat (Hall 1994).

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.00		1.18			
2003−2008	0.54	3.79	0.29	0.00	0.28	0.00

TABLE 2. Habitat availability vs. use for individual Magnolia Warblers. $n = 20$. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.65	2.50	2.10	2.00	2.60	1.93	273.0

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	25.0	15.0	55.0	0.0	5.0	0.0

Habitat.- Observations of individual Magnolia Warblers showed that they tended to inhabit higher elevation forests that were more coniferous, mesic and open understoried than would be predicted from habitat availability. They were associated particularly with conifer-hardwoods (Table 2).

Summering birds occurred in such typical habitats as logged-over forests grown up to shrubs and conifer-containing old fields. However, they also occurred in mature, mesic, conifer-hardwood and even oak-dominated forest. I incidentally observed birds in abandoned Christmas tree plantations.

Elsewhere, the species appears most abundant in young, dense conifer-dominated forests and in conifer-dominated old fields. However, it also is found in mature, mixed and conifer forests with typically dense understories (Hall 1994).

History.- The Magnolia Warbler was unknown to Howe and Sturtevant (1899) as a Rhode Island breeder and Sage et al. (1913) reported possible breeders only from northwestern Connecticut. During the 20th century, it appeared to expand its breeding range south (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 11.8% of survey blocks in western Massachusetts (Meservey 2003f). In the 1980s, it was definite or probable at 4.9% of blocks primarily in more mountainous parts of northern Connecticut (Clark 1994zg). It was a possible breeder at one block in northwestern Rhode Island (Enser 1992). By the 2000s, breeders declined slightly to 10.1% of blocks primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Magnolia Warbler is very uncommon in the forests of southern New England. Breeding densities reported here are well below those reported for preferred habitats elsewhere. The species' greatest densities by far, even in light of considerable variation recorded in duplicated eastern Connecticut observations, are in mountainous northwestern Connecticut. This northern association corresponds to being near its southern range limit in southern New England (Hall 1994). Populations of many species decline toward their range limit (Brown 1984, Pulliam 1988).

My few observations of habitat use suggest that the species uses both of its traditionally known habitats—primarily coniferous successional habitats and mature mixed conifer-hardwood forests. Its tendency to occur at higher elevations appears related to its more northerly distribution. Its occasional occurrence in deciduous habitats is atypical and may relate to it being near its southern range limit—a situation in which species sometimes occupy suboptimal habitat (Thompson and Nolan 1973)

Conservation.- Breeding Bird Survey data and Massachusetts breeding bird atlases demonstrate that the Magnolia Warbler is declining in southern New England. As a species associated in part with successional habitats, its presence at any one location may be ephemeral, so as forests mature (Ward and Barsky 2000) populations may decline. However, because birds can also use mature forests, populations should persist in this region.

BLACKBURNIAN WARBLER
Setophaga fusca

Summer

Density (males/km^2): 6.70 (n = 98, 95% CI: ± 2.91)
CT: 8.01
RI: 0.46

Population (males): 61,029 (95% CI: ± 26,513)
CT: 60,290
RI: 739

Density.- The Blackburnian Warbler appeared on 22% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in more mountainous portions of particularly northwestern Connecticut and least in lowlands and Rhode Island (Table 1).

Population variance.- Breeding Bird Survey data showed little trend in U.S. populations (trend = 0.04, n = 435, %CV = 4.1; quadratic r^2 = 0.02, df = 47, P = 0.42). Northeastern populations, however, showed a nearly linear decline (trend = −2.16, n = 20, %CV = 34.0; Kendall's $\tau = -0.77$, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 0−100% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 28.2 ± 23.2 birds/km^2. Elsewhere, populations are reported to vary from 30 to 170 pairs/km^2 (Morse 1994).

Habitat.- Individual Blackburnian Warblers used higher elevation, more coniferous, mature, closed canopied, open understoried forests than would be predicted from habitat availability. Birds often inhabited pure coniferous stands of white pine and hemlock. Birds occurred at too few transects for us to examine populations vs. habitat factors.

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	7.44		0.00			
2003−2008	7.44	25.03	2.01	0.67	0.97	0.46

TABLE 2. Habitat availability vs. use for individual Blackburnian Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 98. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.24	4.19	2.15	2.04	2.79	1.95	272.8
$P(U)$	<0.01*	<0.01*	0.04	0.01*	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	2.0	6.1	43.9	10.2	31.6	6.1

Elsewhere, the species is reported to inhabit mature coniferous and mixed conifer-deciduous forest, although some birds occur in deciduous forest near their southern range limit. Spruces, hemlocks and pines are used in the Northeast in both upland and swamp forests (Morse 1994).

History.- The Blackburnian Warbler was thought to be a rare summer resident by Sage et al. (1913). Howe and Sturtevant (1899) did not report it breeding in Rhode Island, but it was a regular nester there by the 1940s (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 22.8% of survey blocks in northern and western Massachusetts (Meservey 2003g). In the 1980s, it was definite or probable at 8.9% of blocks primarily in more mountainous parts of northern Connecticut (Clark 1994zh). It was also definite or probable at 3.0% of block in primarily western Rhode Island (Enser 1992). By the 2000s, Massachusetts populations appeared to remain essentially the same, occurring at 21.2% of blocks still primarily in the western part of the state (Walsh and Peterson 2013).

Synthesis.- The Blackburnian Warbler is a locally common breeder in suitable conifer forests in southern New England. Its predominance in particularly northwestern Connecticut is apparently related to its principally boreal distribution (Morse 1994). Data of Clark (1994ze) and modest variance recorded for duplicated eastern Connecticut surveys suggests that this pattern is real.

The observed association of the Blackburnian Warbler with coniferous cover is consistent with other reports of habitat affiliation. Its occurrence in more mesic forests with larger trees and little understory is a consequence of its affiliation with particularly hemlock groves, which are prevalent in mesic cove sites along streams. Hemlock stands typically have little understory. Moreover, because hemlocks are not actively harvested, many of southern New England's hemlock stands have attained characteristics of old growth forest and contain among the largest trees in the region. The species' association with higher elevations appears related to its principally more northerly distribution.

Conservation.- Breeding Bird Survey data indicate that populations are declining, although Massachusetts breeding bird atlases show only a nominal decline. Indeed, my qualitative impression is that birds were less common during this study than they had been two decades earlier (R. Craig pers. obs.). Earlier transect studies of Craig (1987) found higher densities than in this study, although in this case this was likely due in large part to the study being conducted in the heart of the species' local range, where it was most abundant.

CHESTNUT-SIDED WARBLER

Setophaga pensylvanica

Summer

Density (males/km^2): 1.52 (n = 94, 95% CI: ± 0.55)
CT: 1.44
RI: 1.91

Population (males): 13,880 (95% CI: ± 5,008)
CT: 10,847
RI: 3,033

Density.- The Chestnut-sided Warbler appeared on 30% of summer transects. Population estimates are based on detections of singing males and refer only to that portion of the population inhabiting primarily forested landscapes.

Summer densities averaged greatest in more mountainous, northern portions of the study area and least in lowlands, although birds were present in Rhode Island in numbers similar to those for northern areas (Kruskal-Wallis χ^2 = 16.7, n = 147, P = 0.01; Table 1).

Population variance.- Breeding Bird Survey data showed a concave decrease in U.S. populations (trend = −0.92, n = 746, %CV = 13.2; Kendall's τ = −0.91, n = 48, P < 0.001). Northeastern populations showed a steeper concave decline (trend = −2.60, n = 57, %CV = 36.7; Kendall's τ = −0.98, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 35−73% summer increase in numbers between sampling periods. On line transects through northeastern Connecticut, Craig (1987) incidentally detected the species but did not compute densities. Elsewhere, populations are reported to vary depending on successional stage. Population estimates include 68−280 males/km^2 in West Virginia open woodlands and 37−50 pairs/km^2 in Vermont successional habitats (Richardson and Brauning 1995).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.67		0.52			
2003−2008	2.26	3.10	0.90	0.69	0.25	1.91
Rank	86.5	85.9	68.9	62.4	57.6	78.1

TABLE 2. Habitat availability vs. use for individual Chestnut-sided Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 53. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.38	2.28	2.21	1.90	1.92	2.58	235.1
$P(U)$	0.66	0.75	0.55	<0.01*	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	37.7	26.4	24.5	3.8	3.8	3.8

Habitat.- Observations of habitat use by individual Chestnut-sided Warblers showed that they inhabited higher elevation forests of smaller trees, more open canopies and denser understories than would be predicted from habitat availability (Table 2). I typically found birds occupying selectively logged areas, clearcuts, early successional woodlands, edges of beaver swamps and old fields with invading pines and redcedars.

Elsewhere, the species is reported to inhabit early successional habitats with either mesic or xeric conditions. It probably was originally restricted to areas disturbed by forest fires, beaver activity and storms (Richardson and Brauning 1995).

History.- Sage et al. (1913) found the Chestnut-sided Warbler to be most common in northern Connecticut. Howe and Sturtevant (1899) described it as common in Rhode Island. A primarily northern species, it expanded its populations south after the deforestation of the East in the late 18th and early 19th centuries (Zeranski and Baptist 1990, Richardson and Brauning 1995).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 47.1% of survey blocks primarily in western Massachusetts (Meservey 2003h). In the 1980s, it was definite or probable at 44.8% of blocks primarily away from Connecticut lowlands (Clark 1994zi). It was also definite or probable at 27.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders declined slightly to 42.1% of blocks primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Chestnut-sided Warbler is uncommon in the forests of southern New England. Breeding densities reported here are well below those found for preferred habitats elsewhere. The species' greatest densities in mountainous northwestern Connecticut are likely related to it being near its southern range limit in southern New England (Richardson and Brauning 1995). Populations of many species decline toward their range limit (Brown 1984, Pulliam 1988), so would be expected to be lower away from this more northern location. However, its comparatively high densities in Rhode Island may be related to the high cover by conifers there, suggesting that geography and habitat interact to produce distributions.

Like the Blue-winged Warbler, the Chestnut-sided Warbler appears even in comparatively small forest openings caused by selective logging or other disturbance. My observation of the species inhabiting more open, younger forests with denser understories is consistent with other reports. Its association with higher elevations appears related to its more northerly distribution.

Conservation.- As with other species associated with successional environments, Breeding Bird Survey data demonstrate that the Chestnut-sided Warbler is declining regionally as forests mature and urbanization occurs. Massachusetts breeding bird atlases similarly show a slight decline in distribution, although duplicated eastern Connecticut data contradict this trend.

Despite any decline, I found that populations continue to inhabit forests where disturbance has occurred. Regional timber management practices and natural disturbances may be sufficient to sustain populations in this region.

BLACK-THROATED BLUE WARBLER

Setophaga caerulescens

Summer

Density (males/km^2): 4.76 (*n* = 213, 95% CI: ± 1.61)
CT: 5.59
RI: 0.84

Population (males): 43,383 (95% CI: ± 14,653)
CT: 42,050
RI: 1,333

Density.- The Black-throated Blue Warbler appeared on 31% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in more mountainous portions of particularly northwestern Connecticut and least in southeastern Connecticut (Kruskal-Wallis χ^2 = 83.7, *n* = 147, *P* = 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a weakly concave increase in U.S. populations (trend = 0.12, *n* = 399, %CV = 8.5; power function r^2 = 0.43, df = 47, *P* < 0.001). Northeastern populations showed an essentially linear but non-significant decline, however (trend = −0.40, *n* = 22, %CV = 8.7; Kendall's τ = −0.29, *n* = 48, *P* = 0.08).

Duplicated density estimates for eastern Connecticut showed a 0−9% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 9.2 birds/km^2. Moreover, at 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found only 16% with Black-throated Blue Warblers, compared with 42% of the (in many cases same) sites surveyed in this study. In the heart of its breeding range in New Hampshire, populations vary from 10−90 pairs/km^2, depending on habitat quality (Holmes 1994).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	3.63		0.00			
2003−2008	3.32	19.45	0.00	0.81	0.58	0.84
Rank	74.3	125.6	53.5	67.2	58.6	58.9

TABLE 2. Habitat availability vs. use for individual Black-throated Blue Warblers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 142. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.40	2.20	2.11	2.01	2.65	2.50	314.0
P(*U*)	0.28	0.85	<0.01*	0.10	0.04	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	43.0	18.3	31.7	0.0	4.2	7.4

Habitat.- Individual Black-throated Blue Warblers used higher elevation forests that were more mesic and denser understoried than would be predicted from habitat availability. Birds also tended to occupy more closed canopy, conifer-northern hardwood forests (Table 2). The association

TABLE 3. Summer population densities vs. habitat characteristics for Black-throated Blue Warblers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.20	0.10	−0.14	0.15	−0.01	−0.07	0.52
P	<0.01*	0.13	0.03	0.03	0.83	0.26	<0.01*

with dense understories was largely a function of the species' close association with Mountain Laurel thickets. Populations similarly showed a tendency to be greater in mesic habitats, although they significantly increased only with greater conifer cover and elevation (Table 3).

Elsewhere, unbroken tracts of particularly conifer-northern hardwood forests are occupied. A dense, deciduous or evergreen forest understory is also typically present (Holmes 1994).

History.- Sage et al. (1913) considered the Black-throated Blue Warbler to be a common breeder in northwestern Connecticut. Howe and Sturtevant (1899) knew it only as a Rhode Island migrant, however. Populations appear to have increased in southern New England since the late 19th century (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 25.0% of survey blocks in western Massachusetts (Meservey 2003i). In the 1980s, it was definite or probable at 11.4% of blocks primarily in more mountainous parts of northern Connecticut (Petit 1994). It was not known to breed in Rhode Island (Enser 1992). By the 2000s, breeders had increased to 31.4% of blocks, still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Black-throated Blue Warbler is uncommon to locally common in the forests of southern New England. Breeding densities found here are at the lower end of those reported from the heart of the species' range, although they are similar to those reported by Craig (1987). The species' declining densities away from mountainous northwestern Connecticut, corroborated by its low variance on duplicated eastern Connecticut surveys, appear related to it being near its southern range limit in southern New England (Holmes 1994).

Observations of habitat use demonstrate that birds are typically associated with higher elevation, mesic, conifer-northern hardwood forests with dense understories. This is consistent with reports from elsewhere, although whether the scale of observation is individuals or populations influences the type of pattern uncovered. The species now also occurs occasionally even in oak-dominated forests, suggesting that as populations expand, birds are moving into suboptimal habitats.

Conservation.- Even though data from the Breeding Bird Survey, Craig (1987) and duplicated data from eastern Connecticut do not indicate an appreciable regional change in populations, evidence from Massachusetts breeding bird atlases and long term distributional surveys in eastern Connecticut (R. Craig pers. obs.) suggests that a range expansion has occurred since the 1970s. Any such expansion is likely related to the maturation of regional forests (Ward and Barsky 2000).

Sponsored by Heath Drury Boote

PINE WARBLER
Setophaga pinus

Summer

Density (males/km^2): 10.37 (n = 396, 95% CI: ± 3.06)
CT: 7.60
RI: 23.46

Population (males): 94,507 (95% CI: ± 27,926)
CT: 57,191
RI: 37,316

Density.- The Pine Warbler appeared on 50% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in Rhode Island and least in southwestern Connecticut (Kruskal-Wallis χ^2 = 21.8, n = 147, P = 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a nearly linear, possibly five year cyclic increase in U.S. populations (trend = 1.04, n = 1238, %CV = 17.5; Kendall's τ = 0.71, n = 48, P < 0.001). Northeastern populations showed a concave, possibly cyclic increase (trend = 2.01, n = 122, %CV = 27.6; exponential r^2 = 0.96, df = 47, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 67−121% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported no birds. Moreover, at 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found only 5% with Pine Warblers, compared with 41% of the (in many cases same) sites surveyed in this study. Elsewhere, populations are reported as ranging from 0.7 to 254 birds/km^2, with densest populations often occurring in mature forests (Rodewald et al. 1999).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	7.76		2.80			
2003−2008	12.93	9.44	6.20	1.07	10.18	23.46
Rank	73.2	71.4	61.2	47.5	73.2	95.1

TABLE 2. Habitat availability vs. use for individual Pine Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 308. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.17	4.22	2.44	1.98	2.59	2.36	139.5
$P(U)$	<0.01*	<0.01*	<0.01*	0.78	0.36	0.55	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	7.1	3.2	24.4	30.8	29.2	5.2

Habitat.- Individual Pine Warblers inhabited more coniferous, xeric forests than would be predicted from habitat availability. They most frequently inhabited pine and pine-oak forests at lower elevations (Table 2). Comparison of population densities with habitat features similarly showed a significant relationship with increasingly coniferous, particularly pine and pine-oak cover. They also tended to be greatest in more xeric and lower elevation sites (Table

TABLE 3. Summer population densities vs. habitat characteristics for Pine Warblers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.50	0.45	0.15	−0.04	−0.10	0.09	−0.10
P	<0.01*	<0.01*	0.02	0.53	0.13	0.13	0.09

3). Elsewhere, the species is reported to inhabit young to mature pine forest, mixed pine-deciduous forest and even deciduous-dominated forests as long as some pines are present. (Rodewald et al. 1999).

History.- The Pine Warbler was thought to be a rare Connecticut breeder by Sage et al. (1913), although Howe and Sturtevant (1899) thought it common in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 13.7% of survey blocks particularly in southeastern Massachusetts (Bailey 2003). In the 1980s, it was definite or probable at 7.0% of blocks primarily in western and far eastern Connecticut (Clark 1994zj). It was also definite or probable at 26.7% of block in primarily western Rhode Island (Enser 1992). By the 2000s, breeders had exploded to 64.5% of blocks in all but extreme western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Pine Warbler is a fairly common breeder in conifer-dominated forests in southern New England. Even in light of variance uncovered in population estimates from duplicated eastern Connecticut surveys, the comparatively dense populations in Rhode Island appear real, as they are reported historically and reflect the abundance of pine-dominated forest there.

The Pine Warbler consists of two somewhat separate continental populations-one in the North and one in the Southeast. Based on distribution maps (Rodewald et al. 1999), the Rhode Island/ southeastern Connecticut population may be more closely associated with the southeastern population, whereas birds inhabiting more western regions may be more closely associated with northern populations.

The observed association of the Pine Warbler with coniferous cover is consistent with other reports of habitat affiliation. Its occurrence in more xeric forests is also typical for a species that so characteristically inhabits pine forests of the sandy coastal plain. These habitat associations also account for my observation that birds were concentrated in lowland habitats.

Conservation.- The Breeding Bird Survey, Massachusetts breeding bird atlases, duplicated eastern Connecticut data and historical data of R. Craig (pers. obs.) indicate that the Pine Warbler is undergoing a strong regional increase. Its earlier absence from line transects in northeastern Connecticut (Craig 1987) in areas where it is now present further corroborates this trend.

YELLOW-RUMPED WARBLER

Setophaga coronata

Summer

Density (males/km^2): 1.25 (*n* = 69, 95% CI: ± 0.49)
CT: 1.13
RI: 1.81
Population (males): 11,394 (95% CI: ± 4,442)
CT: 8,516
RI: 2,878

Winter

Density (birds/km^2): 0.63 (*n* = 22, 95% CI: ± 0.42)
CT: 0.36
RI: 1.89
Population (birds): 5,729 (95% CI: ± 3,843)
CT: 2,723
RI: 3,006

Density.- The Yellow-rumped Warbler appeared on 22% of summer and 7% of winter transects. Breeding population estimates are based on detections of singing males and winter estimates are based on those of calling birds in flocks. Breeding densities averaged greatest in more mountainous portions of particularly northwestern Connecticut and were largely absent in lowland areas, although the heavily coniferous forests of Rhode Island supported strong populations (Table 1).

I encountered wintering birds infrequently, but my few observations fit a detection function reasonably well, so I present my tentative estimates of winter density above. Birds were present exclusively in lowland areas, principally near the coast (Table 1), but I incidentally recorded winter birds even in northeastern Connecticut.

Population variance.- Breeding Bird Survey data showed a minimal decline in U.S. populations (trend = −0.03, *n* = 1017, %CV = 3.1; Kendall's τ = 0.29, *n* = 48, *P* = 0.004). Northeastern populations, in contrast, showed a weak, nearly linear increase,

TABLE 1. Summer (males/km^2) and winter (birds/km^2) population density estimates for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	1.45		0.13			
2003−2008	1.09	3.58	0.00	0.00	0.00	1.81
Winter						
2001−2003	0.00		2.28			
2003−2009	0.00	0.00	0.62	0.28	0.20	1.15

TABLE 2. Habitat availability vs. use for individual Yellow-rumped Warblers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. Summer *n* = 52, winter *n* = 14. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.12	3.79	2.33	1.99	2.56	2.16	264.1
P(*U*)	<0.01*	<0.01*	0.38	0.67	0.89	0.04	<0.01*
Winter use	1.07	1.34	2.64	1.96	2.36	2.54	102.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	9.6	13.5	34.6	7.7	0.0	34.6
Winter use	78.6	14.3	0.0	7.1	0.0	0.0

although sample size was small (trend = 1.00, n = 27, %CV = 14.6; Kendall's τ = 0.86, n = 48, $P < 0.001$). U.S. Christmas Counts showed a convex population increase peaking about 1995 followed by a decline (quadratic $r^2 = 0.34$, df = 47, $P < 0.001$, %CV = 21.9). New England populations showed a similar increase until about 1985 followed by a decline (quadratic $r^2 = 0.41$, df = 47, $P < 0.001$, %CV = 50.6).

Duplicated density estimates for eastern Connecticut showed a 25−100% summer decline in numbers between sampling periods, although absolute differences were small. In winter, densities declined 0−73%. On summer line transects through northeastern Connecticut, Craig (1987) reported 9.2 birds/km^2. Moreover, at 19 eastern Connecticut forests surveyed in the summers of 1975−1977, R. Craig (pers. obs.) found that only 5% of sites had Yellow-rumped Warblers, compared with 20% of the (in many instances same) sites surveyed in this study. Elsewhere, pairs/km^2 are reported to vary from 10 to 770 (Hunt and Flashpohler 1998).

Habitat.- Individual summering Yellow-rumped Warblers inhabited higher elevation forests that had significantly more coniferous cover—particularly conifer-northern hardwood, pine-oak and pine forest—than would be predicted from habitat availability. Birds also tended to inhabit forests with more open understories. More limited data on wintering birds suggested that they moved to principally deciduous, xeric, open, low elevation forests with denser understories (Table 2). The species occurred at too few transects to compare population densities with habitat characteristics.

Elsewhere, breeders are reported to inhabit mature coniferous and mixed conifer-deciduous forest. They are infrequent in young and deciduous forest. Predominant conifers used in the Northeast include spruces, firs and pines, with pines appearing to be less favored. Populations are largely unaffected by selective logging. In winter, birds inhabit more open forests and thickets that may be xeric and, in the north, locations where Bayberry—also known as myrtle (*Myrica pensylvanica*)—may be common (hence, the traditional name Myrtle Warbler; Hunt and Flashpohler 1998).

History.- The Yellow-rumped Warbler was not known as a Connecticut (Sage et al. 1913) or Rhode Island (Howe and Sturtevant 1899) breeder in the 19th century. It was first reported as likely nesting in Connecticut in 1936 (Zeranski and Baptist 1990) and confirmed nesting in Rhode Island in 1948 (Enser 1992). In winter, the species was known as regularly-occuring in Connecticut (Sage et al. 1913) and common in Rhode Island (Howe and Sturtevant 1899).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 20.9% of survey blocks in primarily western Massachusetts (Meservey 2003j). In the 1980s, it was definite or probable at 11.7% of blocks primarily in more mountainous parts of northern Connecticut (Clark 1994zk). It was also definite or probable at 4.8% of block in western Rhode Island (Enser 1992). By the 2000s, breeders increased slightly to 22.1% of blocks, still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Yellow-rumped Warbler is an uncommon breeder in the forests of southern New England, with densities well below those reported for elsewhere. In light of the Connecticut distribution reported by Clark (1994zd) and the moderate variance in duplicated eastern Connecticut data, the predominance of the species in higher elevations of northern Connecticut appears to be real. The species is near its southern range limit in southern New England (Hunt and Flashpohler 1998), and populations of other species also decline away from these northern-associated regions. However, its comparatively frequent occurrence in Rhode Island appears related to the extensive coniferous cover present there. Hence, geography and habitat appear to interact to produce the observed pattern of distribution in the study area.

The observed summer association of the Yellow-rumped Warbler with more coniferous forests is consistent with other reports of habitat use. Its dramatically different winter association with deciduous, open forests with denser understories is also typical for the species. Particularly in Rhode Island, open coastal forests with Bayberry thickets are used extensively in winter.

Conservation.- Breeding Bird Survey data, Massachusetts breeding bird atlases and long term data of R. Craig demonstrate that the species is undergoing a long term increase in southern New England, although duplicated data from eastern Connecticut contradict this trend. Earlier transect studies of Craig (1987) found higher densities than in this study and so also appear to contradict the trend, although this study was conducted in the heart of the species' local range, where it was most abundant. Winter populations, in contrast, appear to have been declining for the past 20 years, although the observed pattern from Christmas counts suggests that long-term population cycles may occur, perhaps related in part to patterns in winter weather.

PRAIRIE WARBLER

Setophaga discolor

Summer

Density (males/km^2): 0.38 (n = 71, 95% CI: ± 0.17)
CT: 0.40
RI: 0.28
Population (males): 3,484 (95% CI: ± 1,562)
CT: 3,035
RI: 449

Density.- The Prairie Warbler appeared on 25% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in southeastern and southwestern Connecticut and least in northwestern Connecticut (Table 1). Because the Prairie Warbler inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −1.96, n = 1125, %CV = 30.3; power function r^2 = 0.94, df = 47, P < 0.001). Northeastern populations showed a steeper concave decline (trend = −4.10, n = 120, %CV = 59.5; power function r^2 = 0.99, df = 47, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 30−33% decline between sampling periods. On line transects through the northeastern Connecticut, Craig (1987) reported no birds in the largely unbroken forests surveyed. Elsewhere, populations vary depending on successional stage. Densities in successional habitats are reported as 51−268 territories/km^2 (Moore 1980). In open woodlands, they vary from 31 to 48 pairs/km^2. In Connecticut brushy pastures, 28−85 pairs/km^2 have been found (Nolan et al. 1999).

Habitat.- My limited observations of habitat use by individual Prairie Warblers indicated that they inhabited lower elevation forests that were more deciduous, xeric, with smaller trees, more open canopies and denser understories than would be predicted from habitat availability (Table 2). Birds were typically present in selectively logged areas, clearcuts, power line right-of-ways, early successional woodlands and scrubby, open pine-oak barrens. Populations occurred at too few transects to compare densities with habitat variables.

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.42		1.02			
2003−2008	0.28	0.04	0.71	0.68	0.24	0.28

TABLE 2. Habitat availability vs. use for individual Prairie Warblers. n = 18. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.17	2.17	2.50	1.75	2.06	2.64	146.9

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	66.7	5.6	5.6	11.1	0.0	11.1

Elsewhere, the species occurs in a variety of habitats. In our region, typical habitats include shrublands with open canopies, old fields and early to mid-successional woodlands. Xeric, scrubby, pine-oak habitats are often favored (Nolan et al. 1999).

History.- The Prairie Warbler, a primarily southeastern species, expanded its populations north after the deforestation of the East in the late 18th and early 19th century (Nolan et al. 1999). Sage et al. (1913) already considered it common in southern Connecticut, but it continued to extend its populations north after this time (Clark 1994zg). Howe and Sturtevant (1899) similarly described it as a locally common breeder in Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 32.4% of survey blocks particularly in eastern Massachusetts (Lloyd-Evans 2013). In the 1980s, it was definite or probable at 41.4% of blocks throughout Connecticut (Clark 1994zl). It was also definite or probable at 48.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, breeders had increased nominally to 36.6% of blocks in all but extreme western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Prairie Warbler is a very uncommon and local breeder in primarily forested landscapes. Its predominance in southern regions is consistent with the species' more southerly continental distribution. In light of the modest variance found in duplicated eastern Connecticut data, this pattern is likely real.

The Prairie Warbler may be described as an early to mid-successional species of more xeric habitats (Nolan et al. 1999). Hence, its association with more open, xeric, younger forests with dense understories is not surprising. Similarly, its occurrence at lower elevations is to be expected because of its more southerly continental distribution. Its association with principally deciduous habitats is less well reported. Despite the species' association with successional habitats, I found that particularly in southeastern Connecticut and Rhode Island it is more typical of open forest barrens than other earlier successional-related species. It is less associated with small forest openings and wetlands than species like the Blue-winged Warbler.

Conservation.- As with other species typical of successional environments, Breeding Bird Survey and duplicated eastern Connecticut data indicate that Prairie Warblers are declining as forests mature. Massachusetts breeding bird atlases contradict this regional trend, however, which suggests that breeding bird atlases may have data too confounded with survey effort to be consistently useful at detecting population trends.

Despite this apparent decline, I found that populations continue to inhabit forest environments where disturbance has occurred or where pine-oak barrens develop on dry, sandy soil. Logging and natural disturbance seem likely to continue to supply at least some suitable habitat. This and other successional species may be returning to population levels more historically characteristic for them.

BLACK-THROATED GREEN WARBLER

Setophaga virens

Summer

Density (males/km^2): 7.92 (n = 449, 95% CI: ± 1.77)
CT: 8.08
RI: 7.15

Population (males): 72,150 (95% CI: ± 16,129)
CT: 60,785
RI: 11,365

Density.- The Black-throated Green Warbler appeared on 57% of transects, with population estimates based on detections of singing males. Densities averaged greatest in more mountainous portions of particularly northwestern Connecticut and least in southern and central Connecticut (Kruskal-Wallis χ^2 = 27.1, n = 147, P = 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a nearly linear increase in U.S. populations (trend = 1.10, n = 619, %CV = 19.6; Kendall's τ= 0.78, n = 48, P < 0.001). Northeastern populations showed little trend, however (trend = −0.06, n = 44, %CV = 4.9; power function r^2 = 0.01, df = 47, P = 0.53).

Duplicated density estimates for eastern Connecticut showed a 23−25% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 27.5 ± 19.8 birds/km^2. Ellison (1994e) reported 25−63 pairs/km^2 from Connecticut plot studies. Elsewhere, densities are reported to range from 7 to 200 pairs/km^2 (Morse 1993).

Habitat.- Individual Black-throated Green Warblers inhabited higher elevation forests with significantly greater coniferous cover, soil moisture, canopy cover and lower understory density than would be predicted from habitat availability. They used especially conifer-hardwoods and conifers (Table 2). Examination of population density vs. habitat variables similarly showed relationships with greater conifer cover, larger trees, lower understory density and greater elevation. Populations also exhibited a tendency to occupy more mesic habitats

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	7.91		4.98			
2003−2008	9.70	17.42	3.73	4.06	3.05	7.15
Rank	81.5	105.6	61.3	63.1	55.4	71.2

TABLE 2. Habitat availability vs. use for individual Black-throated Green Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 347. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.00	3.44	2.12	2.00	2.73	1.98	219.6
$P(U)$	<0.01*	<0.01*	<0.01*	0.06	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	10.4	8.1	53.3	6.6	19.9	1.7

TABLE 3. Summer population densities vs. habitat characteristics for Black-throated Green Warblers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	2Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.56	0.37	−0.14	0.17	0.06	−0.15	0.24
P	<0.01*	<0.01*	0.02	0.01*	0.37	0.02	<0.01*

(Table 3).

Elsewhere, the species is reported to inhabit conifer forest, mixed conifer-hardwoods and at least on occasion pure hardwood forest. It occupies middle-aged to mature forest as well as coastal Pitch Pine forests and Eastern Redcedar-dominated old fields (Morse 1993).

History.- The Black-throated Green Warbler was known to Sage et al. (1913) as a common Connecticut breeder within its preferred hemlock forest habitat. Howe and Sturtevant (1899) similarly considered it to be a common Rhode Island breeder. However, Zeranski and Baptist (1990) speculated that it declined in Connecticut during the mid-20th century.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 32.5% of survey blocks in particularly western Massachusetts (Sorrie 2003a). In the 1980s, it was definite or probable at 17.3% of blocks primarily away from lowlands in Connecticut (Ellison 1994e). It was also definite or probable at 16.4% of blocks mostly in western Rhode Island (Enser 1992). By the 2000s, breeders increased to 38.0% of blocks still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Black-throated Green Warbler is a locally common breeder within suitable habitat in southern New England. Limited variance found in duplicated eastern Connecticut data and data of Ellison (1994e) suggest that the strong predominance of the species in northwestern Connecticut and lower density toward the coast is real. Higher densities in Rhode Island appear to be related to the state's favorable habitat of high conifer cover.

Computed densities are at the lower end of those reported for elsewhere because the species is not generally distributed across the landscape but rather occurs within primarily coniferous locations. Earlier transect studies of Craig (1987) similarly found higher densities than in this study, probably because this work was conducted in the heart of the species' local range.

The observed association of the Black-throated Green Warbler with coniferous cover is consistent with other reports of habitat affiliation. Its occurrence in more mesic forests with larger trees and little understory is a consequence of its association with particularly hemlock groves, which are prevalent in mesic cove sites and along streams. Hemlock stands also typically have little understory. Moreover, because hemlocks are not actively harvested, many of southern New England's hemlock stands have attained characteristics of old growth forest and contain among the largest trees in the region. The species' association with higher elevations appears related to its more northerly distribution (Morse 1993).

Conservation.- Data from the Breeding Bird Survey show that the Black-throated Green Warbler has no clear population trend in the Northeast. The species has been locally common in this region since the 19th century. However, as with many species, Massachusetts breeding bird atlases indicate a regional population increase. This may indicate that the confounding of counts and survey effort make interpretation of population trends from atlas data difficult. Populations are likely sensitive to forest fragmentation and the loss of hemlock due to insect infestations, which suggest that populations might decline in the future.

CANADA WARBLER
Cardellina canadensis

Summer
Density (males/km^2): 1.03 (n = 79, 95% CI: ± 0.34)
CT: 0.98
RI: 1.30
Population (males): 9,419 (95% CI: ± 3,120)
CT: 7,357
RI: 2,062

Density.- The Canada Warbler appeared on 24% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in northern Connecticut and least in central Connecticut (Table 1).

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −2.72, n = 406, %CV = 38.9; Kendall's $\tau = -0.97$, n = 48, $P < 0.001$). Northeastern populations showed a stronger concave decline (trend = −6.50, n = 31, %CV = 95.9; Kendall's $\tau = -0.95$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 30−83% decline between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 17.8 birds/km^2. Elsewhere, density has been reported to vary from 2.5−35 pairs/km^2 depending upon habitat conditions (Conway 1999).

Habitat.- Individual Canada Warblers inhabited higher elevation forests that were more coniferous, wetter and with more dense understories than would be predicted from habitat availability (Table 2). I most frequently encountered birds in conifer-dominated swamps, although they also were present in laurel thickets of upland forest. Populations occurred at too few transects to compare density vs. habitat use.

Elsewhere, the species is reported to breed in a wide range of deciduous and coniferous forests, although mesic, conifer-deciduous forests with dense understories appear to be favored. Coniferous and deciduous swamps are occupied as well. It is present in younger and mature forest, although evidence suggests that populations are greatest in the latter (Conway 1999).

History.- The Canada Warbler was reported by Sage et al. (1913) to be an

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = cetral CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.99		0.65			
2003−2008	1.40	2.04	0.11	0.43	0.00	1.30

TABLE 2. Habitat availability vs. use for individual Canada Warblers. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 44. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.59	3.07	1.94	1.93	2.53	2.64	246.3
$P(U)$	0.02	0.01*	<0.01*	0.39	0.98	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	27.3	20.5	27.3	2.3	11.4	11.4

uncommon breeder of primarily northwestern Connecticut. Howe and Sturtevant (1899) also reported it as rare, although summering individuals were present to the coast. Zeranski and Baptist (1990) asserted that populations in Connecticut increased during the 20th century as a consequence of forest expansion.

Breeding bird atlas data showed that in the 1970s, the species was a definite breeder at 26.1% of survey blocks throughout Massachusetts, although it occurred most frequently to the west (Smith 2003). In the 1980s, it was definite or probable at 18.0% of blocks primarily in more mountainous portions of northern Connecticut (Clark 1994zm). Remarkably, it was also definite or probable at 11.5% of blocks primarily in southern Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had decreased to 10.9% of blocks still primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The primarily boreal-distributed (Conway 1999) Canada Warbler is an uncommon and local breeder in the forests of southern New England. Even in light of substantial variance in duplicated eastern Connecticut data, this species' much greater densities in mountainous portions of northern Connecticut are apparently real, with data from breeding bird atlases corroborating these patterns. The higher densities found in Rhode Island are likely related to greater conifer cover there, and point out that both geographic and habitat factors interact to produce observed distributions.

The observed association of the Canada Warbler with more coniferous, mesic forests with denser understories is consistent with other reports of habitat affiliation. Its prevalence at higher elevations appears related to its principally more northern geographic distribution (Conway 1999).

Conservation.- Breeding Bird Survey, data of Craig (1987), duplicated eastern Connecticut data and Massachusetts breeding bird atlases indicate that Canada Warbler populations are undergoing a long-term decline. Ongoing forest fragmentation and a warming climate may be causing populations at the southern periphery of the range to decline and retreat northward.

EASTERN TOWHEE
Pipilo erythropthalmus

Summer

Density (males/km^2): 10.90 (n = 917, 95% CI: ± 1.91)
CT: 8.68
RI: 21.40

Population (males): 99,335 (95% CI: ± 17,406)
CT: 65,301
RI: 34,034

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	13.58		14.93			
2003−2008	15.05	5.17	13.34	4.94	4.67	21.40
Rank	95.2	53.2	83.3	45.3	50.4	109.4

TABLE 2. Habitat availability vs. use for individual Eastern Towhees. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 529 summer, 6 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.37	2.43	2.49	1.94	2.39	2.59	153.7
$P(U)$	0.79	0.51	<0.01*	<0.01*	<0.01*	<0.01*	0.03
Winter use							
	1.00	1.00	2.83	2.00	2.00	2.50	56.6

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	51.6	13.4	7.6	14.7	5.9	6.8
Winter use	100.0	0.0	0.0	0.0	0.0	0.0

Density.- The Eastern Towhee appeared on 73% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in eastern Connecticut and especially Rhode Island, and were uniformly much lower in western Connecticut (Kruskal-Wallis χ^2 = 49.4, n = 147, $P < 0.001$; Table 1).

I also encountered birds on 2% of winter transects in southeastern Connecticut and Rhode Island, particularly in coastal locations. From eight detected birds, I tentatively estimate a density of 0.14 birds/km^2 and total population of 3,327 for this season.

Population variance.- Breeding Bird Survey data showed a weak concave decline in U.S. populations (trend = −1.38, n = 1944, %CV = 20.9; Kendall's $\tau = -0.96$, n = 48, $P < 0.001$). Northeastern populations showed a stronger concave decline (trend = −5.26, n = 135, %CV = 83.7; Kendall's $\tau = -0.99$, n = 48, $P < 0.001$). Christmas Count data indicated a weak U.S. increase (Kendall's τ = 0.01, n = 30, P = 0.005, %CV = 9.7), but New England populations exhibited no significant trend (Kendall's τ = 0.08, n = 26, P = 0.58, %CV = 29.2).

Duplicated density estimates for eastern Connecticut showed an 11% change between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) reported 17.7 ± 17.7 birds/km^2. In New Hampshire, Holmes et al. (1986) found 61 ± 19 breeding birds/km^2. Densities to 200 males/km^2 are attained in pine barren habitats (Greenlaw 1996). Graber and Graber (1979) reported three-year mean

TABLE 3. Summer population densities vs. habitat characteristics for Eastern Towhees. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.08	<0.01	0.39	−0.17	−0.16	0.34	−0.07
P	0.19	0.99	<0.01*	0.01*	<0.01*	<0.01*	0.24

winter densities of 0.5–4.7 birds/km^2 in Illinois.

Habitat.- Individual summering Eastern Towhees inhabited forests that were more xeric and with smaller trees, more open canopies and denser understories than would be predicted from habitat availability (Table 2). Comparison of populations with habitat features showed that densities were greater in more xeric forests with more open canopies and denser understories (Table 3). My few winter observations suggested that birds moved to low elevations where they inhabited xeric, open-canopied, densely shrubby, oak-dominated forests.

Elsewhere, the species is reported to inhabit dense shrubs in either forests or mid- to late successional habitats. When in forest, those with an open canopy are typically chosen. Xeric environments appear favored, although it is also present in more mesic situations. Oak-hickory, mixed conifer-deciduous and coniferous habitats are used, but greatest densities are reported from pine barrens habitats (Greenlaw 1996).

History.- Sage et al. (1913) found the Eastern Towhee to be a common summer and rare winter resident of Connecticut. Howe and Sturtevant (1899) thought it to be a common summer resident of Rhode Island, and they also reported one winter record. Zeranski and Baptist (1990) asserted that population status had not changed appreciably since the 19th century, although this seems unlikely in light of the reforestation of the landscape since then.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 84.5% of blocks throughout Massachusetts (Brown 2003). In the 1980s, it was definite or probable at 84.4% of blocks throughout Connecticut (Proctor 1994b). It was also definite or probable at 70.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had decreased to 72.7% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Eastern Towhee is particularly common as a breeder in eastern portions of the study area—a relationship that appears related to the occurrence of widespread recessional moraines and glacial sand and gravel deposits in this area (Stone et al. 1999), which lead to the development of xeric habitats favored by the species. The small variance found between duplicated eastern Connecticut surveys substantiates this pattern.

The observed association of the Eastern Towhee with more open, xeric, shrubby habitats is consistent with other reports of habitat affiliation. Its winter associations appear rather similar to those of summer, except that its prevalence in coastal locations is likely related to the milder, less energetically expensive microclimates found there.

Conservation.- Breeding Bird Survey data and Massachusetts breeding bird atlases show that the Eastern Towhee is declining regionally, although findings of Craig (1987) suggest a small increase and duplicated eastern Connecticut data show little clear trend. The maturing forests of Connecticut (Ward and Barsky 2000) are likely responsible for any regional decline, because forest maturation eliminates successional habitats which the species occupies at high densities.

In winter, many species have shown increasing populations when southern New England is the northern periphery of the range. Although there is no present evidence for a winter increase, populations of Eastern Towhees should be monitored for long term change as climate warms.

TREE SPARROW

Spizelloides arborea

Density.- The Tree Sparrow appeared only 12 times on 4% of winter transects. I found birds in central, northwestern and southwestern Connecticut and Rhode Island. From my tiny sample, I tentatively estimate a winter density in primarily forested landscapes of 0.82 birds/km^2 and a total population of 9903 during the study period.

Population variance.- Christmas Counts showed a concave U.S. (Kendall's $\tau = -0.56$, $N = 48$, $P < 0.001$, %CV = 22.9) and New England (Kendall's $\tau = -0.58$, $N = 48$, $P < 0.001$, %CV = 29.8) decline, with numbers stabilizing since about 2000. I found no reports of winter densities other than that they are variable (Naugler 1993).

Habitat.- My small sample of individual wintering birds showed that they tended to occupy lower elevation forests that were more coniferous, mesic, and with more open understories than would be predicted from habitat availability (Table 1). Elsewhere, the species is principally associated with shrubby wetlands and wetland borders in winter (Naugler 1993).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) described the species as common to abundant winter visitor.

Synthesis.- The Tree Sparrow is a common wintering species within its preferred shrub swamp habitat, although it also ranges into adjacent upland forest. My few observations of habitat use suggest that birds moving into uplands favor lower elevation forests with more conifers.

Conservation.- The Tree Sparrow remains a common winter resident, although as with several other wintering species, it is declining in southern New England, perhaps as a consequence of birds wintering further north in response to a warming climate.

TABLE 1. Habitat availability vs. use for individual Tree Sparrows. *n* = 6. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.67	2.67	2.00	2.00	2.58	1.83	101.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	33.3	16.7	33.3	0.0	16.7	0.0

CHIPPING SPARROW
Spizella passerina

Summer

Density (males/km^2): 1.21 (n = 140, 95% CI: ± 0.26)
CT: 1.24
RI: 1.11

Population (males): 11,069 (95% CI: ± 2,376)
CT: 9,297
RI: 1,772

Density.- The Chipping Sparrow appeared on 51% of summer transects, with population estimates based on detections of singing males. Densities showed no clear regional pattern (Kruskal-Wallis χ^2 = 3.4, n = 147, P = 0.64; Table 1). Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Population variance.- Breeding Bird Survey data showed a weak linear increase in U.S. populations (trend = 0.07, n = 2903, %CV = 5.5; Kendall's τ = 0.42, n = 48, P < 0.001). Northeastern populations showed a stronger concave decline followed by increase, with a low reached about 1980 (trend = 0.41, n = 135, %CV = 13.6; Kendall's τ = 0.58, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 9−23% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 16.3 birds/km^2. I found no data for other populations in forested landscapes.

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	1.60		1.28			
2003−2008	1.46	0.97	1.58	1.51	0.87	1.11
Rank	79.6	68.9	82.7	74.1	65.8	73.5

TABLE 2. Habitat availability vs. use for individual Chipping Sparrows. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 65. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.69	3.17	2.31	2.00	2.17	2.20	167.3
$P(U)$	<0.01*	<0.01*	0.55	0.53	<0.01*	0.19	0.78

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	27.7	15.4	18.5	16.9	15.4	6.2

Habitat.- Observations of habitat use by individual Chipping Sparrows showed that they inhabited forests more coniferous and open than would be predicted from habitat availability (Table 2). Comparison of population densities with habitat features again showed a relationship with more coniferous forest (Table 3). I typically found birds in tree fall gaps, selectively logged areas and forest edge.

Elsewhere, the species is reported to inhabit forest openings, suburban habitats and river and pond borders. Particularly in northern portions of its range, it is associated with open, coniferous forest. Shrubbery is

TABLE 3. Summer population densities vs. habitat characteristics for Chipping Sparrows. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	0.17	0.17	0.01	0.07	−0.08	−0.01	0.01
P	0.01*	0.01*	0.93	0.34	0.23	0.94	0.84

generally an important habitat requirement throughout (Middleton 1998).

History.- The Chipping Sparrow has been known as a common to abundant summer resident in Connecticut and Rhode Island since the 19th century (Sage et al. 1913, Howe and Sturtevant 1899). Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 77.8% of blocks throughout Massachusetts (Walton 2003b). In the 1980s, it was definite or probable at 96.5% of blocks throughout Connecticut (Clark 1994zn). It was also definite or probable at 66.1% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 88.4% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Chipping Sparrow is an uncommon breeder in the forests of southern New England. Its lack of a regional density pattern is surprising in light of its strong relationship with conifers and more open landscapes, which are distributed non-uniformly through the study area. However, the modest variance in duplicated eastern Connecticut data suggest that this lack of pattern is real.

The species' observed trends toward inhabiting more open forests with greater coniferous cover is consistent with reports from elsewhere. It appears capable of using even small forest openings. However, I did not find any association with the greater shrub density that has been reported for other locations.

Conservation.- Breeding Bird Survey data and Massachusetts breeding bird atlases show that Chipping Sparrow populations are presently increasing, although Northeastern data suggest that population cycles may also occur. Because the species inhabits a variety of environments, it appears to be prospering despite the maturation of regional forests (Ward and Barsky 2000). However previous study by Craig (1987) in northeastern Connecticut indicate that numbers may have declined at least locally in these maturing forest landscapes.

FOX SPARROW
Passerella iliaca

Density.- The Fox Sparrow appeared only two times on winter transects in Rhode Island. I make no population estimate from this tiny sample.

Population variance.- Christmas Counts showed little pattern in U.S. (Kendall's $\tau = -0.05$, N = 48, $P = 0.60$, %CV = 17.9) populations but a concave New England decline, with numbers stabilizing or possibly increasing since about 1985 (Kendall's $\tau = -0.36$, N = 48, $P < 0.001$, %CV = 51.2). I found no reports of winter densities.

Habitat.- Two observations of habitat use showed that birds used open, mesic deciduous forest with dense understories. Elsewhere, the species is thought to prefer dense thickets and woodland borders, at least sometimes near wetlands (Weckstein et al. 2002).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) described the species as a common migrant but rare winter visitor in Rhode Island and Connecticut. Zeranski and Baptist (1990) considered it uncommon to rare in Connecticut.

Synthesis.- The Fox Sparrow is a generally rare wintering species that appears to use forest habitat only secondarily. My few observations of habitat use suggest that when birds occur in forest, they favor open, densely shrubby, mesic forest.

Conservation.- Although populations declined in earlier decades, they now may be stable in southern New England.

SONG SPARROW

Melospiza melodia

Summer

Density (males/km^2): 1.48 (*n* = 196, 95% CI: ± 0.48)
CT: 1.50
RI: 1.38

Population (males): 13,514 (95% CI: ± 4,381)
CT: 11,320
RI: 2,194

Winter

Density (birds/km^2): 1.62 (*n* = 28, 95% CI: ± 0.85)
CT: 1.54
RI: 1.97

Population (birds): 14,742 (95% CI: ± 7,715)
CT: 11,604
RI: 3,138

Density.- The Song Sparrow appeared on 47% of summer transects, with population estimates based on detections of singing males. Birds were also present on 13% of winter transects, with estimates at this season based on detections of all individuals encountered.

Summer densities were greatest in central Connecticut and least in northwestern Connecticut, although these regional differences were not significant (Kruskal-Wallis χ^2 = 4.0, *n* = 147, *P* = 0.56; Table 1). Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Winter density estimates are based on a sample of about half the 60 observations preferred for density estimation, but my data fit a detectability curve well, so I believe my density estimates are reasonable, albeit with high variance. Densities at this season tended to be greatest in lowland and coastal areas and least in northern, more mountainous locations, indicating a populat-

TABLE 1. Summer (males/km^2) and winter (birds/km^2) population density estimates and summer Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	1.49		1.49			
2003−2008	1.27	0.92	0.84	1.43	2.64	1.38
Rank	79.9	67.9	66.9	76.8	70.4	82.4
Winter						
2001−2003	0.39		1.71			
2003−2009	0.79	0.37	1.28	2.28	3.28	1.97

TABLE 2. Habitat availability vs. use for individual Song Sparrows. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 74 summer, 20 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.24	2.22	1.84	1.95	1.98	2.41	94.1
P(*U*)	0.12	0.34	<0.01*	0.15	<0.01*	0.15	<0.01*
Winter use	1.25	2.90	1.78	1.78	1.75	2.58	80.4

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	23.0	54.1	14.9	2.7	2.7	2.7
Winter use	10.0	50.0	25.0	0.0	0.0	15.0

TABLE 3. Summer population densities vs. habitat characteristics for Song Sparrows. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.06	0.05	−0.13	−0.09	−0.24	0.10	−0.21
P	0.39	0.42	0.05	0.21	<0.01*	0.12	<0.01*

tion shift to lowlands during this season.

Population variance.- Breeding Bird Survey data showed a weak linear decline in U.S. populations (trend = −0.48, *n* = 2466, %CV = 8.1; Kendall's $\tau = -0.77$, *n* = 48, $P < 0.001$). Northeastern populations showed a concave decline (trend = −1.30, *n* = 134, %CV = 19.7; Kendall's $\tau = -0.91$, *n* = 48, $P < 0.001$). Christmas Counts showed a nearly linear U.S. decline (Kendall's $\tau = 0.28$, *n* = 44, *P* = 0.006, %CV = 98.0) and limited data on New England populations showed no significant trend (Kendall's $\tau = 0.01$, *n* = 23, *P* = 0.96, %CV = 77.9).

Duplicated summer density estimates for eastern Connecticut showed a 15−44% decline between sampling periods. In winter, densities showed a 25−103% change between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) found no birds, although they were present in the study area (R. Craig pers. obs.). Graber and Graber (1979) reported three-year mean winter densities of 0.5−6.7 birds/km^2 in Illinois.

Habitat.- Observations of habitat use by breeding Song Sparrows demonstrated that they inhabited lower elevation forests that were more mesic and open-canopied than would be predicted from habitat availability. Birds tended to be present particularly in mixed hardwood associations of more mesic locations. Wintering birds followed similar patterns (Table 2). Comparison of population densities with habitat values also showed similar patterns (Table 3).

I typically found birds associated with forest openings and edge, particularly open swamps and larger streams, in both summer and winter. Elsewhere, the species is reported to inhabit moister habitats, including shrublands, marsh edge, coastline, clearcuts, and riparian areas, as well as suburban and agricultural areas (Arcese et al. 2002).

History.- The Song Sparrow was known as a common to abundant resident of Rhode Island (Howe and Sturtevant 1899) and Connecticut (Sage et al. 1913), although winter populations were reported to be lower. Zeranski and Baptist (1990) believed that winter populations had increased.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 93.6% of blocks throughout Massachusetts (Forster 2003e). In the 1980s, it was definite or probable at 98.7% of blocks throughout Connecticut (Burkett 1994). It was also definite or probable at 91.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had remained essentially stable at 94.0% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Song Sparrow is an uncommon breeder in the forests of southern New England. Its lack of a regional pattern in summer density is surprising in light of its strong relationship with lower elevations, which are distributed non-uniformly in the study area. It appears to concentrate in southern and lowland areas in winter, however.

My observations that the Song Sparrow is associated with more open forest and mesic locations are consistent with other reports of habitat use. Winter habitat does not appear to differ appreciably from summer use.

Conservation.- Breeding Bird Survey and duplicated eastern Connecticut data indicate that breeding Song Sparrow populations are undergoing a regional decline. Because the species is principally associated with non-forest habitats, the maturation of regional forests (Ward and Barsky 2000) is likely at least in part responsible for this decline.

Winter populations show no clear trend, despite evidence that habitat use does not greatly differ seasonally. This suggests that factors influencing winter numbers differ from those of summer and do not involve habitat factors.

WHITE-THROATED SPARROW
Zonotrichia albicollis

Winter
Density (birds/km^2): 2.32 (n = 42, 95% CI: ± 0.94)
CT: 2.09
RI: 3.42
Population (birds): 21,171 (95% CI: ± 8,563)
CT: 15,773
RI: 5,438

Density.- The White-throated Sparrow appeared on only one summer transect in northwestern Connecticut, so I had insufficient data for assessing breeding density. Birds were also present on 21% of winter transects, with estimates at this season based on detections of flocking individuals. Winter densities were greatest in central Connecticut and least in northeastern Connecticut, although populations were present at too few locations to assess whether these differences were significant (Table 1). Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −2.07, n = 418, %CV = 28.0; Kendall's $\tau = -0.88$, n = 48, $P < 0.001$). A small sample from the Northeast showed a stronger concave decline (trend = −9.25, n = 25, %CV = 119.8; Kendall's $\tau = -0.99$, n = 48, $P < 0.001$). Christmas Counts exhibited a convex U.S. decline (Kendall's $\tau = -0.32$, n = 48, $P = 0.001$, %CV = 13.3), but New England populations had a linear increase (Kendall's $\tau = 0.31$, n = 48, $P = 0.002$, %CV = 35.1).

Duplicated density estimates for eastern Connecticut showed a 0−100% increase in winter populations. On line transects through northeastern Connecticut, Craig (1987) reported 5.1 summering birds/km^2. Elsewhere, breeding densities have been reported as 1−94.7 males/km^2 in Ontario and Quebec (Falls and Kopachena 1994). Graber and Graber (1979) reported three-year mean winter densities of 0.7−72.6 birds/km^2 in Illinois.

TABLE 1. Winter population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2003	0.00		2.06			
2003−2009	0.00	0.71	4.12	1.65	5.14	3.42

TABLE 2. Habitat availability vs. use for individual White-throated Sparrows. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 41 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.15	2.41	2.06	1.96	1.94	2.55	74.9
$P(U)$	<0.01*	0.31	<0.01*	0.38	<0.01*	0.03	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	19.5	63.4	4.9	0.0	4.9	7.3

Habitat.- My one summer observation was of a bird in mesic, mixed hardwood forest with semi-open canopy and dense understory. Previous observations of breeding White-throated Sparrows in northeastern Connecticut were of birds in mature hemlock-white pine-hardwood forest bordering swamps and ponds (R. Craig pers. obs.).

Observations of habitat use by wintering White-throated Sparrow individuals demonstrated that they inhabited lower elevation deciduous forests that were more mesic and open-canopied than would be predicted from habitat availability. Birds tended to be present particularly in the mixed hardwood associations (Table 2). Typical winter observations were of flocks at forest edge and in forest openings, including open floodplain forests with dense understory. Birds were present at insufficient locations to assess population relationships with habitat variables.

Elsewhere, the species is reported to summer in coniferous and mixed forests, particularly those with low, dense vegetation in openings. Areas with second growth, logged areas, beaver swamps and open bogs appear to be favored. In winter, it is a typical inhabitant of forest edge, swamps, riparian areas and other more open environments with dense cover (Falls and Kopachena 1994).

History.- The White-throated Sparrow was known as a rare breeder of northwestern Connecticut and an occasional Connecticut winter resident (Sage et al. 1913). After 1915, breeding populations are thought to have increased (Zeranski and Baptist 1990). The species was also known as an uncommon to rare winter resident of Rhode Island (Howe and Sturtevant 1899), but was not recorded breeding there until the 1960s (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 29.4% of blocks primarily in western and northern Massachusetts (Walton 2003c). In the 1980s, it was definite or probable at 9.4% of blocks primarily in northwestern Connecticut (Proctor 1994c). It was also definite or probable at 1.8% of blocks from northern to southern Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had declined to 10.6% of blocks primarily in western and northern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The White-throated Sparrow is a rare breeder and uncommon winter resident in the forests of southern New England. I found the species to be restricted to northwestern Connecticut in summer, although in previous years it also bred in northeastern Connecticut (Craig 1987).

Whether the tendency of the White-throated Sparrow to winter at lower elevations is real is uncertain in light of the substantial variance found in duplicated eastern Connecticut data. Wide annual variation in bird populations is typical at this season (Craig and Klaver 2012), but other overwintering species also concentrate populations at lower elevations. Hence, the observed pattern is likely to be part of a larger community phenomenon.

The species' observed trend toward inhabiting more mesic, open forests in winter is consistent with other reports of habitat use. I observed it using even small forest openings. Its association with deciduous cover and lower elevations is unreported, however, and I did not find an association with the denser shrubs that it is described to use elsewhere.

Conservation.- The White-throated Sparrow is at the southern fringe of its breeding range in southern New England (Falls and Kopachena 1994). As demonstrated by the Breeding Bird Survey, Massachusetts breeding bird atlases and data from Craig (1987), it has largely retired north from this region in recent decades. As with many species at their range limits, its occurrence may be expected to be erratic

(Thompson and Nolan 1973, Marti 1997). Moreover, because it prefers successional and edge habitats, the summer decline may be related to the conversion of such habitats to mature forest.

Based on Christmas Count and duplicated eastern Connecticut data, winter populations appear, in contrast, to be increasing. Other overwintering species have also undergone population increases in recent years—a phenomenon that may be related to a warming climate.

DARK-EYED JUNCO

Junco hyemalis

Summer

Density (males/km^2): 1.13 (n = 37, 95% CI: ± 0.78)
CT: 1.37
RI: 0.00
Population (males): 10,320 (95% CI: ± 7,067)
CT: 10,320
RI: 0.00

Winter

Density (birds/km^2): 8.25 (n = 124, 95% CI: ± 1.97)
CT: 6.47
RI: 16.64
Population (birds): 75,173 (95% CI: ± 17,996)
CT: 48,708
RI: 26,465

Density.- The Dark-eyed Junco appeared on 7% of summer transects, with population estimates based on detections of singing males. Birds were also present on 47% of winter transects, with estimates at this season based on detections of flocking birds. Summer density estimates have below the 60 observations preferred for density estimation, but my data fit a detectability curve well, so I believe my estimates are reasonable, albeit with high variance.

In summer, I detected populations only in northern, more mountainous regions of Connecticut. Winter populations were greatest in Rhode Island and central Connecticut and least in northern, more mountainous regions (Kruskal-Wallis χ^2 = 43.7, n = 147, P < 0.001; Table 1). Because wintering birds commonly inhabit environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Population variance.- Breeding Bird Survey data showed a concave decline in

TABLE 1. Summer (males/km^2) and winter (birds/km^2) population density estimates and winter Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	2.21		0.00			
2003−2008	1.55	4.10	0.00	0.00	0.00	0.00
Winter						
2001−2003	2.19		3.80			
2003−2009	2.19	1.22	8.06	9.49	15.0	16.6
Rank	51.2	46.9	73.8	78.8	93.8	102.6

TABLE 2. Habitat availability vs. use for individual Dark-eyed Juncos. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 29 summer, 119 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.21	3.72	2.03	2.07	2.66	1.67	343.6
Winter use	1.50	2.83	2.30	1.93	2.44	2.40	122.8
$P(U)$	0.08	0.01*	0.34	0.04	0.05	0.21	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	10.3	0.0	0.0	0.0	31.0	0.0
Winter use	32.8	25.2	10.9	12.6	12.6	5.9

TABLE 3. Winter population densities vs. habitat characteristics for Dark-eyed Juncos. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.03	0.01	0.16	−0.30	−0.09	0.06	−0.24
P	0.63	0.93	0.02	<0.01*	0.16	0.05	<0.01*

U.S. populations (trend = −1.16, *n* = 997, %CV = 15.6; Kendall's $\tau = -0.77$, *n* = 48, $P < 0.001$). A small sample from Northeastern populations showed a non-significant decline (trend = −0.89, *n* = 13, %CV = 32.4; Kendall's $\tau = -0.14$, *n* = 48, *P* = 0.23). Christmas Counts showed a strongly concave U.S. increase (Kendall's $\tau = 0.72$, *n* = 44, $P < 0.001$, %CV = 98.0) and New England populations showed an even stronger concave increase (Kendall's $\tau = 0.48$, *n* = 23, *P* = 0.001, %CV = 77.9).

Duplicated density estimates for eastern Connecticut showed a 30% decline in summer and 0−112% increase in winter populations. On summer line transects through northeastern Connecticut, Craig (1987) found 9.2 birds/km^2. Elsewhere in the East, breeding densities have been reported to be 19−260 males/km^2 (Holmes et al. 1986, Nolan et al. 2002). Graber and Graber (1979) reported three-year mean winter densities of 62.7−84.2 birds/km^2 in Illinois.

Habitat.- My limited observations on summer habitat use suggested that birds occupied more coniferous, mesic, open-understoried and higher elevation forests than would be predicted from habitat availability. In winter, flocks again differentially inhabited more coniferous forests, although they shifted from high to low elevations (Table 2). Comparison of population densities with habitat features showed no association with more coniferous cover, but association with smaller trees and lower elevations (Table 3).

Elsewhere in the Northeast, the species is reported to summer in largely coniferous forests. Its greatest abundance is reached in subalpine areas of low, open coniferous canopy in the White Mountains, New Hampshire. However, it is also common in mature, unfragmented hardwood forest with dense understory. In winter, flocks inhabit riparian areas, weedy fields, forest edge and disturbed habitats (Nolan et al. 2002).

History.- The Dark-eyed Junco was unknown to Sage et al. (1913) as a Connecticut breeder, although they described it as a common winter resident. The species appears to have become established in Connecticut only in the 20th century, and it was not known to nest in Rhode Island until the 1960s (Enser 1992). It may have increased as a winter resident since the 19th century (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 17.3% of blocks primarily in western Massachusetts (Fox 2003). In the 1980s, it was definite or probable at 9.1% of blocks primarily in northwestern Connecticut (Clark 1994zo). It was also definite or probable at 1.8% of blocks in northwestern Rhode Island (Enser 1992). By the 2000s, definite or probable breeders declined slightly to 16.6% of blocks primarily in western Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Dark-eyed Junco is an uncommon and local breeder but fairly common winter resident in the forests of southern New England. Its breeding range is restricted to more mountainous portions of northern Connecticut.

The prevalence of breeding birds in more coniferous habitats is consistent with other reports, and their association with higher elevations appears related to their more northerly continental distribution. A winter association with younger trees is also consistent with other observations, and an association with lower elevations at this season is similar to that of a number of overwintering species in the region (Craig 2012).

Conservation.- The Breeding Bird Survey, Massachusetts breeding bird atlases, data of Craig (1987), and duplicated eastern Connecticut data demonstrate that breeding Dark-eyed Juncos are declining in southern New England. Both they and White-throated Sparrows are simultaneously retiring from this southern edge of their breeding range. Winter populations, in contrast, are increasing. A warming climate may be responsible for the retreat of such breeding species from their southern range periphery and for the increase in overwintering individuals, as birds progressively winter further north.

SCARLET TANAGER

Piranga olivacea

Summer

Density (males/km^2): 21.93 (*n* = 1,564, 95% CI: ± 1.56)
CT: 22.52
RI: 19.12
Population (males): 199,865 (95% CI: ± 14,246)
CT: 169,450
RI: 30,415

Density.- The Scarlet Tanager appeared on 99% of summer transects, with population estimates based on detections of singing males. Densities averaged least in Rhode Island, although differences among regions were not significant (Kruskal-Wallis $\chi^2 = 3.9$, $n = 147$, $P = 0.56$; Table 1).

Population variance.- Breeding Bird Survey data showed a weak linear decline in U.S. populations (trend = −0.23, $n = 1500$, %CV = 3.7; linear $r^2 = 0.10$, df = 47, $P = 0.028$). Northeastern populations showed a stronger concave decline (trend = −1.71, $n = 133$, %CV = 23.5; power function $r^2 = 0.98$, df = 47, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 4−11% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 30.4 ± 23.3 birds/km^2. Elsewhere, densities are reported as 18−52 birds/km^2 (Mowbray 1999).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	22.54		20.72			
2003−2008	23.40	23.12	23.03	23.30	21.45	19.12
Rank	80.0	78.5	78.2	78.4	68.5	61.5

TABLE 2. Habitat availability vs. use for individual Scarlet Tanagers. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 883. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.31	2.17	2.23	2.00	2.69	2.27	180.2
P(*U*)	0.28	0.07	0.41	0.05	<0.01*	0.10	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	48.9	19.9	16.8	6.3	3.3	4.8

Habitat.- Individual Scarlet Tanagers inhabited slightly lower elevation forests with greater canopy cover than would be predicted from habitat availability (Table 2). Comparison of population densities with habitat features showed, in contrast, that densities were greatest in higher elevation forests with more closed canopies and open understories. They also tended to occupy forests that had more deciduous cover (Table 3). However, I observed that birds generally appeared to tolerate a wide variety of forest conditions, and have regularly observed them even in more open, park-like environments.

Elsewhere, the species is reported to inhabit a variety of forest types from mesic to xeric and from deciduous to pure coniferous. Studies indicate a preference for mature deciduous forests, particularly where oaks

TABLE 3. Summer population densities vs. habitat characteristics for Scarlet Tanagers. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.01	−0.13	0.07	0.10	0.18	−0.15	0.23
P	0.91	0.02	0.22	0.13	<0.01*	<0.01*	<0.01*

are common, and for forests with reduced sapling density. It occurs occasionally in parks. Several studies have demonstrated that population density increases with forest tract size (Mowbray 1999).

History.- Sage et al. (1913) described the Scarlet Tanager as a common summer resident in Connecticut. Howe and Sturtevant (1899) described it as common in Rhode Island except for the southern part, where it was uncommon. Zeranski and Baptist (1990) speculate that the Scarlet Tanager was less common in Connecticut in the 19th century when forests were less abundant than at present.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 67.2% of blocks throughout Massachusetts (Heil 2003). In the 1980s, it was definite or probable at 69.3% of blocks throughout Connecticut (Ellison 1994f). It was also definite or probable at 51.5% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had decreased to 65.5% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Scarlet Tanager is a common and widespread breeder in the forests of southern New England. It is one of the few species that shows no strong population differences among regions, which suggests that a wide range of forest types serve as suitable habitats for it. The small variance found between duplicated eastern Connecticut surveys substantiates this lack of regional variation, although lower numbers in Rhode Island are corroborated by breeding bird atlas results.

The observed association of the Scarlet Tanager with deciduous, closed canopied, open understoried forest is consistent with other reports of habitat affiliation. However, patterns of habitat use differ among scales of analysis, with closed canopy forest being the only variable showing significant positive relationships at both scales. Elevation shows weakly conflicting patterns among scales, for which there appears to be no clear explanation.

Conservation.- Data from the Breeding Bird Survey and Massachusetts breeding bird atlases indicate that regional Scarlet Tanager populations are declining. In contrast, data of Craig (1987) and duplicated eastern Connecticut data suggest local increases. It is possible that regional forest fragmentation and maturing forest structure operate in opposing directions on population growth. Their effects may also differ regionally and at different scales.

Sponsored by Ann and Dr. Peter Jones

NORTHERN CARDINAL
Cardinalis cardinalis

Summer

Density (birds/km^2): 7.32 (*n* = 568, 95% CI: ± 1.16)
CT: 7.15
RI: 8.09
Population (birds): 66,684 (95% CI: ± 10,553)
CT: 53,812
RI: 12,872

Winter

Density (birds/km^2): 4.04 (*n* = 185, 95% CI: ± 1.18)
CT: 4.38
RI: 2.44
Population (birds): 36,862 (95% CI: ± 10,741)
CT: 32,983
RI: 3,879

Density.- The Northern Cardinal appeared on 86% of summer transects and 54% of winter transects, with estimates at both seasons based on detections of individual birds. Because the species commonly inhabits environments other than forests, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Summer populations were greatest in southern, low elevation regions and least in northern, more mountainous regions (Kruskal-Wallis χ^2 = 28.2, *n* = 147, *P* < 0.001). Winter populations were greatest by far in central Connecticut and least in northern, more mountainous regions (Kruskal-Wallis χ^2 = 31.6, *n* = 147, *P* < 0.001; Table 1).

Populations also showed a significant summer-winter decline (Wilcoxon *Z* = −6.21, *n* = 147, *P* < 0.001). Similarly, duplicated data from eastern Connecticut showed evidence of a seasonal population decline, although the decline was weaker in southeastern Connecticut (Table 1).

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	3.86		6.62			
2003−2008	5.27	3.32	9.69	8.70	12.04	8.09
Rank	59.4	44.8	89.0	81.7	98.4	76.0
Winter						
2001−2003	0.30		4.13			
2003−2009	1.67	1.70	5.62	3.74	10.78	2.44
Rank	56.7	61.0	93.2	72.9	103.3	59.8

TABLE 2. Habitat availability vs. use for individual Northern Cardinals. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 306 summer, 143 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.36	2.66	2.16	1.97	2.33	2.44	105.4
P(*U*)	0.69	0.01*	<0.01*	0.62	<0.01*	<0.01*	<0.01*
Winter use	1.17	2.43	2.07	1.93	2.12	2.57	91.9
P(*U*)	<0.01*	0.15	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	34.0	27.8	14.4	10.1	3.6	10.1
Winter use	25.9	51.7	6.3	5.6	1.4	9.1

TABLE 3. Population densities vs. habitat characteristics for Northern Cardinals. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	−0.10	0.02	−0.04	−0.12	−0.25	0.15	−0.46
P	0.10	0.69	0.46	0.07	<0.01*	0.01*	<0.01*
Winter							
τ	−0.21	−0.05	−0.22	−0.04	−0.23	0.07	−0.30
P	<0.01*	0.42	<0.01*	0.60	<0.01*	0.31	<0.01*
Difference							
τ	0.30	0.07	0.09	0.08	−0.06	0.08	−0.21
P	0.15	0.21	0.14	0.23	0.28	0.20	<0.01*

Population variance.- Breeding Bird Survey data showed a weak, nearly linear increase in U.S. populations (trend = 0.33, n = 2321, %CV = 5.1; Kendall's τ = 0.69, n = 48, $P < 0.001$). Northeastern populations showed a stronger concave increase (trend = 1.46, n = 135, %CV = 24.6; Kendall's τ = 0.90, n = 48, $P < 0.001$).

Christmas Counts showed a concave U.S. decline ending about 2000, with an increase occurring since then (quadratic r^2 = 0.15, df = 47, P = 0.006, %CV = 6.7), but New England populations showed a concave increase (quadratic r^2 = 0.87, df = 47, $P <$ 0.001, %CV = 14.6).

Duplicated density estimates for eastern Connecticut showed a 37−46% increase in summer and a 36−457% increase in winter. On summer line transects through northeastern Connecticut, Craig (1987) reported no birds. Elsewhere, densities in forest are reported to be 9.9−98.8 birds/km^2 in summer and 2.2−58.8 birds/km^2 in winter (Artman and Dettmers 2007, Beddall 1963, Graber and Graber 1979).

Habitat.- Observations of summer habitat use by individual Northern Cardinals showed that they inhabited lower elevation forests that were more mesic, open and denser understoried than would be predicted from habitat availability. They were also in forests that were less oak-dominated and with more mixed cover. Wintering birds used lower elevation forests that were more deciduous, open, with smaller trees and with greater understory density (Table 2).

Comparison of summer densities with habitat features showed a positive relationship with more open, denser understoried, lower elevation forests. Winter densities were greatest in more deciduous, mesic, open, lower elevation forests (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed that they used forests that were more deciduous, with smaller trees and with more open canopies in winter compared with summer, although the relationships were rather weak (Nagelkerke r^2 = 0.09, % correctly classified = 68.8, n = 449, $P < 0.001$). Seasonal shifts in populations showed that they used lower elevation forests in winter compared to summer (Table 3).

Elsewhere, the Northern Cardinal is reported to inhabit areas with shrubs and small trees, including forest edge and forest openings. Selectively logged areas, young forest, wetland borders and old fields are occupied, as well as human-associated landscapes (Halkin and Linville 1999).

History.- The Northern Cardinal was reported to be extremely rare in Connecticut by Sage et al. (1913). After appearing more frequently by the 1930s, its populations dramatically increased until by the 1960s it inhabited the entire state (Zeranski and Baptist 1990). Howe and Sturtevant (1899) did not report the species from Rhode Island, where it was first found breeding in 1957 (Enser 1992).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 65.5% of blocks throughout Massachusetts (Kricher 2003b). In the 1980s, it was definite or probable at 96.8% of blocks throughout Connecticut (Smith and Devine 1994m). It was also definite or probable at 69.7% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 84.6% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Also common in non-forest habitats, the Northern Cardinal is a fairly common year-round resident in the forests of southern New England. Its prevalence in southern portions of the study area, even considering variance reported for duplicated eastern Connecticut data, is to be expected in light of its primarily southern continental distribution (Halkin and Linville 1999).

The observed decline in Northern Cardinal numbers from summer to winter may reflect movement of this supposedly non-migratory species (Halkin and Linville 1999) out of forest habitat, as detectability did not change obviously between seasons. Short distance movements south also may occur, as they appear to do for other resident species (Craig 2012). Although my data show little direct evidence of such seasonal movement from northern to southern Connecticut, my finding that populations are more concentrated at lower elevations in winter provides some evidence for seasonal movement.

The association of the Northern Cardinal with more mesic, open, denser understoried forests is consistent with other reports of habitat use. Its association with lower elevations is expected due to its more southerly continental distribution (Halkin and Linville 1999). Its winter association with more deciduous forests with smaller trees and even more open canopies is unreported.

Conservation.- The Breeding Bird Survey, Christmas Count, Massachusetts breeding bird atlases, duplicated eastern Connecticut data and data of Craig (1987) demonstrate that Northern Cardinal populations are expanding in southern New England. The increase of this forest edge species is unexpected in light of the maturation of regional forests (Ward and Barsky 2000). However, the invasion of this primarily southern species may be attributed to a warming climate as well as to human population growth, which creates suburban habitats that also are occupied.

ROSE-BREASTED GROSBEAK

Pheucticus ludovicianus

Summer

Density (males/km^2): 5.93 (n = 245, 95% CI: ± 0.1.25)
CT: 6.75
RI: 2.08

Population (males): 54,067 (95% CI: ± 11,395)
CT: 50,765
RI: 3,302

Density.- The Rose-breasted Grosbeak appeared on 67% of summer transects, with population estimates based on detections of singing males. Densities averaged greatest in central Connecticut and least in Rhode Island (Kruskal-Wallis χ^2 = 14.8, n = 147, P = 0.01; Table 1).

Population variance.- Breeding Bird Survey data showed a weak linear decline in U.S. populations (trend = −0.48, n = 1174, %CV = 6.9; Kendall's $\tau = -0.71$, n = 48, $P < 0.001$). Northeastern populations showed a stronger concave decline (trend = −2.77, n = 60, %CV = 40.9; Kendall's $\tau = -0.98$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 4−22% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 1.8 birds/km^2. Elsewhere, 3−6 pairs/km^2 (Wyatt and Francis 2002) to 29−61 birds/km^2 (Holmes et al. 1986, Ellison 1994g), have been reported.

Habitat.- Observations of habitat use by individual Rose-breasted Grosbeaks showed that they used forest habitats more deciduous and mesic than would be predicted from habitat availability. They also tended to use particularly mixed hardwoods (Table 2). Comparison of population densities with habitat features similarly showed a positive relationship with more deciduous, mixed hardwood, mesic forests (Table 3).

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	5.10		4.87			
2003−2008	3.98	6.43	5.06	7.50	10.44	2.08
Rank	70.5	78.3	77.0	86.9	86.3	49.0

TABLE 2. Habitat availability vs. use for individual Rose-breasted Grosbeaks. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 188. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.17	1.97	2.12	1.99	2.50	2.43	168.0
$P(U)$	<0.01*	0.03	<0.01*	0.57	0.24	0.05	0.92

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	47.3	32.4	11.7	3.2	0.5	4.8

Elsewhere, the species is reported to inhabit deciduous and mixed woodland, particularly forest openings and wetland borders. It also inhabits second growth woodland, suburban areas, parks, gardens and orchards. It prefers mesic sites over xeric oak-dominated cover, deciduous over coniferous habitats, and avoids closed

TABLE 3. Summer population densities vs. habitat characteristics for Rose-breasted Grosbeaks. τ = Kendall's τ correlation, *P* = probability, corrected false discovery rate significance probability = 0.01. *n* = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.24	−0.16	−0.14	−0.02	−0.04	0.05	−0.11
P	<0.01*	<0.01*	<0.01*	0.80	0.46	0.35	0.05

canopy forest (Wyatt and Francis 2002).

History.- The Rose-breasted Grosbeak may have been rare in Conecticut before the mid-19th century (Zeranski and Baptist 1990). Later, it was termed common and increasing there by Sage et al. (1913). Howe and Sturtevant (1899) described it as common in northern but rare in southeastern parts of Rhode Island in summer.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 52.8% of blocks primarily away from southeastern Massachusetts (Smith 2013). In the 1980s, it was definite or probable at 71.8% of blocks throughout Connecticut (Ellison 1994g). It was also definite or probable at 32.1% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 55.7% of blocks still primarily away from southeastern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Rose-breasted Grosbeak is a fairly common breeder in the forests of southern New England. Its high densities in central Connecticut and low densities in Rhode Island appear real in light of historical evidence and the modest density variance found for duplicated eastern Connecticut data. Moreover, low densities encountered in Rhode Island mirror low breeding bird atlas results for this state. The prevailing xeric, pine-oak forests of Rhode Island are likely responsible for its lower densities there.

The species' positive relationship to more deciduous, mesic forest is consistent with reports of habitat use from elsewhere. I found no evidence that it prefers open canopy forest, however.

Conservation.- Breeding Bird Survey data show that the Rose-breasted Grosbeak is declining regionally, perhaps in response to a regionally maturing forest (Ward and Barskey 2000). However, Massachusetts breeding bird atlases and data of Craig (1987) suggest a local increase, although duplicated eastern Connecticut data showed no consistent pattern.

Sponsored by Ken Goldsmith

INDIGO BUNTING

Passerina cyanea

Summer

Density (males/km^2): 0.54 (n = 58, 95% CI: ± 0.17)
CT: 0.61
RI: 0.21

Population (males): 4,946 (95% CI: ± 1,565)
CT: 4,611
RI: 335

Density.- The Indigo Bunting appeared on 27% of summer transects, with population estimates based on detections of singing males. Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes. Densities averaged greatest in central Connecticut and least in Rhode Island (Table 1).

Population variance.- Breeding Bird Survey data showed a linear decline in U.S. populations (trend = −0.80, n = 2319, %CV = 9.0; Kendall's $\tau = -0.93$, n = 48, $P < 0.001$). Northeastern populations showed a weaker concave decline (trend = −0.24, n = 129, %CV = 5.1; Kendall's $\tau = -0.45$, n = 48, $P < 0.001$).

Duplicated density estimates for eastern Connecticut showed a 30−40% change between sampling periods. On line transects through northeastern Connecticut, Craig (1987) found no birds. I found no other estimates of densities in primarily forested landscapes.

Habitat.- My limited observations on habitat use by individual Indigo Buntings suggested that they used forests that were more open and with more open understories than would be predicted from habitat availability. I found birds associated with forest edge, logged areas, forests bordering marshes and, incidentally to surveys, forests bordering gardens and farm fields.

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.35		0.76			
2003−2008	0.49	0.46	0.53	0.71	0.88	0.21

TABLE 2. Habitat availability vs. use for individual Indigo Buntings. n = 22. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.27	2.68	2.18	1.95	2.25	2.09	177.8

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	31.8	31.8	13.6	9.1	0.0	13.6

Elsewhere, the species is reported to inhabit forest openings, riparian habitats, swamps, open deciduous woods and old fields. It is absent from closed canopy forest (Payne 1992).

History.- The Indigo Bunting has been known as a common summer resident in Connecticut since the 19th century (Sage et al. 1913), although more recently it has been declining (Zeranski and Baptist 1990). Howe and Sturtevant (1899) also described it as common in northern but rare in southeastern Rhode Island.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 53.7% of Massachusetts blocks, primarily away from Cape Cod (Stokes and Stokes 2003b). In the 1980s, it was definite or probable at 46.5% of blocks throughout Connecticut (Proctor 1994d). It was also a definite or probable breeder at 15.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 59.1% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Although fairly common outside of forests, the Indigo Bunting is one of the least common breeders of primarily forested landscapes. Within forests, its low densities in Rhode Island mirror low breeding bird atlas results for the state. Its comparatively high densities in central Connecticut likely reflect the more fragmented nature of forests found there. These patterns are, therefore, likely real despite the moderate population variance found in duplicated eastern Connecticut data.

Limited observations on habitat use suggest that birds inhabit more open forests-evidence consistent with reports from elsewhere. Their association with more open understories appears related to its occurrence at forest edge adjacent to fields, where shrubs are absent.

Conservation.- Breeding Bird Survey data show that the Indigo Bunting is declining regionally, albeit weakly. The maturing forests of Connecticut (Ward and Barsky 2000) may be precipitating a decline, because forest maturation eliminates the more open habitats that the species occupies. However, duplicated eastern Connecticut data show no clear trend and Massachusetts breeding bird atlases suggest that an increase has occurred.

Unlike some inhabitants of forest edge, the species does not appear to be capable of occupying small openings resulting from the loss of one or a few trees. However, my observations of it inhabiting open swamps, river edge, logged areas and other human-associated habitats likely will ensure its long-term persistence in this region.

Sponsored by Mary Cheyne

BROWN-HEADED COWBIRD

Molothrus ater

Summer

Density (birds/km^2): 17.36 (n = 821, 95% CI: ± 1.92)
CT: 17.92
RI: 14.68
Population (birds): 158,203 (95% CI: ± 17,532)
CT: 134,863
RI: 23,340

Density.- The Brown-headed Cowbird appeared on 97% of summer transects, with population estimates based on detections of calling birds. Birds are also present occasionally in winter, primarily in non-forested habitats, although I detected only one in central Connecticut forest during this study.

Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes. Summer densities averaged greatest in southeastern and central Connecticut but were similar elsewhere (Kruskal-Wallis χ^2 = 23.9, n = 147, P < 0.001; Table 1). I make no estimate of winter density.

Population variance.- Breeding Bird Survey data showed a weak concave decline in U.S. populations (trend = −0.50, n = 3611, %CV = 6.5; Kendall's τ = −0.78, n = 48, P < 0.001). Northeastern populations showed a weak concave increase (trend = 0.38, n = 135, %CV = 7.7; Kendall's τ = 0.73, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 28−53% increase between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) reported 20.4 ± 15.2 birds/km^2. I found no other estimates of population densities from primarily forested landscapes.

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	10.21		19.01			
2003−2008	15.63	14.81	24.37	15.21	24.88	14.68
Rank	66.7	62.0	100.4	60.2	95.3	59.0

TABLE 2. Habitat availability vs. use for individual Brown-headed Cowbirds. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 665. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.31	2.32	2.17	1.99	2.57	2.38	154.5
$P(U)$	0.26	0.89	<0.01*	0.39	0.35	0.14	0.07

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	45.9	27.7	14.3	3.0	2.6	6.5

Habitat.- Observations of habitat use by individual Brown-headed Cowbirds showed that they inhabited more mesic forests, although they otherwise used habitats in about the proportions at which they were present. In contrast, comparison of population densities with habitat use showed that populations were greatest in lower

TABLE 3. Summer population densities vs. habitat characteristics for Brown-headed Cowbirds. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.17	−0.15	−0.04	0.10	0.03	0.08	−0.15
P	<0.01*	0.01*	0.47	0.14	0.59	0.17	0.01*

elevation deciduous forests (Table 3). My one winter observation of habitat use was of a bird in mesic, mature, closed canopy oak forest.

Elsewhere, the species is reported to inhabit principally grasslands, disturbed areas, thickets and suburban habitats, with woodland edge appearing to be preferred. It is said to avoid extensive forests, but it may invade them when forest fragmentation occurs (Lowther 1993).

History.- The Brown-headed Cowbird has been known as a common to abundant Rhode Island and Connecticut summer resident since the 19th century (Howe and Sturtevant 1899, Sage et al. 1913). It increased in southern New England during the deforestation of the 18th and 19th centuries (Zeranski and Baptist 1990).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 51.2% of blocks throughout Massachusetts (Arvidson 2003d). In the 1980s, it was definite or probable at 75.3% of blocks throughout Connecticut (Elliot 1994). It was also definite or probable at 53.3% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 77.6% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Brown-headed Cowbird is a common summer inhabitant of southern New England's forests. Higher densities in central Connecticut may be due to greater forest fragmentation there, which is thought to benefit the species. However, in light of the range of variation recorded for duplicated eastern Connecticut data, densities may not differ appreciably in the study area.

The difference between habitat associations recorded for individuals and populations is likely related to most individuals being detected—unlike for most other species—in flight through or above the forest canopy. This made habitat associations found for individuals more problematic in interpretation. Population data that point toward use of lower elevation deciduous forests likely reflect better actual habitat associations.

Notably, I found no association of birds with more open forests, as is reported for elsewhere, which suggests that eastern populations have successfully invaded even closed canopy forests. Indeed, R. Craig (pers. obs.) has observed numerous nests of interior forest birds parasitized by cowbirds.

Conservation.- Breeding Bird Survey data show that the Brown-headed Cowbird is increasing regionally—a trend corroborated by Massachusetts breeding bird atlases and duplicated eastern Connecticut data. However, comparison of my results with earlier transect studies of Craig (1987) suggest a small decline in at least northeastern Connecticut.

BALTIMORE ORIOLE

Icterus galbula

Summer

Density (males/km^2): 9.35 (n = 261, 95% CI: ± 1.95)
CT: 10.02
RI: 6.19

Population (males): 85,217 (95% CI: ± 17,819)
CT: 75,380
RI: 9,837

Density.- The Baltimore Oriole appeared on 72% of summer transects, with population estimates based on detections of singing males. Wintering birds can also be present in non-forested habitats, although I detected none during this study.

Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes. Densities averaged greatest in central and southwestern Connecticut but were similarly lower elsewhere in the study area (Kruskal-Wallis χ^2 = 18.4, n = 147, P < 0.001; Table 1).

Population variance.- Breeding Bird Survey data showed a weak, nearly linear decline in U.S. populations (trend = −0.75, n = 1774, %CV = 10.2; Kendall's τ = −0.82, n = 48, P < 0.001). Northeastern populations showed a stronger concave decline (trend = −2.61, n = 126, %CV = 37.1; Kendall's τ = −0.96, n = 48, P < 0.001).

Duplicated density estimates for eastern Connecticut showed a 20−131% increase between sampling periods. On line transects through northeastern Connecticut, Craig (1987) reported 12.2 birds/km^2. Elsewhere, 46.9 pairs/km^2 are reported from Vermont, and 37 males/km^2 are reported from West Virginia (Rising and Flood 1998).

Habitat.- Data from individual Baltimore Orioles showed that they used lower elevation forests that were more deciduous than would be predicted from habitat availablity. They also tended to use more mesic, open canopied forests (Table 2). Comparison of population densities with habitat features again demonstrated that birds were associated with more deciduous forests, although no other significant associations

TABLE 1. Summer population density estimates (males/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	3.96		5.36			
2003−2008	9.15	6.20	6.43	15.37	17.75	6.19
Rank	80.8	58.7	63.3	91.3	94.5	60.7

TABLE 2. Habitat availability vs. use for individual Baltimore Orioles. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 231. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	1.23	2.17	2.17	1.96	2.45	2.32	142.6
$P(U)$	<0.01*	0.21	0.02	0.23	0.02	0.80	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	42.7	25.6	15.6	6.0	3.9	6.3

TABLE 3. Summer population densities vs. habitat characteristics for Baltimore Orioles. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.20	−0.12	−0.02	0.07	−0.08	−0.06	−0.08
P	<0.01*	0.05	0.71	0.29	0.28	0.37	0.18

were present (Table 3).

Elsewhere, the species is reported to inhabit woodland edge, riparian woods, and open areas with scattered trees. It strongly prefers deciduous over coniferous forest (Rising and Flood 1998).

History.- The Baltimore Oriole has been a common to abundant summer resident of Rhode Island and Connecticut since the 19th century (Howe and Sturtevant 1899, Sage et al. 1913). More recently, Clark (1994zp) thought that a decline in regional populations had been brought about by the maturation of regional forests.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 76.8% of blocks throughout Massachusetts (Pokras 2003). In the 1980s, it was definite or probable at 91.4% of blocks throughout Connecticut (Clark 1994zp). It was also definite or probable at 75.8% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 84.5% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Baltimore Oriole is an uncommon to fairly common breeder in the forests of southern New England. Its greater densities in central and southwestern Connecticut may be related to the greater forest fragmentation there, as the species is thought to be associated with forest edge. However, I found only weak evidence for a relationship with forest openings. My finding of an association with more deciduous habitats is consistent with other reports.

Conservation.- Breeding Bird Survey data indicate that populations of the Baltimore Oriole are declining regionally. However, Massachusetts breeding bird atlases, data of Craig (1987) and duplicated eastern Connecticut data contradict this trend, suggesting that local population patterns may be complex.

PINE GROSBEAK

Pinicola enucleator

Density.- The Pine Grosbeak, an irruptive winter visitor, appeared only eight times on 3% of winter transects. I found birds in northwestern Connecticut during the winter of 2007−2008 and had one detection in Rhode Island. From my tiny sample, I tentatively estimate a winter density of 0.18 birds/km^2 and a total population of 1686 during the study period. Population estimates are based on detections of flocking birds.

Population variance.- Christmas Counts showed a variable U.S. presence with no population trend (Kendall's $\tau = -0.09$, N = 48, *P* = 0.35, %CV = 57.9) but a significant although highly variable New England decline (Kendall's $\tau = -0.30$, N = 48, *P* = 0.003, %CV = 164.3). Winter populations generally peak at two to five year intervals. Elsewhere, Kron (1975) reported 0.7−1.1 wintering birds/km^2 in Alaska.

Habitat.- My few observations on individual wintering birds showed that they tended to occupy forests that were more mesic, had more closed canopies and occurred at higher elevations than would be predicted from habitat availability. They showed a tendency to occur more frequently in some coniferous associations, although they were also present in oaks (Table 1).

Elsewhere, the species is thought to choose winter habitats primarily with respect to the presence of foods, which include ash and maple seeds. Hence, winter habitats may sharply differ from primarily coniferous breeding habitats (Adkisson 1999).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) described the species as a rare and irregular winter visitor to southern New England, although they reported that it was occasionally common. Similarly, Zeranski and Baptist (1990) noted that it was fairly common during flight years.

TABLE 1. Habitat availability vs. use for individual Pine Grosbeaks. *n* = 7. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.57	2.29	2.14	2.00	2.71	2.29	329.6

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	57.1	0.0	28.6	0.0	14.3	8.1

Synthesis.- The Pine Grosbeak is an irruptive species that is generally uncommon to rare in southern New England. Observations of habitat use are limited, but the association I found with higher elevations is consistent with the species' tendency to winter north of southern New England (Adkisson 1999). However, this association, based on a small sample, may also have occurred because I sampled more mountainous northwestern Connecticut during a flight year.

Conservation.- Christmas Count data suggest that Northeastern populations are declining, apparently because of the logging of coniferous forests in the breeding range (Adkisson 1999).

PURPLE FINCH

Haemorhous purpureus

Summer

Density (males/km^2): 0.20 (n = 19, 95% CI: ± 0.10)
CT: 0.15
RI: 0.45

Population (males): 1,820 (95% CI: ± 947)
CT: 1,102
RI: 718

TABLE 1. Summer population density estimates (males/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.30		0.00			
2003−2008	0.30	0.28	0.00	0.00	0.08	0.45

TABLE 2. Habitat availability vs. use for individual Purple Finches. n = 7. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use	2.14	4.00	2.43	2.00	2.57	2.36	268.1

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	0.0	14.3	28.6	28.6	28.6	0.0

Density.- The Purple Finch appeared on only 12% of summer transects and only once on a southeastern Connecticut winter transect. Summer population estimates are based on detections of singing males, and I make no estimate for winter populations.

Although my sample was less than the 60 observations preferred for density estimation, my data fit a detectability curve reasonably, albeit with high variance, so I report my density estimates here. Summer densities averaged greatest in Rhode Island and least in southern, lower elevation portions of the study area (Table 1).

Population variance.- Breeding Bird Survey data showed a nearly linear decline in U.S. populations (trend = −1.44, n = 822, %CV = 20.3; Kendall's $\tau = -0.89$, n = 48, $P < 0.001$). Northeastern populations had a strongly concave decline (trend = −6.28, n = 50, %CV = 87.9; Kendall's $\tau = -0.99$, n = 48, $P < 0.001$). Christmas Counts exhibited a convex U.S. (Kendall's $\tau = -0.64$, n = 48, $P = 0.006$, %CV = 6.7) and New England decline (Kendall's $\tau = -0.44$, n = 48, $P < 0.001$, %CV = 14.6).

Duplicated density estimates for eastern Connecticut showed no change between sampling periods. On summer line transects through northeastern Connecticut, Craig (1987) reported 1.8 birds/km^2. Elsewhere, breeding densities have been reported to range from 5.8−48.8 pairs/km^2 (Wooten 1996). Graber and Graber (1979) reported three-year mean winter densities to be 0−4.0 birds/km^2 in Illinois forest habitats.

Habitat.- My few observations of habitat use suggested that birds occcupied particularly conifer-containing forest associations that were at much higher elevations than would be predicted from habitat availability. Previous observations of breeding Purple Finches in Connecticut were of birds at the edge of mature hemlock ravines, in groves of mixed conifers bordering forest openings and in copses of conifers in early successional and garden landscapes (R. Craig pers. obs.). My one winter observation was of a bird in deciduous, open-canopied low elevation forest.

Elsewhere, the species is reported to summer in primarily coniferous and mixed forests, particularly those that are mesic and that border wetlands. Edge appears to be an important habitat requirement as well. Consequently, conifer groves and ornamental plantations are also used. Mature deciduous forest appears to be less suitable habitat. In winter, the species uses a wide variety of habitats, including forested and open habitats in which conifers are typically present (Wootton 1996).

History.- The Purple Finch was reported to be fairly common in summer and irregular in winter in Connecticut, particularly toward the coast (Sage et al. 1913). More recently, Zeranski and Baptist (1990) thought it rare to uncommon in summer and uncommon to fairly common in winter in Connecticut. It was described as common year-round in Rhode Island (Howe and Sturtevant 1899).

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 54.0% of blocks throughout Massachusetts (Blodget 2003f). In the 1980s, it was definite or probable at 30.9% of blocks primarily in eastern and western Connecticut (Clark 1994zq). It was also definite or probable at 24.2% of blocks throughout Rhode Island, although most common to the northwest (Enser 1992). By the 2000s, definite or probable breeders had declined to 28.0% of blocks primarily in western and northern Massachusetts (Walsh and Peterson 2013).

Synthesis.- The Purple Finch is a rare breeder in the forests of southern New England, although it is more common in open landscapes with conifer copses (R. Craig pers. obs.). It is near the southern boundary of its breeding range here (Wootton 1996), which accounts for its predominance in the northern part of the region. Populations typically decline toward range limits (Brown 1984, Pulliam 1988), probably in part because of the decline in coniferous habitat from north to south. Notably, however, I also found larger populations in more heavily coniferous Rhode Island.

My few observations of habitat use are consistent with other reports that birds inhabit coniferous and mixed forests. The association with higher elevations is expected in light of the species' northerly distribution.

Conservation.- The Breeding Bird Survey, Christmas Counts, data of Craig (1987) and Massachusetts breeding bird atlases show that Purple Finch populations are declining regionally. The maturing forests of southern New England (Ward and Barsky 2000) may be responsible for at least some of the decline, because forest maturation eliminates the more open habitats often occupied by the species.

RED CROSSBILL

Loxia curvirostra

Density.- The Red Crossbill appeared only 11 times on 3% of winter transects. I found birds in northwestern and southwestern Connecticut and also had five detections in Rhode Island. From my tiny sample, I tentatively estimate a winter density of 0.71 birds/km^2 and a total population of 6440 during the study period. Population estimates are based on detections of flocking birds.

Population variance.- Christmas Counts showed a highly variable U.S. (Kendall's τ = 0.03, N = 48, *P* = 0.80, %CV = 47.0) and New England (Kendall's τ = −0.18, N = 48, *P* = 0.07, %CV = 130.4) presence with no clear populaton trend. Winter populations generally peaked at two to five year intervals. I found no reports of winter densities other than that they are variable (Dawson 1996).

Habitat.- My small sample of individual wintering birds showed that they tended to occupy forests that were more coniferous, with more open understories and at lower elevations than would be predicted from habitat availability (Table 1). Elsewhere, the species is thought to prefer conifers in winter, although it may be found in a variety of other forest and non-forest habitats (Dawson 1996).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) described the species as an irregular winter visitor, although it was described as occasionally common in Rhode Island but rare in Connecticut. Zeranski and Baptist (1990) thought it occasionally common in Connecticut during flight years. Although also known to have nested in Connecticut (Zeranski and Baptist 1990) and Massachusetts (Sorrie 2003b), I detected no summering birds during this survey.

Synthesis.- The Red Crossbill is generally rare as a wintering species although its presence is annually variable. My few observations of habitat use suggest that birds favor conifers, as is typical for elsewhere. Its association with lower elevations may be a function of its occurrence principally during winters when I surveyed lower elevation areas.

TABLE 1. Habitat availability vs. use for individual Red Crossbills. *n* = 6. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.67	2.67	2.00	2.00	2.58	1.83	101.3

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	33.3	16.7	33.3	0.0	16.7	0.0

Conservation.- Wintering populations are variable but generally rare in southern New England. There is no clear evidence for a decline in populations.

COMMON REDPOLL

Acanthus flammea

Winter
Density (birds/km^2): 1.97 (n = 46, 95% CI: ± 0.84)
CT: 1.70
RI: 3.24
Population (birds): 17,943 (95% CI: ± 7,611)
CT: 12,796
RI: 5,147

Density.- The Common Redpoll appeared on 19% of winter transects. Although my sample was less than the 60 observations preferred for density estimation, my data fit a detectability curve reasonably, albeit with high variance, so I report my density estimates here. Estimates are based on detections of flocking birds, represent populations occurring during the study years and refer only to that part of the population inhabiting primarily forested landscapes.

Although common during some winters, this irruptive winter visitor occurred variably during the study period, and population differences among regions should be interpreted in light of this variable winter occurrence. Winter densities averaged greatest in southwestern Connecticut and least in southeastern Connecticut (Kruskal-Wallis χ^2 = 91.6, n = 147, P < 0.001; Table 1). The winter of 2008−2009, when I surveyed southwestern Connecticut, was notable in being a major flight year for this and other finch species.

Population variance.- Christmas Counts showed a highly variable U.S. (Kendall's τ = 0.01, N = 48, P = 0.94, %CV = 92.8) and New England presence (Kendall's τ = 0.03, N = 48, P = 0.76, %CV = 136.1) with no clear population trend. Winter populations generally peaked at two to five year intervals.

Duplicated density estimates for eastern Connecticut showed a 0−100% increase between sampling periods. I found no reports of winter densities other than that they are variable (Knox and Lowther 2000).

TABLE 1. Winter population density estimates (birds/km^2) for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.25		0.00			
2003−2008	0.50	3.47	0.00	5.39	0.08	3.24

TABLE 2. Habitat availability vs. use for individual Common Redpolls. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 40. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.30	2.58	2.14	1.98	2.40	2.51	194.9
$P(U)$	0.51	0.81	0.14	0.77	0.16	0.09	0.05

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	45.0	17.5	20.0	0.0	5.0	12.5

Habitat.- Observations of individual birds showed no clear habitat associations. They occupied too few transects to examine the relationship between habitat and population density.

Outside of the study period, R. Craig (pers. obs.) also found birds at weedy marsh edges and in gardens. Elsewhere, winter habitat is described as open woodland and birch, alder and willow scrub (Knox and Lowther 2000).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) reported the Common Redpoll to be an occasionally common but irregular winter visitor in Rhode Island and Connecticut. Similarly, Zeranski and Baptist (1990) described the species as being of erratic occurrence- a status they believed had not changed in the past century.

Synthesis.- The Common Redpoll is an irruptive species that occasionally winters in large numbers, although it more typically is an uncommon winter resident. Regional differences in density observed during the study appear to be primarily the consequence of this variable occurrence. I found no clear association of the species with any habitat factors.

Conservation.- Wintering populations are highly variable and exhibit no clear population trend.

PINE SISKIN

Spinus pinus

Winter

Density (birds/km^2): 4.38 (n = 134, 95% CI: ± 1.74)
CT: 4.91
RI: 1.90

Population (birds): 39,938 (95% CI: ± 15,831)
CT: 36,910
RI: 3,028

Density.- The Pine Siskin appeared on 30% of winter transects, with population estimates based on detections of flocking birds. Although common during some winters, this irruptive winter visitor occurred variably during the study period, and population differences among regions should be interpreted in light of this variable winter occurrence. Although individuals occasionally remain to breed, particularly after years of large winter incursions, I found no breeders during this study.

Winter densities averaged greatest in southwestern Connecticut and least in central Connecticut, although the species failed to occur on transects in three years. The winter of 2008−2009, when I surveyed southwestern Connecticut, was notable in being a major flight year for this and other finch species (Table 1). Densities represent those occurring during the study years and refer only to that part of the population inhabiting primarily forested landscapes.

TABLE 1. Winter population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
2001−2002	0.76		0.00			
2003−2008	0.00	3.89	0.82	25.85	0.00	1.90
Rank	56.5	67.2	66.8	136.5	56.5	76.4

TABLE 2. Habitat availability vs. use for individual Pine Siskins. $P(U)$ = probability level of Mann-Whitney U, corrected false discovery rate significance probability = 0.01. n = 123. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Winter use	1.25	2.28	2.14	1.99	2.69	2.17	156.8
$P(U)$	0.11	0.54	0.01*	0.35	0.01*	<0.01*	0.80

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Winter use	42.7	21.1	16.3	5.7	1.6	8.1

Population variance.- Breeding Bird Survey data showed a concave decline in U.S. populations (trend = −2.53, n = 805, %CV = 42.5; Kendall's $\tau = -0.81$, n = 48, $P < 0.001$). Northeastern populations were too small to measure meaningfully. Christmas Counts showed a variable U.S. presence (Kendall's $\tau = -0.05$, n = 48, P = 0.64, %CV = 56.1) but an overall New England decline, albeit also a variable one (Kendall's $\tau = -0.26$, n = 48, P = 0.01, %CV = 124.5).

On summer line transects through northeastern Connecticut, Craig (1987) reported 3.0 birds/km^2. Elsewhere, breeding densities have been reported as 0−80 birds/km^2 in Utah. I found no reports of winter densities other than that they are var-

TABLE 3. Winter population densities vs. habitat characteristics for Pine Siskins. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
τ	−0.06	−0.02	−0.05	−0.04	−0.08	−0.11	−0.02
P	0.35	0.78	0.42	0.54	0.26	0.10	0.71

iable (Dawson 1997).

Habitat.- Individual wintering birds occupied forests that were more mesic and had lower shrub density than would be predicted from habitat availability (Table 2), although they otherwise showed no affinity for particular forest types. Examination of population densities vs. habitat variables showed no significant relationships (Table 3). Elsewhere, birds are thought to prefer conifers in winter, although they may be found in a variety of other forest and non-forest habitats at this season (Dawson 1997).

Craig (1987) found summer residents in conifer-northern hardwood forests. Elsewhere, they typically nest in open coniferous, mixed and deciduous forest (Dawson 1997).

History.- Howe and Sturtevant (1899) and Sage et al. (1913) reported no breeders in Rhode Island or Connecticut, but described the species as an irregularly common winter visitor. Zeranski and Baptist (1990) described it similarly but noted that it was also a rare and irregular Connecticut nester.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 4.2% of blocks throughout Massachusetts (Forster 2003f). In the 1980s, it was definite or probable at 3.7% of blocks primarily in northern Connecticut (Clark 1994zr) but it was absent from Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 9.7% of blocks throughout Massachusetts, although most breeding occurred after the 2008−2009 winter irruption (Walsh and Peterson 2013).

Synthesis.- The Pine Siskin is an irruptive species that occasionally winters in large numbers. Some individuals may remain to breed after large winter incursions, such as those of the late 1970s, early to mid-1980s and 2008−2009.

Observations of winter habitat use are unlike those reported for elsewhere in that I found no association with conifers. Moreover, my observations that individuals used more mesic and open understoried forests are unreported.

Conservation.- Wintering populations are highly variable but New England populations appear to have declined. This is likely related to the larger scale decline in breeding populations. The winter decline may as well be related to a warming climate, as other more typically northern-associated species have also declined near this southern periphery of their range.

AMERICAN GOLDFINCH
Spinus tristis

Summer

Density (birds/km^2): 23.79 (*n* = 770, 95% CI: ± 2.40)
CT: 22.77
RI: 28.63

Population (birds): 216,853 (95% CI: ± 21,864)
CT: 171,327
RI: 45,526

Winter

Density (birds/km^2): 15.25 (*n* = 551, 95% CI: ± 2.52)
CT: 15.07
RI: 16.10

Population (birds): 138,982 (95% CI: ± 22,962)
CT: 113,379
RI: 25,603

Density.- The American Goldfinch appeared on 97% of summer and 83% of winter transects, with population estimates at both seasons based on detections of flocking birds. Because the species commonly inhabits environments other than forest, densities reported here refer only to that part of the population associated with primarily forested landscapes.

Summer populations were most dense in central Connecticut and least dense in northwestern Connecticut (Kruskal-Wallis χ^2 = 119.6, *n* = 147, *P* = 0.001). Winter populations were greatest by far in southern and low elevation portions of the study area and least in more mountainous, northern areas (Kruskal-Wallis χ^2 = 57.8, *n* = 147, *P* < 0.001; Table 1).

Populations also showed a summer−winter decline (Wilcoxon *Z* = −5.16, *n* = 147, *P* < 0.001). Duplicated data from eastern Connecticut showed that northern populations declined from summer to winter but southern populations remained

TABLE 1. Population density estimates (birds/km^2) and Kruskal-Wallis density ranks for Connecticut/ Rhode Island. NE = northeastern CT, NW = northwestern CT, SE = southeastern CT, SW = southwestern CT, CE = central CT, RI = Rhode Island.

	Region					
	NE	NW	SE	SW	CE	RI
Summer						
2001−2002	20.15		20.10			
2003−2008	20.38	16.37	26.55	22.82	31.91	28.63
Rank	63.2	49.3	81.0	72.2	95.0	85.1
Winter						
2001−2003	4.23		16.13			
2003−2009	6.64	6.54	25.29	24.71	22.39	16.10
Rank	45.4	37.6	101.5	104.0	94.3	73.6

TABLE 2. Habitat availability vs. use for individual American Goldfinches. *P*(*U*) = probability level of Mann-Whitney *U*, corrected false discovery rate significance probability = 0.01. *n* = 693 summer, 493 winter. * = significant relationship. F = forest type, V = vegetation type, M = moisture regime, D = dbh, C = canopy cover, U = understory density, E = elevation (m), OD = oak-dominated, MH = mixed hardwoods, CN = conifer-northern hardwoods, PO = pine-oak, CO = conifer-dominated, MI = mixed sites.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Availability							
	1.37	2.36	2.26	1.98	2.55	2.33	184.2
Summer use							
	1.45	2.72	2.23	1.98	2.54	2.33	145.9
P(*U*)	0.02	<0.01*	0.38	0.80	0.91	0.87	<0.01*
Winter use							
	1.26	2.22	2.19	1.97	2.54	2.27	117.3
P(*U*)	<0.01*	0.18	0.04	0.44	0.97	0.19	<0.01*

	Percent Vegetation					
	OD	MH	CN	PO	CO	MI
Availability	44.0	22.5	14.0	8.0	6.9	4.6
Summer use	37.5	20.8	15.4	9.7	8.1	8.5
Winter use	45.4	28.8	10.8	4.7	4.5	5.9

TABLE 3. Population densities vs. habitat characteristics for American Goldfinches. τ = Kendall's τ correlation, P = probability, corrected false discovery rate significance probability = 0.01. n = 147. * = significant relationship.

	Habitat Characteristics						
	F	V	M	D	C	U	E
Summer							
τ	0.10	0.14	0.03	−0.10	−0.06	−0.05	−0.29
P	0.12	0.02	0.61	0.15	0.32	0.41	<0.01*
Winter							
τ	−0.11	−0.02	−0.11	−0.13	−0.04	−0.06	−0.39
P	0.07	0.75	0.08	0.05	0.56	0.35	<0.01*

similar seasonally (Table 1).

Population variance.- Breeding Bird Survey data showed a weak concave increase in U.S. populations (trend = 0.07, n = 2614, %CV = 8.6; quadratic $r^2 = 0.27$, df = 47, $P < 0.001$). Northeastern populations showed a stronger concave increase that leveled off about 2000 (trend = 2.37, n = 133, %CV = 43.7; Kendall's $\tau = 0.86$, $n = 48$, $P < 0.001$).

Christmas Counts showed that U.S. populations had no clear populaton trend (Kendall's $\tau = 0.17$, $n = 48$, $P = 0.09$, %CV = 9.1), although New England populations showed a variable but generally concave increase starting about 1990 (Kendall's $\tau = 0.27$, $n = 48$, $P = 0.001$, %CV = 31.1). Winter populations generally peaked at two to five year intervals.

Duplicated density estimates for eastern Connecticut showed a 1−32% increase in summer and 57% increase in winter populations. On line transects through northeastern Connecticut, Craig (1987) reported no birds, although they were present in the study area (R. Craig pers. obs). Elsewhere, breeding densities have been reported as 78 pairs/km^2 (Miller 1978) to 1400 nests/km^2 (Dhondt et al. 2007). Graber and Graber (1979) found three-year mean winter densities to be 2.5−32.1 birds/km^2 in Illinois forest habitats.

Habitat.- Observations of summer habitat use by individual American Goldfinches showed that they inhabited forests that were more coniferous and at lower elevations than would be predicted from habitat availability. In winter, birds moved into more deciduous forests that were at even lower average elevations (Table 2). Comparison of summer densities with habitat features showed that birds tended to be present in more coniferous vegetation types that were at lower elevations. In winter, densities were again greatest at lower elevations (Table 3).

Stepwise logistic regression analysis of habitat use by individual birds showed a limited tendency to use forests that were more deciduous, had more open understories and were at lower elevations in winter compared with summer (Nagelkerke r^2 = 0.08, % correctly classified = 59.9, n = 1186, $P < 0.001$). Stepwise regression of seasonal population change showed that populations occurred in more deciduous forests in winter compared with summer ($r^2 = 0.07$, $f_{2,144}$ = 11.6, standardized coefficients: forest type = 0.27, $P = 0.001$).

Elsewhere, the American Goldfinch is reported to inhabit weedy fields, floodplains, forest edge, early successional growth, orchards and gardens (Middleton 1993). As demonstrated here, the extent to which forest is used year-round is generally not recognized.

History.- Howe and Sturtevant (1899) and Sage et al. (1913) reported that the American Goldfinch was abundant in summer and common in winter in southern New England. Zeranski and Baptist (1990) speculate that populations declined during the 20th century as forests re-grew.

Breeding bird atlas data showed that in the 1970s, the species was a definite or probable breeder at 66.8% of blocks throughout Massachusetts (Stokes and Stokes 2003c). In the 1980s, it was definite or probable at 82.4% of blocks throughout Connecticut (Clark 1994zs). It was also definite or probable at 52.1% of blocks throughout Rhode Island (Enser 1992). By the 2000s, definite or probable breeders had increased to 84.5% of blocks throughout Massachusetts (Walsh and Peterson 2013).

Synthesis.- Despite the American Goldfinch's reputation as a bird of early successional habitats, it is a fairly common forest inhabitant year-round. Based on the variance recorded in duplicated eastern Connecticut data, its tendency to predominate in southern and lowland locations is likely real.

The observed decline in populations from summer to winter relates to the species being strongly migratory from northern parts of its range, including southern New England (Middleton 1993). Such southward movement also accounts for the concentration of birds in more southerly and lower elevation locations during winter.

The association of the American Goldfinch in summer with more coniferous forests does not correspond with other reports of habitat use. The tendency toward a greater winter association with more deciduous landscapes is also reported by Craig (2012), who found a winter habitat shift to more deciduous forests at lower elevations in eastern Connecticut.

Conservation.- Despite the maturation of regional forests (Ward and Barsky 2000), duplicated eastern Connecticut, Breeding Bird Survey, Christmas Count and Massachusetts breeding bird atlas data indicate that American Goldfinch populations are growing in southern New England. The species is an adaptable one that appears to use a variety of habitats in this region.

Sponsored by Denise Archambault

EVENING GROSBEAK

Coccothraustes vespertinus

Density.- The Evening Grosbeak appeared on only one winter transect in northwestern Connecticut. Hence, I make no population estimate for a species that has become a rare winter visitor to southern New England. Although it has also nested in Connecticut (Zeranski and Baptist 1990), I recorded no summering birds.

Population variance.- Christmas Counts showed a highly variable but generally sigmoid U.S. (Kendall's $\tau = -0.67$, $N = 48$, $P < 0.001$, %CV = 98.7) and New England decline (Kendall's $\tau = -0.60$, $N = 48$, $P < 0.001$, %CV = 154.2), with the decline slowing since about 1992. I found no reports of winter densities other than that they are variable (Gillihan and Byers 2001).

Habitat.- My one observation of a wintering bird occurred in mesic, mixed hardwood forest at 423 m elevation. Elsewhere, winter habitat is described as coniferous and deciduous forest and also suburban to urban environments (Gillihan and Byers 2001).

History.- The Evening Grosbeak was first reported from Rhode Island in the winter of 1910−1911 (Hathaway 1913). Sage et al. (1913) described it as occurring accidentally in Connecticut. It has nested several times in Connecticut, with the first record being in 1962 (Zeranski and Baptist 1990).

The species was largely unknown in the east before the mid-19th century and first appeared commonly in New England during the winter of 1889−1890. It has since become regular in the Northeast, although numbers have fallen dramatically since the 1980s (Gillihan and Byers 2001, R. Craig pers. obs.).

Synthesis.- The Evening Grosbeak was largely absent from southern New England during the study period. My one observation of habitat use is notable primarily because of the high elevation and northern location at which it was detected. This suggests that wintering birds may now be most likely to occur at such locations.

Conservation.- Although once a fairly common wintering species in southern New England, the Evening Grosbeak is now an uncommon to rare visitor, much as it was in the 19th century. It nested in Connecticut during its years of winter abundance, but has since retired north as a breeder.

Species Detected Incidentally to Surveys

NORTHERN BOBWHITE (*Colinus virginianus*).- two summer detections of birds in open habitat in coastal Rhode Island.

RING-NECKED PHEASANT (*Phasianus colchicus*).- two summer detections of birds inhabiting open habitats in southeastern Connecticut.

LEAST BITTERN (*Ixobrychus exilis*).- one summer detection in a coastal Rhode Island marsh.

GREAT BLUE HERON (*Ardea herodias*).- seven summer detections of birds inhabiting ponds and marshes in eastern and northwestern Connecticut.

GREEN HERON (*Butorides virescens*).- two summer detections of birds inhabiting ponds and marshes in northeastern and central Connecticut.

BLACK VULTURE (*Coragyps atratus*).- one summer detection of an adult and fledgling on a cliff in northwestern Connecticut.

TURKEY VULTURE (*Cathartes aura*).- 19 summer and winter detections of flying birds from most of the region.

OSPREY (*Pandion haliaetus*).- one summer detection of a flying bird in southeastern Connecticut.

BALD EAGLE (*Haliaeetus leucocephalis*).- Two winter detections of flying birds in southeastern and southwestern Connecticut.

ROUGH-LEGGED HAWK (*Buteo lagopus*).- one winter detection of a flying bird in central Connecticut.

SORA (*Porzana carolina*).- two summer detections of calling birds in marshes and shrub swamps in Rhode Island.

COMMON MOORHEN (*Gallinula chloropus*).- one summer detection in a coastal Rhode Island marsh.

KILLDEER (*Charadrius vociferus*).- three summer detections of birds in open habitats in Rhode Island and southwestern Connecticut. One winter detection occurred in central Connecticut.

SPOTTED SANDPIPER (*Actitus macularius*).- three summer detections of birds in wetland habitats in Rhode Island and central Connecticut.

SOLITARY SANDPIPER (*Tringa solitaria*).- one detection of a late spring migrant at the edge of a pond in central Connecticut.

AMERICAN WOODCOCK (*Scolopax minor*).- One summer detection of a bird in forest habitat in northeastern Connecticut. This early spring breeder was not readily detected by the methods I employed.

ROCK PIGEON (*Columba livia*).- three winter detections from Rhode Island.

EASTERN SCREECH OWL (*Otus asio*).- One summer detection of a bird in forest habitat in southeastern Connecticut. This species was not readily detected by the methods I employed.

GREAT HORNED OWL (*Bubo virginianus*).- six summer and three winter detections in deciduous to coniferous forest in most of the study area. This species was not readily detected by the methods I employed.

BARRED OWL (*Strix varia*).- 17 summer and 10 winter detections in deciduous to conifer forest from most of the study area. This species was not readily detected by the methods I employed.

EASTERN WHIP-POOR-WILL (*Caprimulgus vociferus*).- two summer detections of birds in forest habitat in northeastern Connecticut. This species was not readily detected by the methods I employed.

BELTED KINGFISHER (*Megaceryle alcyon*).- nine summer and 12 winter detections of birds associated with ponds and rivers from all regions except northwestern Connecticut.

ALDER FLYCATCHER (*Empidonax alnorum*).- Three detections of birds in shrub swamp/ marsh environments in northwestern Connecticut.

WILLOW FLYCATCHER (*E. traillii*).- Seven detections of birds in shrub swamp/ marsh environments in Rhode Island, eastern and northwestern Connecticut.

HORNED LARK (*Eremophila alpestris*).- two winter detections of birds in open habitats in central Connecticut.

PURPLE MARTIN (*Progne subis*).- three detections of flying birds in northeastern, southeastern and northwestern Connecticut.

TREE SWALLOW (*Tachycineta bicolor*).- four detections of flying birds in eastern, central and northwestern Connecticut.

NORTHERN ROUGH-WINGED SWALLOW (*Stelgidopteryx serripennis*).- two detections of flying birds in central Connecticut.

MARSH WREN (*Cistothorus palustris*).- two detections of birds in marshes in southeastern Connecticut.

SWAINSON'S THRUSH (*Catharus ustulatus*).- one detection of a spring migrant in floodplain forest from central Connecticut.

BROWN THRASHER (*Toxostoma rufum*).- four summer detections of birds at forest edge from southeastern and central Connecticut; one winter detection after the study period in coastal Rhode Island woodland.

NORTHERN MOCKINGBIRD (*Mimus polyglottos*).- four summer detections in edge habitat from southeastern and central Connecticut and four winter detections from Rhode Island and central Connecticut.

EUROPEAN STARLING (*Sturnus vulgaris*).- 48 primarily winter detections of birds flying over or in open habitat in Rhode Island, southeastern and particularly central Connecticut.

YELLOW WARBLER (*S. petechia*).- 186 detections of birds primarily inhabiting shrubbery around ponds and marshes from throughout the region.

BLACKPOLL WARBLER (*Setophaga striata*).- 18 detections of late spring migrants in forest habitat in Rhode Island, southeastern, southwestern and central Connecticut.

FIELD SPARROW (*Spizella pusilla*).- 28 summer detections of birds inhabiting fields from nearly the entire study area.

COMMON GRACKLE (*Quiscalus quiscula*).- 99 summer detections of primarily flying birds from throughout the study area.

ORCHARD ORIOLE (*Icterus spurius*).- One detection of a bird in deciduous forest edge in southwestern Connecticut.

HOUSE FINCH (*Haemorhous mexicanus*).- eight summer and 181 winter detections of birds flying over forest or in open habitat throughout the region.

HOUSE SPARROW (*Passer domesticus*).- 27 winter detections of birds primarily in open habitat in central Connecticut.

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