Making Management Recommendations from Annual Bird Point Count Data[1]

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Abstract

In the past decade, more than one hundred thousand breeding bird occurrences have been recorded on Southern National Forests in the United Sates. The majority of these occurrences have been geo-referenced using global positioning satellite (GPS) technology. This spatial information is available for use as a coverage in several geographic information system (GIS) applications. ArcView GIS software was used to overlay selected occurrence records with other habitat coverages (e.g., soils, hydrology, vegetation, elevation, and land use). Multiple years of accumulated bird point count data has made analysis possible at a local district and forest level. This revealed clues to understanding habitat preference, landscape distribution, and frequency of occurrence for breeding birds on the Francis Marion and Sumter National Forests in South Carolina. The comparison of ecological data with occurrence information is incorporated in project planning and analysis on the Francis Marion and Sumter National Forests. Interpretations of bird point count data influence field projects by providing insight into habitat parameters, management actions and potential project outcomes that promote conservation of avian habitats. One interesting outcome was the trend in frequency of occurrence for some species differed from statewide and regional trends derived from the North American Breeding Bird Survey.

Key words: breeding birds, Francis Marion and Sumter National Forests, frequency of occurrence, GIS, monitoring, point counts, spatial coverages.

Introduction

Interest in declining numbers of neotropical migratory birds in the latter part of the 20th century focused attention on monitoring efforts for these and associated species (Harris 1984; Soule 1986; Verner et al. 1986; Cooperrider et al. 1986; Wilson 1988; Hunter et al. 1993). In response, National Forests in the Southern Region of the United States initiated a pilot study during 1992 to develop a methodology for monitoring breeding birds across all forested habitats on the Chattahoochee National Forest in Georgia. By 1994, two thousand eight hundred sixty-five bird point counts were grouped by physiographic area (Robbins 1986), and distributed over one hundred five Ranger Districts on sixteen National Forests in the South. This effort implemented the Southern National Forest's Migratory and Resident Landbird Conservation Strategy (Gaines and Morris 1996). One of the objectives of this strategy is: "to develop and implement a standardized forest bird monitoring program that will measure the success in achieving population and habitat objectives at the district, forest, and regional level…" The Francis Marion and Sumter National Forests (FMS) augmented this regional strategy by installing additional bird points in all forest habitats on the FMS.

On the FMS, point count data are geo-referenced and entered into a Microsoft Access database developed specifically to manage bird point count data for spatial display and analysis, which we refer to as "Sumter BIRDBASE." In 2002, the Forest Service Southern Region developed a similar database (Access R8Bird) for region-wide application. Access R8Bird will facilitate data analysis at several spatial scales and enhance compatibility with Fauna, the national Forest Service terrestrial species database. Reports generated from Sumter BIRDBASE, and Access R8Bird enable users to identify habitat preference (*fig. 1*), and variations by physiographic area (*fig. 2*) for breeding birds. Information contained in Sumter BIRDBASE and Access R8Bird is also compatible with the National Bird Point Count Database (currently under beta-testing) maintained at Patuxent Wildlife Research Center (U.S. Department of the Interior, Geological Survey 2001).

Compiling multiple years of data permits investigation into possible indices describing temporal population trends at landscape scales (*fig. 3*).

Linking these results to a spatial display of habitat variables provides valuable information on species distribution (*fig. 4*), as well as habitat quality and distribution at both local and larger landscape scales.

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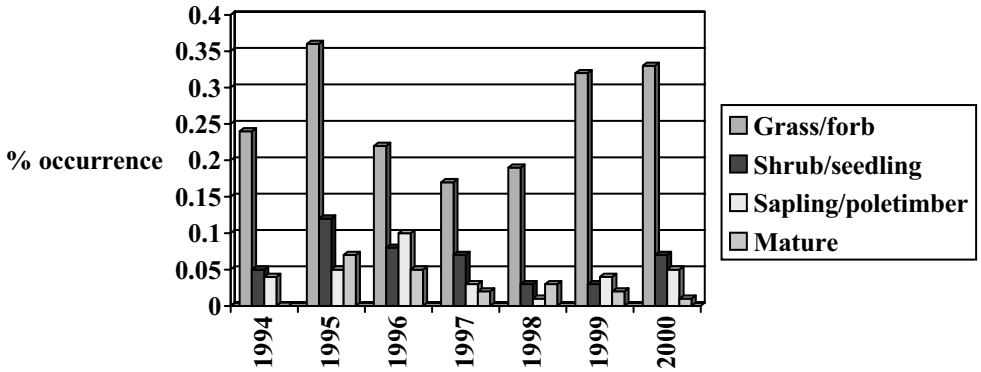

Figure 1— Frequency of annual observations of Eastern Bluebird (*Sialia sialis*) by successional sere on the Francis Marion and Sumter National Forests.

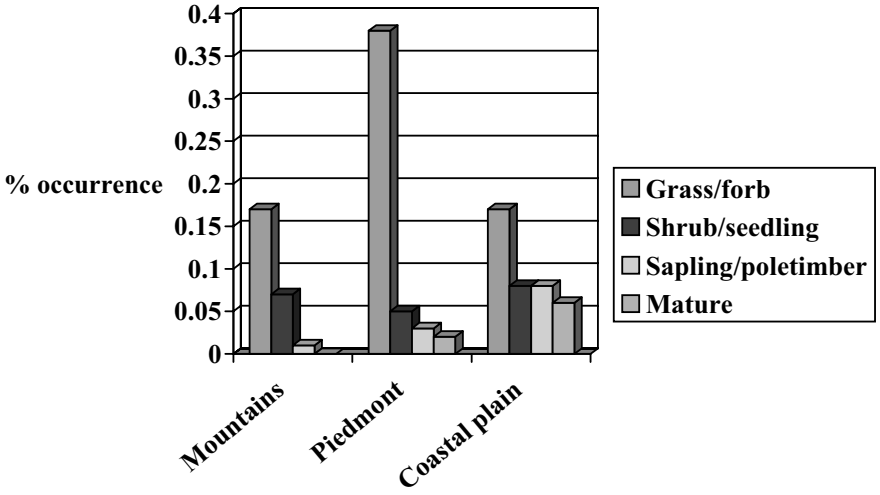

Figure 2— Eastern Bluebird (*Sialia sialis*) observation frequency by successional sere, by physiographic area on the Francis Marion and Sumter National Forests.

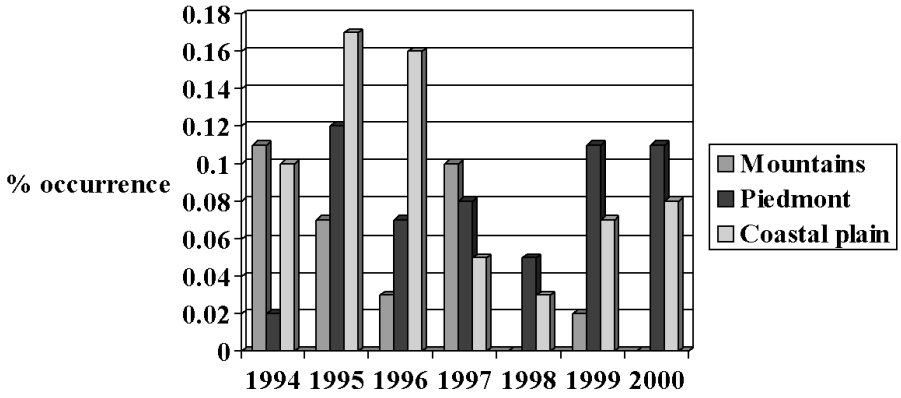

Figure 3— Frequency of observations of Eastern Bluebird *(Sialia sialis*) by physiographic area on the Francis Marion and Sumter National Forests (1994–2000).

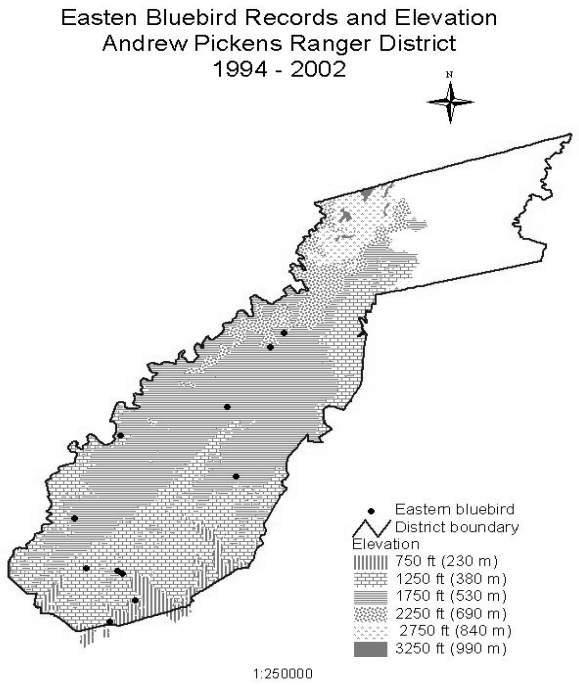

Figure 4— Eastern Bluebird (*Sialia sialis*) occurrence in relation to elevation. Occurrence of a selected species compared to elevation.

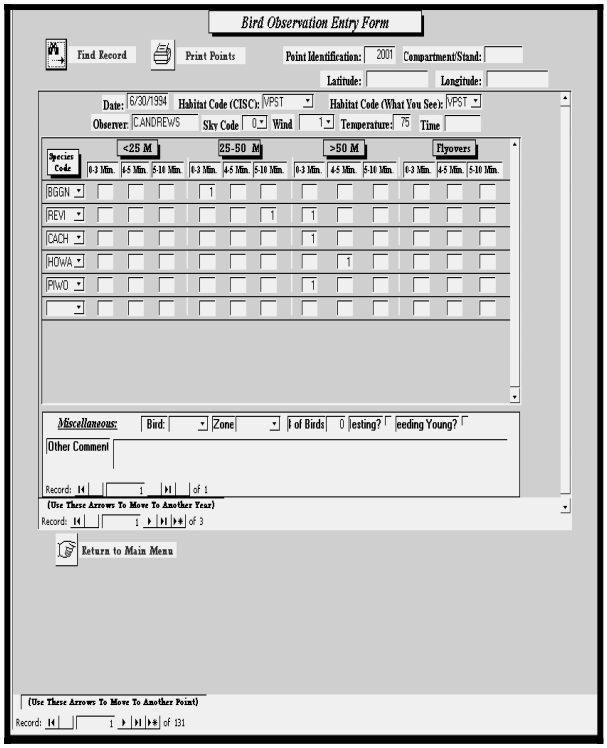

Figure 5— Sumter BIRDBASE bird observation data entry form.

Methods

Standard 10-minute point counts (Hamel et al. 1996) are used to collect bird point count data. Visual and auditory observations are recorded at three time intervals (0-3 min., 4-5 min., 6-10 min.) and at three distance bands (<25m, 25-50m, >50m) from the point center. Points were established in four habitat conditions (grass/forb, shrub/seedling, sapling/pole, mature forest), in several forest "habitat groups" (e.g., southern yellow pine, bottomland hardwood, upland hardwood, mixed pine hardwood, white pine/hemlock, cove hardwoods) to represent the full range of available forest types and structural conditions found on the Francis Marion and Sumter National Forests. Permanent point locations within forest stands are randomly selected within each habitat group. A minimum of five points was established for each condition in all habitat groups, and placed at least 50m within a stand boundary. A subset of total bird point locations are selected each year and monitored once per season, which extends from May 5 to June 15. All bird points on the FMS have been monitored between three to nine times during the nine-year period 1994–2002. In addition to bird observations, weather, date, time, and observed habitat conditions are recorded each time a point is sampled (*fig. 5*).

After a point location was determined, latitude, longitude, and vegetation parameters describing midstory and groundcover conditions are collected (*fig. 6*).

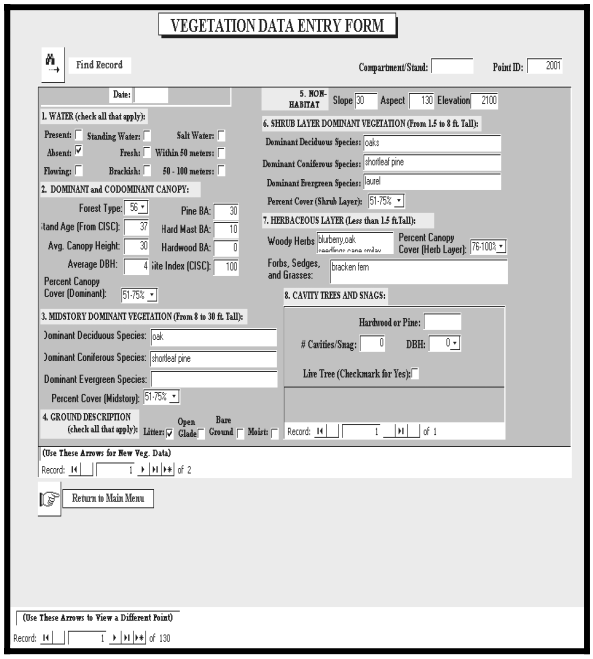

Figure 6— Sumter BIRDBASE vegetation data entry form.

Data entered into Sumter BIRDBASE is linked to a spatial coverage created with spatial coordinates from each point (*fig. 7*).

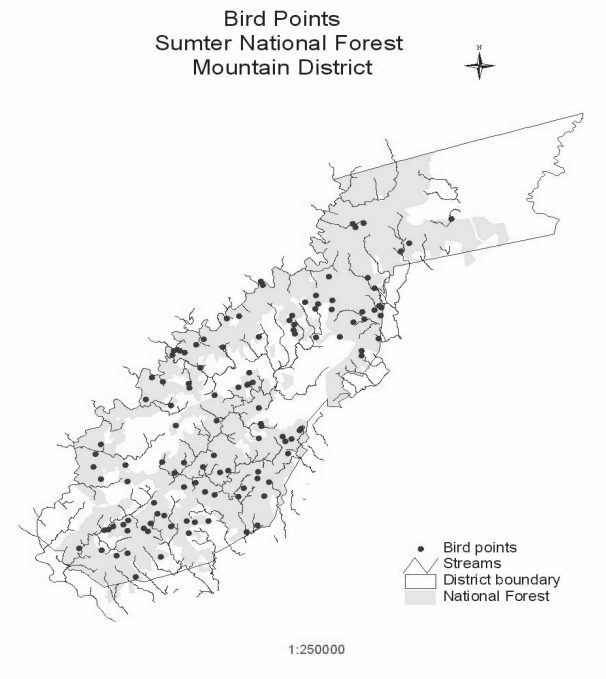

Figure 7— Distribution of bird points on the Andrew Pickens Ranger District, Sumter National Forest in South Carolina (USA).

Results

Nine years of data collection on the Francis Marion and Sumter National Forests has provided a foundation to partially accomplish several objectives: (1) acquire baseline information on habitat relationships of breeding birds on the Forests; (2) gather data on frequency of occurrence, and the ability to monitor neotropical migrants and other birds on a National Forest by physiographic area (Keys et al. 1995); (3) gather information to assess habitat quality for inventory, maintenance, and restoration proposals; (4) accumulate data for eventual development of habitat capability models (Linder 2001; Buehler et al., this volume); (5) accumulate data to facilitate large and small scale comparisons with modeled population changes from the North American Breeding Bird Survey (Sauer et al. 2001), or the Monitoring Avian Productivity and Survivorship (MAPS) Program (DeSante 2001); and (6) develop management recommendations to affect change in avian reproductive success (Nott 2000).

In addition, this stratified random sample of habitats often suggested population trends different than those referenced in published literature (e.g., North American Breeding Bird Survey [Sauer et al. 2001]). Differences were most apparent for species dependent upon short-lived (<10 – 20 years old) habitats such as open woodland/savannas, shrubland, and grasslands. For example, Eastern Bluebird (*Sialia sialis*) population change in South Carolina is summarized as slightly increasing, trend estimate 0.5; P = 0.74 in the BBS from 1980–2000 (Sauer et al. 2001), whereas detections on the FMS indicate population trends are decreasing in the mountains and coastal plain (*fig. 3*). Northern Bobwhite Quail (*Colinus virginianus*) in South Carolina are shown to be in decline from 1980-2000, BBS trend estimate –5.6; P = 0.0, however FMS detections indicate increasing populations in the coastal plain, and stable populations in the piedmont (*fig. 8*). Likewise, Yellow-breasted Chat (*Icteria virens*) population change in South Carolina for 1980–2000 is reported by BBS as stable, trend estimate 0.0; P = 0.97, however FMS detections indicate a decline in all physiographic areas (*fig. 9*).

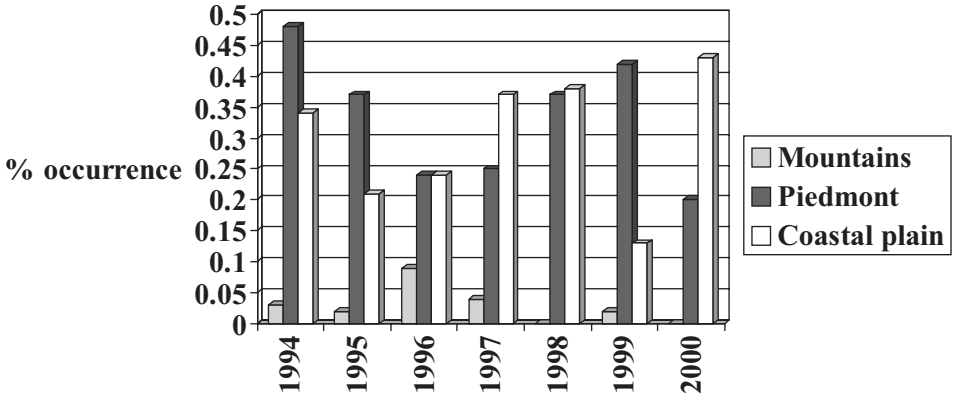

Figure 8— Frequency of annual observations of Northern Bobwhite Quail (*Colinus virginianus*) by physiographic area on the Francis Marion and Sumter National Forests (1994–2000).

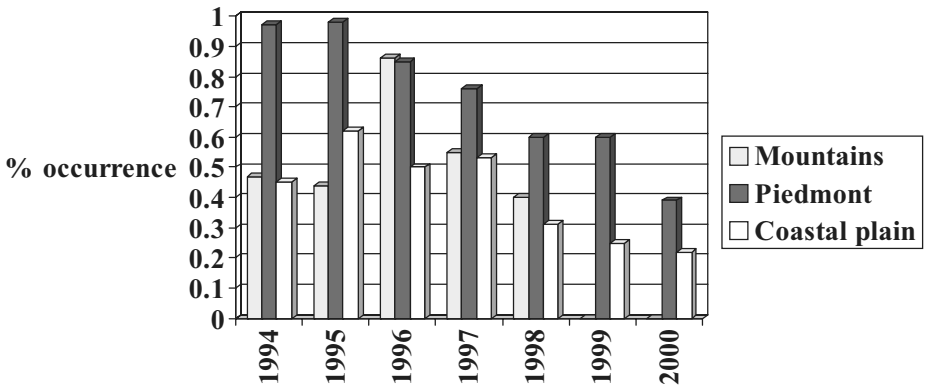

Figure 9— Frequency of annual observations of Yellow-breasted Chat (*Icteria virens*) by physiographic area on the Francis Marion and Sumter National Forests (1994–2000).

These differences can largely be attributed to two factors: 1) contrasting forest management regimes on relatively small (<5 percent of the State) National Forests, and 2) over a decade of deferred forest management activities due to policy direction arising from administrative appeal procedures on the Sumter and, except for prescribed burning and Red-cockaded Woodpecker (*Picoides borealis*) management, effects of Hurricane Hugo on the Francis Marion. When it is possible to implement, management of the FMS emphasizes a diversity of habitat conditions, extended harvest rotations (60+ years for pine types, 100+ years for hardwood types), increased basal area in mast producing hardwoods, and restoration of pyrophitic communities such as Table Mountain pine (*Pinus pungens*), longleaf pine (*Pinus palustris*) and shortleaf pine (*Pinus taeda*)/bluestem (*Andropogon* spp.).

Analysis of bird point data provides species-specific information used at project level analyses in describing effects and developing mitigation measures for improving wildlife habitat. Interpretation of data collected through bird point monitoring also supports projects that implement new strategies in forest silviculture such as low-density management (LDM) (*fig. 10*). While traditional forest management maintains high productivity levels of wood products per unit area, LDM maintains forestland at 40 – 60 ft^2 (12 – 18 m^2) or lower basal area, and develops groundcover dominated by herbaceous plants and grasses (*fig. 11*).

Discussion

It has become increasingly evident that the power of geographically based habitat relationship and species occurrence information can begin to answer questions related to population trends and management effects for many species of birds. Observations from a companion monitoring effort in the Northern Rocky Mountains recognize similar possibilities at local, landscape, and regional scales (Hutto and Young 2002). Overall, the value of monitoring landbirds on the Francis Marion and Sumter National Forests has been greatly increased by implementing strategies that are similar in design, comparable in results, and complimentary to other regional or national efforts such as Access R8Bird, MAPS, and the National Bird Point Count Database.

Figure 10— Herbaceous understory response to LDM strategy from initial treatments of a combination of thinning and burning.

Figure 11— A heavily reduced basal area loblolly pine (*Pinus taeda*)/bluestem (*Andropogon* spp.) stand under LDM. These open woodland/savanna conditions are established through sequential thinnings and harvests, and maintained with periodic fire.

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