

FEATURE ARTICLES

**COMBINING BREEDING BIRD SURVEY AND DISTANCE SAMPLING TO ESTIMATE DENSITY OF MIGRANT AND BREEDING BIRDS**

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*Abstract.* We combined Breeding Bird Survey point count protocol and distance sampling to survey spring migrant and breeding birds in Vicksburg National Military Park on 33 days between March and June of 2003 and 2004. For 26 of 106 detected species, we used program DISTANCE to estimate detection probabilities and densities from 660 3-min point counts in which detections were recorded within four distance annuli. For most species, estimates of detection probability, and thereby density estimates, were improved through incorporation of the proportion of forest cover at point count locations as a covariate. Our results suggest Breeding Bird Surveys would benefit from the use of distance sampling and a quantitative characterization of habitat at point count locations. During spring migration, we estimated that the most common migrant species accounted for a population of 5000–9000 birds in Vicksburg National Military Park (636 ha). Species with average populations of >300 individuals during migration were: Blue-gray Gnatcatcher (*Polioptila caerulea*), Cedar Waxwing (*Bombycilla cedrorum*), White-eyed Vireo (*Vireo griseus*), Indigo Bunting (*Passerina cyanea*), and Ruby-crowned Kinglet (*Regulus calendula*). Of 56 species that bred in Vicksburg National Military Park, we estimated that the most common 18 species accounted for >8150 individuals. The six most abundant breeding species, Blue-gray Gnatcatcher, White-eyed Vireo, Summer Tanager (*Piranga rubra*), Northern Cardinal (*Cardinalis cardinalis*), Carolina Wren (*Thryothorus ludovicianus*), and Brown-headed Cowbird (*Molothrus ater*), accounted for >5800 individuals.

*Key words:* breeding bird survey, density, detection probability, distance sampling, loess bluff forest, migration.