INTRODUCTION

In order to estimate abundance for tufted titmice (*Baeolophus bicolor*; family Paridae) across a forest disturbance gradient in West-central Indiana, we performed flock scan samples and recorded sightings of individually identifiable banded birds as well as non-individually identifiable (non-banded) birds. We also used data from encounter surveys of individually identifiable banded birds. Abundance data was restricted to March 1st through April 19th, 2016, a time when no additional birds were banded. In this data set, we describe data collection and parameterization of foraging data for subsequent statistical analyses. See Gentry et al. (in review) for background information and contextual rationale.

METHODS

Study sites

We conducted our research in forest remnants embedded in an agriculture-dominated landscape in the glaciated region of west-central Indiana. We chose study site locations in three sections of forest corridors managed by Purdue University: Ross Biological Reserve (40°24’ N, 87°04’ W; 37.61 ha), Martell Forest (40°26’ N, 87°02’ W; 38.72 ha), and Stephens Forest (40°40’ N, 86°37’ W; 30.04 ha). Each section contained a unique subpopulation of birds. Based on the relative distances juvenile parids typically disperse (e.g. Brewer 1963), birds occupying the Ross Biological Reserve and Martell Forest were likely from the same genetic population, whereas the Stephens Forest birds were likely genetically distinct.

Disturbance rankings of Martell and Stephens Forest sites were qualitatively based on the extent to which the integrity of the natural forest structure was altered relative to the Ross Biological Reserve. The reserve (hereafter ‘undisturbed’ site) is managed for biological diversity and has been left relatively untouched since its establishment in 1949 (Pierce et al. 2006). In contrast, Martell Forest (hereafter ‘mid-disturbed’ site) is managed for invasive species control and the following practices are ongoing: cut stump treatments, prescription burns, and application of basal or foliar chemical sprays. The third site, Stephens Forest (hereafter ‘most-disturbed’ site), is a managed timber harvest property that includes three different plantation stand types: three walnut stands (cumulative area of 8.30 ha), one red oak (0.53 ha), and one yellow poplar stand (1.02 ha). The plantations were created in 1972 and thinned last in 2004. Forest surrounding the plantation stands is managed (via selective harvest) to promote uneven aged growth (cumulative area of 20.19 ha).
**Color banding for individual identification**

We periodically captured and individually marked tufted titmice starting in winter 2015 through spring of 2016 and the number of marked birds ranged from 54–76 per site. Birds were drawn in to treadle traps set on feeding trays that were filled with seed four days before traps were set for capture and marking. Each captured bird was given a numbered, aluminum U.S. Fish and Wildlife Service band and a unique color combination of plastic leg-bands. We used strips of colored electrical tape placed over the colored band that extended about 10 mm behind the leg to facilitate identification of the birds, creating a more visible marker. No feeder stands were stocked with seeds outside of the trapping periods. All protocols for handling, banding, and observing animals were approved by the Purdue Animal Care and Use Committee (PACUC no. 1306000883).

**Abundance data collection**

We used flock scan samples and encounter survey data collected between March 1st through April 19th, 2016 as mark-resight data in Program Mark to obtain population abundance estimates for tufted titmice (White and Burnham 1992); no additional birds were banded during this time frame. Similar procedures were followed for scan sampling and encounter surveys: the surveys were conducted during weekdays between 0800 h and 1400 h on days without precipitation. The sites were visited on a rotating basis so that a site was never sampled on consecutive survey days. The surveys were conducted across sub-area plots that were delineated within each site based on topography, private properties lines, and trails. The order in which each plot was surveyed was randomized at the time of arrival to the site each day. Observers spent approximately 45 minutes within each plot looking and listening for the birds. Scan samples were conducted each time a flock was sighted, and involved identifying banded birds and the number of banded and non-banded birds in each flock. Approximately 50 hours were spent collecting scan sample data at each site. Encounter surveys differed from scan samples in that sightings were limited to individually identifiable birds and recorded regardless of whether the bird occurred alone or within a flock. Flocks were defined as the spatial association of at least two birds who were at most 10 m from the next closest bird and traveling in the same direction.

We did not assume demographic closure, as examination of the number of resightings per banded individual revealed not all birds were resighted multiple times between March 1st and April 19th, 2016. However, the low proportion (9/73) of birds seen only once indicates that the effect from dispersal and death is negligible. We also did not assume that the study population was geographically closed, as our sites represented a portion of a linear continuous forest patch corridor. We sampled with replacement, as it was possible for the same birds to be sighted more than once in a day. We also included individuals in the analysis as “+0” if they were seen incidentally outside of scan sampling to set a more accurate minimum population size of birds known to persist in the study area during that time (McClintock et al. 2009). We therefore used a Poisson mark-resight model, as it accounts for the fact that 1) CACH are highly mobile, and 2) the exact number of marked individuals in the population at the time of resighting surveys was unknown. The Poisson mark-resight approach also allows for the inclusion of resight data from partial color band readings, where an individual is identified as marked, but not to individual identity.
VARIABLE DESCRIPTIONS

Individual Individuals listed by a concatenation of study site code and band color. Study site code is MAR for Martell Forest, RRE for Ross Biological Reserve, and STE for Stephens Forest.

Abundance data Number of sightings per 1 occasion (March 1 through April 19, 2016).

Group Name of study site at which the encounter surveys took place; coordinates for study sites in latitude and longitude are listed under the methods section. Group 1 (Ross Biological Reserve) is coded as ‘1 0 0’; group 2 (Martell Forest) is coded as ‘0 1 0’; group 3 (Stephens Forest) is coded as ‘0 0 1’.

LITERATURE CITED


