Correlation of Woodcock Counts with Habitat Types in Eastern Texas

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Abstract: We used correlation analysis to test for relationships between habitat types and numbers of courting American woodcock (*Scolopax minor*) recorded along singing-ground survey routes in eastern Texas. Availability of 10 different habitat types was quantified at each survey route stop and compared to the number of woodcock recorded. Numbers of courting woodcock recorded were strongly correlated to pine (*Pinus* spp.) seedling and pine sapling habitats. Results may prove helpful in monitoring long-term trends in singing-ground habitat availability.

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The U.S. Fish and Wildlife Service, the Canadian Wildlife Service, and numerous states and provinces monitor the population status of American woodcock using the North American Woodcock Singing-Ground Survey (SGS). The SGS involves driving along randomly selected routes, each consisting of 10 stops (listening points) spaced 0.6 km apart. At each stop, the number of different courting male woodcock heard during a 2-minute interval is recorded. These counts provide an index for monitoring population trends (Tautin et al. 1983).

Many areas are experiencing a decline in woodcock habitat (Owen 1977). However, most previous studies concerning the effect of habitat changes on woodcock abundance have been conducted in the northern portions of the woodcock's range. These studies indicate that the majority of singing grounds consist of early to mid-successional stage habitats such as abandoned fields and 2- to 10-year-old clearcuts (Sheldon 1956, Marshall 1958, Maxfield 1961, Nicholson et al. 1977, Dwyer et al. 1983). Using aerial photography, Dobell (1977) developed a woodcock singing-ground habitat index based on crown cover classes of habitat at each stop along 54 routes in New Brunswick. A significant, although weak correlation (r =

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0.15) was found between the habitat index and the number of courting males recorded. Also using aerial photography, Dwyer et al. (1983) investigated relationships between habitat types at survey stops and numbers of courting males in 9 northeastern states using multiple regression analysis. Numbers of courting males were positively related to abandoned fields and alder (*Alnus* spp.), and negatively related to urban areas ($R = 0.47$).

Currently, Illinois is the southern-most state included in the Central Region of the SGS. However, methods have recently been adapted for use in eastern Texas (Tappe 1987, Tappe et al. 1989) and an operational survey was begun in 1988 by the Texas Parks and Wildlife Department. The objectives of this study were to describe a method to quantify singing-ground habitat available along survey routes in eastern Texas and to determine the correlation between numbers of courting males recorded and habitat types.

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Methods

This study was conducted in 6 eastern Texas counties: Angelina, Cherokee, Nacogdoches, Rusk, San Augustine, and Shelby. Thirty, 5-minute latitude-longitude blocks, 5 in each county, were selected randomly. We located 5.8-km long routes in each block using a procedure similar to that described by Tautin et al. (1983). Each route consisted of 10 stops 0.6 km apart. Routes were surveyed at dawn and dusk in February 1986 and at dusk in January and February 1987. Dawn surveys began 60 minutes before sunrise and dusk surveys began 22 minutes after sunset. The numbers of individual courting male woodcock heard during a 2-minute interval at each stop were summed for each route.

Stops were divided into 4 quadrats (right front, left front, right rear, left rear) based on the direction of travel. The predominant habitat type in each quadrat was recorded as being in 1 of 5 broad classes: agricultural, water, houseplace or dwelling, forested, and non-forested. Each class was further divided into several categories and sub-categories. If applicable, the sub-categories included the appropriate successional stages for the general category. For example, under the forested land class, 1 general category is pine monoculture. This category is further divided into unplanted clearcut, seedling, sapling, pole, and sawtimber. A complete listing of categories is outlined by Tappe (1987). The percentage of a route consisting of a specific habitat type was calculated by summing the number of quadrats in which the habitat type was predominant and dividing by the total number of quadrats (40) on the route.

Correlation analysis was used to test for relationships between numbers of courting males recorded and habitat types. These analyses were conducted twice for each year; once using all of the survey routes and then again after deleting routes on which no woodcock were recorded. The same tests also were performed on combined data from both years.

Results

Several habitat types had a poor range of values and/or occurred on few (<25%) of the survey routes. Therefore, these habitat types were not included in the analyses. Only 10 habitat types were eventually used in the final analyses: pine seedling, pine sapling, pine pole, pine-hardwood sapling, pine-hardwood pole, pine-hardwood sawtimber, pasture, brush, occupied homesite, and unoccupied homesite. Only 2 of these habitat types exhibited a significant ($P < 0.05$) relationship with numbers of courting males recorded. Percent of pine seedling habitat along a route yielded a positive correlation in 1986 and 1987 when all routes were included in the analyses (Table 1). In 1986 and 1987, 10 and 14 routes, respectively, had no woodcock recorded on them. When these routes were excluded from the analyses, percent of pine seedling habitat also yielded significant positive correlations; in addition, the correlations increased (Table 1). Numbers of courting males recorded were positively correlated with the percent of pine sapling habitat along a route only when routes on which no birds occurred were excluded (Table 1). When data from 1986 and 1987 were combined, percent of pine seedling and pine sapling habitats continued to yield significant correlations; however, no additional habitat types exhibited significant relationships to numbers of courting males recorded.

Discussion

Many zero counts are recorded each year in the SGS, not only due to randomly selected routes located in marginal habitat, but also due to the fact that woodcock exist in relatively low densities (Tautin et al. 1983). Assuming a count of zero when woodcock actually exist at a low density may lead to erroneous inferences. Eliminating from our analyses the routes on which no woodcock were recorded may

Table 1. Correlations of percent pine seedling habitat and percent pine sapling habitat with numbers of courting woodcock recorded per route in eastern Texas.

Habitat type	Year	Routes	*N*	*r*	*P*
Pine seedling	1986	All	60	0.56	<0.001
		Zeros excluded[a]	40	0.69	<0.001
	1987	All	30	0.64	<0.001
		Zeros excluded	16	0.73	0.001
	1986–87	All	90	0.58	<0.001
		Zeros excluded	55	0.69	<0.001
Pine sapling	1986	All	60	0.19	0.147
		Zeros excluded	40	0.57	<0.001
	1987	All	30	0.24	0.197
		Zeros excluded	16	0.63	0.008
	1986–87	All	90	0.21	0.050
		Zeros excluded	55	0.58	<0.001

[a]Excluding routes on which no woodcock were recorded.

have eliminated additional sources of error. Therefore, correlations based only on routes on which woodcock were recorded may have reflected the relationship between habitat type and the number of woodcock recorded more accurately than did correlations based on all routes.

Our results suggest a strong association between courting woodcock and pine seedling and pine sapling habitats in eastern Texas. Kroll and Whiting (1977) also suggested that young upland pine plantations are important as habitat for wintering woodcock in eastern Texas. In addition, our method of quantifying availability of singing-ground habitat along survey routes may prove helpful in monitoring long-term trends in availability of singing-ground habitat concurrently with woodcock surveys.

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