

# Courtship and Territorial Behavior of Some Indiana Woodcocks<sup>1</sup>

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## *Abstract*

Woodcocks were observed during evening flight performances from their beginning on March 15 until conclusion on May 24 at Shidler Forest in western Tippecanoe County. Aspects of flight performances were noted, timed when possible, and recorded. Territorial observations were recorded. Three birds were mist-netted for banding and identification purposes. Taped woodcock calls were used to attract males for netting and for testing territorial extent.

The greatest number of performing males was observed during the last half of March. This was probably the peak migration period. A few birds remained on the study area throughout the breeding season. Light intensity controls the onset and cessation of performance events. Low temperatures and precipitation had little observed effect on performances. Longer flight times and greater ground area coverage by flights were noted in this study than in previous studies. These two parameters are interrelated.

With the aid of the taped woodcock call, a woodcock was found to defend an area of at least 4.38 acres. Most territorial defense consisted of threats and retreats with no physical contact observed between combatants. When attracted by taped calls, one bird did attack the author and struck him several times. One singing site appeared most attractive because of the sequential appearance there of three males coinciding exactly with disappearances of males from other sites.

## Introduction

The American woodcock (*Philohela minor*) is an uncommon summer resident in Indiana, but because they commonly nest farther to the north and winter to the south, large numbers may be seen here during fall and spring migrations (10). By the time woodcocks reach this area in the spring, they have already begun their courtship and this performance may be seen almost anywhere in the state if one searches the correct habitats.

The courtship performance consists of a rather spectacular spiraling flight by the male and a harsh, nasal call, generally described as a "peent" (8), which is given from the ground between flights. A true vocal song is given in the flight during the first part of a rather direct descent. The performing area is defended against other males by the territorial bird, and females move into this area to be mated.

Although this behavior has been described by many observers (1, 8, 9), the territorial and courtship behavior of the woodcock are poorly described and little work has been done on this species in Indiana. The objectives of this study were to attempt to answer some of these questions and to establish some performance parameters for Indiana woodcocks.

The study area was a 200-acre tract known as Shidler Forest, owned by the Department of Forestry and Conservation, Purdue University, and located 10 miles west of Lafayette, Indiana, in Tippecanoe County. It

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consists of bottomlands along Indian Creek, ridges, and ridgetops. There are openings in the bottomlands and on the ridgetops which are used as woodcock singing fields. The area has a small resident woodcock population.

**Methods and Materials**

Beginning in early March, the open fields of the study area were checked periodically for performing birds. When birds began to perform,

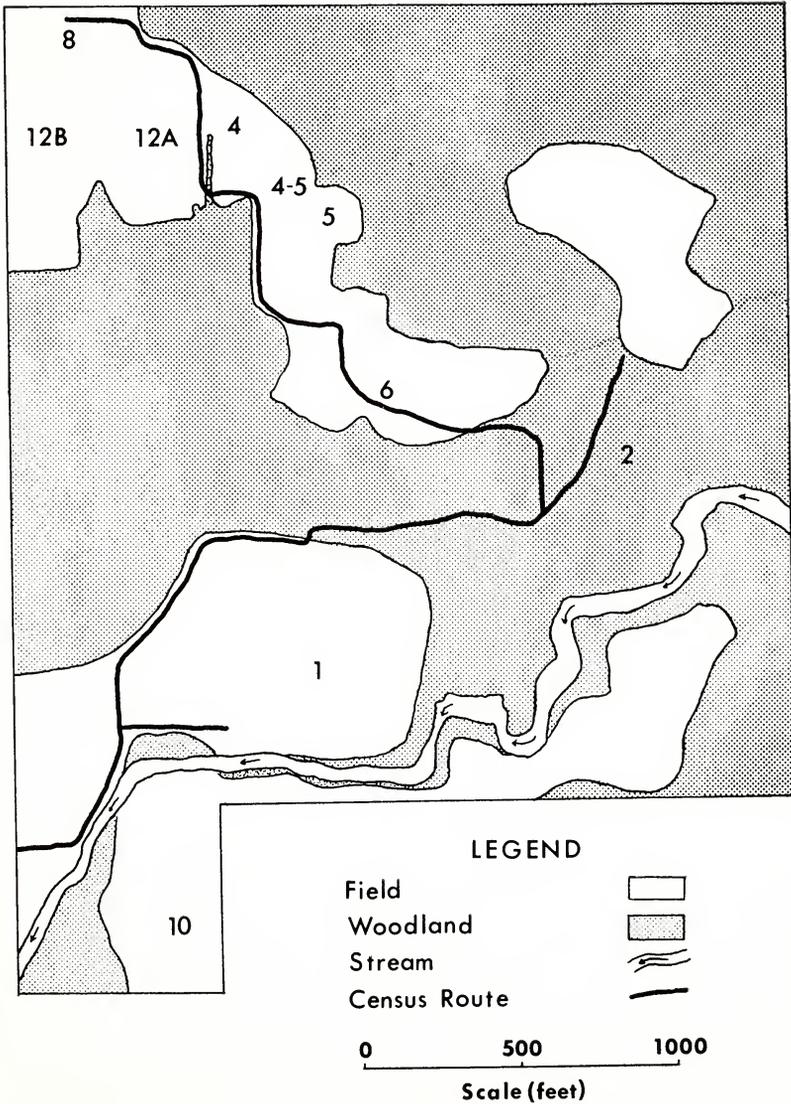


FIGURE 1. A major portion of Shidler Forest showing performing areas which were occupied by singing woodcocks at times during 1969.

a route was established to include visits to all occupied and other likely singing sites on the area. These sites were numbered for identification, incorporating woodcock territorial numbers of previous studies. This accounts for the non-sequential numbering (Fig. 1).

This route was walked several evenings a week, and a record was kept of sites being used by singing woodcocks. No morning censuses were made. When a site was in use on two consecutive observations, it was assumed to have been used during the period between those visits. Records were kept of numbers of birds on and off territories, behavioral observations, and timing of performance events.

On some days all field time was spent observing complete performances of individual territorial males. The chronological order and duration of performance events, the number of flights and peents, and behavioral observations were recorded.

In an attempt to identify individual birds performing on an area, three males were mist-netted and banded with U.S. Fish and Wildlife Service bands. In the first netting attempts the net was simply set in the usual path of flight of the bird. Later a portable cassette tape recorder was used to play a tape recording of the peenting of a territorial woodcock to lure the territorial bird into the net.

The size of the territory (defended area) of resident birds was tested with the taped peenting call. This tape was played at various distances from the landing site of a territorial male and a positive response was considered to be an overflight with the issuance of a cackling threat note. The tape was played at the same volume at which it was recorded. This technique also allowed the observation of various reactions of territorial birds to intruding males.

Weather conditions were recorded each day on the area. Temperature was measured with a mercury thermometer. Wind speed was estimated. In the consideration of light intensity effects, only completely clear or completely cloudy days were used.

Data were tested for significance when necessary with Students'-t test. Differences were considered significant at the 95% confidence level and highly significant at the 99% confidence level.

## Results and Discussion

### Occupancy of Singing Grounds

The first woodcock was observed performing on Area 1 on March 15, 1969. The number of birds performing and the total number of birds observed on the area increased from that date until about March 25 and then decreased, more or less stabilizing during the first week in April (Fig. 2). Individual singing fields were occupied for periods of from 1 day to 2 months. The last half of March would seem to be the time of the main migratory flight in this area. Migratory males obviously occupied performing areas during short pauses in their northward movement.

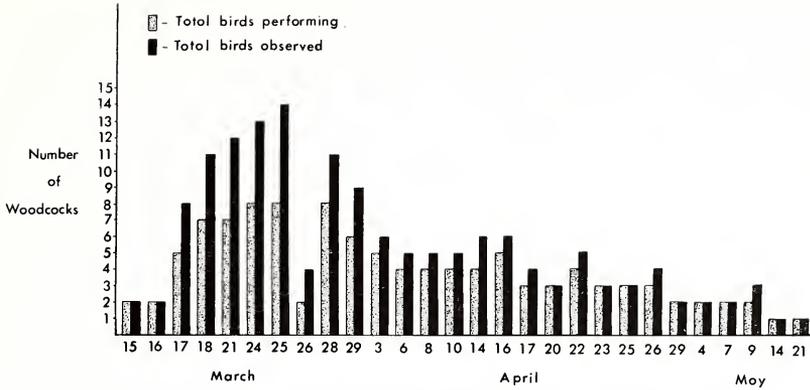


FIGURE 2. Number of performing woodcocks and total woodcocks recorded during censuses at Shidler Forest, 1969.

The requirements for a singing field are fairly rigid, for even transient birds performing along their migratory routes prefer certain areas (11). A few conditions seemed to be necessary on the study area. A site was always an area with no tall herbaceous vegetation, either an area of bare ground, of matted vegetation, or of short grasses (mowed or otherwise checked), and small rather widely scattered woody plants. Acceptable heights of woody vegetation ranged from 2-15 feet.

Temperatures did not seem to affect the performance level even when coupled with precipitation; birds performed at normal levels on March 29 when the temperature was at 27°F and on March 25 when the

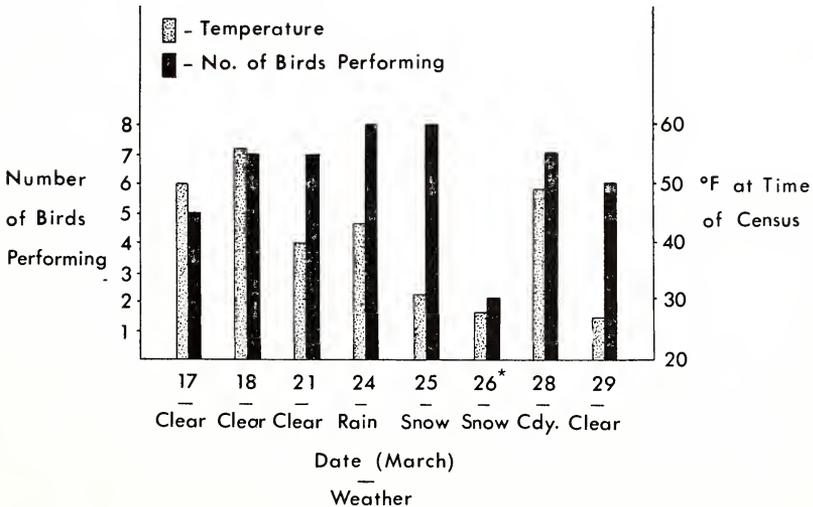


FIGURE 3. Comparison of temperature and the number of woodcocks performing in late March, 1969, at Shidler Forest (one inch of snow on ground, drifts to four inches).

temperature was at 31°F and a light snow was falling (Fig. 3). On March 26, however, with the temperature at 28°F, a light snow falling and 1 inch of snow on the ground, only a few very irregular flights occurred (Fig. 3). Although other studies showed that performance levels decreased as temperatures reached 35° to 41°F (2, 5, 7), no decrease was evident in this study at these temperatures. Snow cover was apparently the influencing factor. Mendall and Aldous (7) observed that birds hesitated to land on snow and Pettingill (8) reported that a snow cover curtailed performances and that those that did occur were irregular.

Fairly strong winds also failed to alter performance levels. On March 28, a 10-20 miles per hour (mph) wind, with gusts to 30 mph, blew without inhibiting performances (Fig. 2). Light rain had no depressing effect, but during periods of heavy rain no flights were made, although the birds continued peenting from the ground. Song flights resumed when intensity of the rain decreased. Sheldon (11) found that high winds with or without rain and heavy downpours without wind curtailed breeding activity. It seems that the drive to perform courtship flights is so great that only the most extreme environmental conditions would cause elimination of a performance.

### Display Behavior

Territorial birds usually began peenting from their diurnal areas 5-15 min before moving onto their singing grounds. Some individuals gave no preperformance peenting. Mendall and Aldous (7) found it unusual for distances from the diurnal area to the singing ground to be greater than 100 yards. Although the same was found in this study, one bird had its diurnal area in the bottomland, about 0.4 miles from its singing ground on the ridgetop, Area 4-5. This bird, however, after 11 days shifted to a performing territory within 75 yards of its diurnal area, when that territory, Area 1, was abandoned by its performing bird (Fig. 1).

On clear days woodcocks arrived on their singing grounds an average of 16 min after sunset and began the first flight an average of 21 min after sunset. Cloudy conditions caused the birds to occasionally move onto the areas well before sunset and greatly increased variability in time of first peent and of first flight relative to sunset (Table 1). Light intensity is the major influencing factor on time of first on-area peent and first flight. The greater variability in time of first peent than in time of first flight on clear days is undoubtedly because of the variable light intensities on the individual diurnal areas (Table 1). All of singing grounds have very similar light conditions, for none have overhead cover. This first flight begins when the light intensity reaches about 2 foot-candles (4, 7). The greater variability evident on cloudy days in the times between sunset and the first peent and flight comes from the fact that even a complete cloud cover can let through extremely variable amounts of light (Table 1).

A total of 89 flights in 9 complete performances were timed. There was much variation within and among performances. The average flight

TABLE 1. *Time after official sunset of first peent from performing area and of first flight of male woodcocks at Shidler Forest, 1969.*

Measurement	First Peent		First Flight	
	Clear Sky	Cloudy Sky	Clear Sky	Cloudy Sky
Mean Length (min)	16.29	-0.08	21.18	8.00
Range (min)	7 to 24	-17 to 20	16 to 27	-13 to 22
Standard Deviation	4.37	12.03	2.28	12.44
No. of Observations	24	13	22	11

length was 61.5 sec with a range of 52-76 sec. The time intervals between flights were also very variable.

Three component parts of a total of 29 flights from 3 separate performances were timed—the ascent (period before vocal song), the song, and the silent descent. By far the most variable component among the three was the ascent with the other two being relatively invariable. The mean length of time for the ascent was 45.2 sec with a standard deviation of 3.30; of the song 9.7 sec with a standard deviation of 0.81; and of the silent descent 7.0 sec with a standard deviation of 0.63. Almost all of the variability in the flights was due to the variation in ascent times. Because the song and silent period occurred during fairly direct, though somewhat zigzagged, groundward plunges, the altitude attained during such flights must have been fairly uniform. Estimates of heights attained vary from 200-300 feet (7, 8); Sheldon (11) measured the altitude of 3 flights of the same bird and found all to be 275 feet. If this constancy of song and silent descent length hold for woodcocks elsewhere, then variation evident in flight length can be attributed to variation in ascent times. Brewster (3) reported the length of 2 songs as 11 and 12 sec. The average and the range of flight times in this study were longer than those of other studies, and the area covered in one flight was also larger, averaging over 2 acres. Pitelka (9) reported average flight coverage of only 1/3 acre and flight times of 29 to 60 sec with an average of 43 sec (calculated by author). The majority of the flights timed by Mendall lasted 50 to 55 sec with a range from 44 to 63 sec (7). The author suggests that the time of an ascent, and thus a flight, is determined by the time required to reach a certain altitude, and that this time is directly proportional to the amount of area encompassed in a flight. This area may in turn be determined by several factors including size of singing field, height of surrounding vegetation, and juxtaposition of other territorial males.

The number of peents per minute varied greatly, ranging from 7 to 28 per minute. The woodcocks occasionally walked or ran short distances between peents but most often remained in one spot, usually pivoting a little after each peent. Some birds turned 360° in one direction while others pivoted 90-180° in one direction and then reversed directions. This rotation caused the volume of the peenting to seem to vary to an

observer and probably served to make territorial birds conspicuous for the maximum distance possible in all directions.

The average length (from first peent on the area to the last) of 26 performances not influenced by moonlight was 34.2 min, ranging from 16 to 53 min. On a moonlit night, April 29, a performance lasted 74 min. It was found that performances were highly significantly longer on cloudy than clear days, 41.3 and 31.5 min, respectively. The lengths of performances were also more variable on cloudy than on clear days. Total performance length was greatly influenced by light conditions. Cloudiness extended performances because of earlier starting times and fairly comparable stopping times; the greater variability in lengths of performances on cloudy days was undoubtedly caused by differential light penetration through a full cloud cover. A long performance on a moonlit night as observed in the study has been reported by many investigators. It is a good example of the degree to which various aspects of the performance are light intensity dependent (7, 8, 11).

The manner in which performances ended differed among individuals. A bird left an area after the last flight either immediately, after a long period of silence, or most commonly after several minutes of decelerating peenting.

### **Territorial Behavior**

Territorial birds tolerated no territorial intrusions by other males. Cackling was the most common threat exhibited. When an intruder peented within an occupied territory, the territorial bird usually would fly immediately toward the source of the strange peenting and cackle. This generally discouraged the intruder which hid and became silent or departed. The peent was the major communication in woodcock relationships and served the dual purpose of advertising occupancy and of disclosing the presence of intruders.

Several chases were observed and in all cases both birds seemed to flush from nearly the identical spot. When first sighted, the birds were usually 10 to 15 feet above the ground with one about 5 feet ahead of the other. This interval was kept throughout the chase as the birds climbed at a 45 to 90° angle from the horizontal. Usually the only sound emitted during these chases was wing-twitter although cackling occasionally occurred. About half of these chases ended with the bird giving chase veering off and beginning a flight song. At other times the chase continued upward until both birds were lost from view and several minutes elapsed before the territorial bird returned to the area. No physical contact between birds was ever observed. Similar chases were observed by Pitelka (9) who attributed them to two males simultaneously starting their flights. From the observations in this study, this does not seem likely. It is also unlikely that this is a courtship flight including male and female, because in none of the 11 chases observed did the bird being chased ever return to the field. It seems most probable that it is a very ritualized form of chase which has developed evolutionarily to maximize

survival by preventing injury to combatants and still maintaining territorial integrity.

An attempt was made to determine the area defended by a territorial bird. On May 5 and 6, as the peenting tape was played from various locations on the area, the territorial male on Area 1 reacted by flying toward it and cackling over a total area of 4.38 acres. The greatest distance from which a response was drawn was 330 feet. It had been thought previously that the birds defended at most the area covered by their flights, estimates of which varied from  $\frac{1}{2}$  to 2 acres in different studies (8, 9). Because this bird reacted at all points tested, 4.38 acres is the minimum estimate of the territorial size. If the greatest distance from which a response was drawn, 330 feet, is assumed to be the territorial limit and a circle circumscribed about the landing site with this as the radius, the area included is 7.85 acres, a considerably larger territory than anyone had previously suspected.

Several aggressive reactions of territorial birds to the presence of the investigator were encountered. On May 1, I was lying about 100 feet from the usual landing site of the bird on Area 1. The taped peenting was played to test the bird's reaction to it. The territorial bird cackled, flew toward the sound and lit within 20 feet of the recorder, which was on the ground about 3 feet from my head. After flying closer to the recorder and peenting several times, it flushed and returned to its usual landing site. The complete approach process was repeated twice more. On the third approach, the bird landed 5 feet from the recorder and approached it on foot. It stood silently next to it for a few seconds and then began searching through the grass around the recorder. Suddenly it moved through the weeds and appeared about a foot from my face. Almost immediately the woodcock lunged toward me and struck my eye with its bill and then grabbed a tuft of hair in its bill and yanked vigorously several times. The bird then released its hold, jumped back about a foot, and stood watching me. I remained as still as possible. The whole attack was then repeated with the bird first striking my eye and then yanking my hair. After this attack an attempt was made to catch the bird by hand, but its reactions were much too quick and it flushed. However, it immediately responded again to the peenting tape and attacked my hand several times as I shuffled it in the grass. These attacks indicate how strong a role peenting plays in the territorial behavior of the woodcock. This woodcock and others were invariably attracted by the peenting from the tape even seconds after unsuccessful attempts to capture them. After a woodcock is attracted to an area by alien peenting, any movement is evidently attributed to the intruder and is attacked. In both face-to-face encounters the woodcock first struck my eye, the only place in which movement occurred. It also attacked my hand only when it was shuffled in the grass. This would be the expected reaction sequence in a species which defends territory only during periods of marginal light intensity and against somber colored intruders.

In an attempt to band birds so that homing could be tested in subsequent years, the bird on Area 1 was mist-netted and banded on April 25.

Soon after this a different behavior pattern for the bird on this area was noted (i.e., changes in landing site, flight pattern, diurnal area, reaction to taped peenting, and various other performance parameters) and a male caught on May 7 proved to be a different bird. The subsequent appearance soon afterward of a third behavior pattern lead to the capture and banding of a third male from Area 1 on May 16. The appearance of the second bird on Area 1 was closely linked with the discontinuance of the performances of the bird on Area 4-5, and the appearance of the third bird with the cessation of the performances of the bird on Area 10 (Fig. 4). Woodcocks from adjacent areas undoubtedly replaced previous territorial birds as they disappeared from Area 1. Both birds which were replaced on Area 1 disappeared soon after netting and banding. It is impossible to determine what caused this disappearance, but the trauma of the netting and banding operation may have caused the birds to move off the study area. However, the subnormal post-banding performance by bird "A" illustrated that banded birds may have ceased performing while remaining on the study area (Fig. 4). Because of this replacement pattern, Area 1 was interpreted as being the prime performance site on the study area, and thus, the one most competed for. The fact that it had at least three males on it with not a day of non-occupancy is indicative of its attractiveness.

Sheldon (11) suggested that competition for open spaces was very important in the evolutionary shaping of the territorial behavior of the

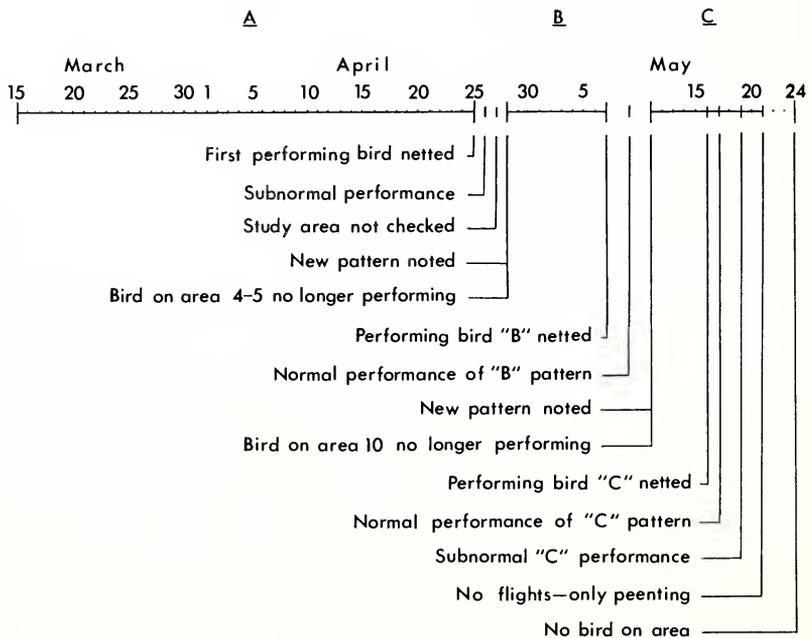


FIGURE 4. Chronological sequence of events on Area 1 in woodcock study at Shidler Forest, 1969.

woodcock, for in primeval times very few openings existed in the eastern United States and Canada. It is probable that even now strong competition for preferred sites exists. This competition and territorial defense appears to be principally a ritualistic type which involves little physical contact. Lack (6) said that avoidance by others of occupied areas was the primary factor in maintaining territorial integrity in birds. Tinbergen (12) said that his previous view that hostility was the primary factor as well as Lack's that avoidance was primary were both one-sided and that the two factors operate in tandem. The cofunctioning of these two factors may offer a partial explanation for the tenacious drive to perform which has evolved in the woodcock. When a bird is on territory, it is at an advantage since its defense is nearly always successful because of the natural avoidance of occupied areas by unattached males. However, if a bird fails to occupy its territory for a day or more due to the weather or some other factor and another bird occupies the area in the interim, the former territorial bird is then at a disadvantage. Those birds which establish a territory in a favorable location and perform there daily, regardless of conditions, will be selected for evolutionarily, for they have a greater chance of being on territory throughout the breeding season and thus more chances to procreate.

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