# SOME ECOLOGICAL NOTES ON THE GRASSHOPPER SPARROW

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FROM 1944 through 1947, and to a limited extent in 1948, I had the opportunity to study both the songs and ecology of the Grasshopper Sparrow (*Ammodramus savannarum*) in some detail. In an earlier paper (Smith, 1959) I described the songs and their functions, and in this paper will describe some observations on the ecology of the species.

The study area consisted of 30 acres on and about the family farm three miles west of Reynoldsville, Jefferson County, Pennsylvania. Elevation ranged from 1,700 to 1,948 feet and the land sloped to the west and northwest. Soil fertility was low and the sod thin when the farm was acquired in 1942. Subsequent applications of manure and fertilizer increased the fertility and produced a much heavier sod. At first the layout of the fields followed the practices of the past, but in 1946 the farm was put in contour strips. Rotations consisted of corn, oats or wheat and hay, a mixture of red clover (*Trifolium pratense*), alfalfa (*Medicago sativa*), and common timothy (*Phleum pratense*). Later timothy was replaced with awnless brome-grass (*Bromus inermis*). Pastures were seeded to a mixture of orchard-grass (*Dactylis glomerata*) and ladino white clover (*Trifolium repens*). Yearly crop rotations are shown in the territorial maps (Fig. 1).

Observations began with the arrival of the first birds and continued through the season. I attempted to band all birds for positive identification. Since the Grasshopper Sparrow is very difficult to trap, the effort was only partially successful. Three banded males, however, returned in successive seasons, 3 M and 10 M for two years and 5 M for three years.

*Habitat and population.*—The Grasshopper Sparrow is a grassland bird and it appears to be most abundant on cultivated grasslands, particularly those containing orchard-grass, alfalfa, red clover, bush-clover (*Lespedeza* spp.), all of which form bunches, seemingly required by this species. Old fields of poverty-grass (*Danthonia spicata*), bramble (*Rubus* spp.), and beardgrass (*Andropogon* spp.) also are inhabited by Grasshopper Sparrows, but the birds leave as the fields fill with shrubs. Johnston and Odum (1956) observed that in Georgia these birds were absent in fields having 35 per cent of the area in shrubs, and were most abundant in managed grasslands. Grasshopper Sparrows to a limited extent inhabit small grain fields, but their densities in such areas are a fraction of those found in grassland, even in the western race, *A. s. perpallidus* (Johnston and Odum, 1956; Dambach and Good, 1940; Good and Dambach, 1943; Johnston, 1949).

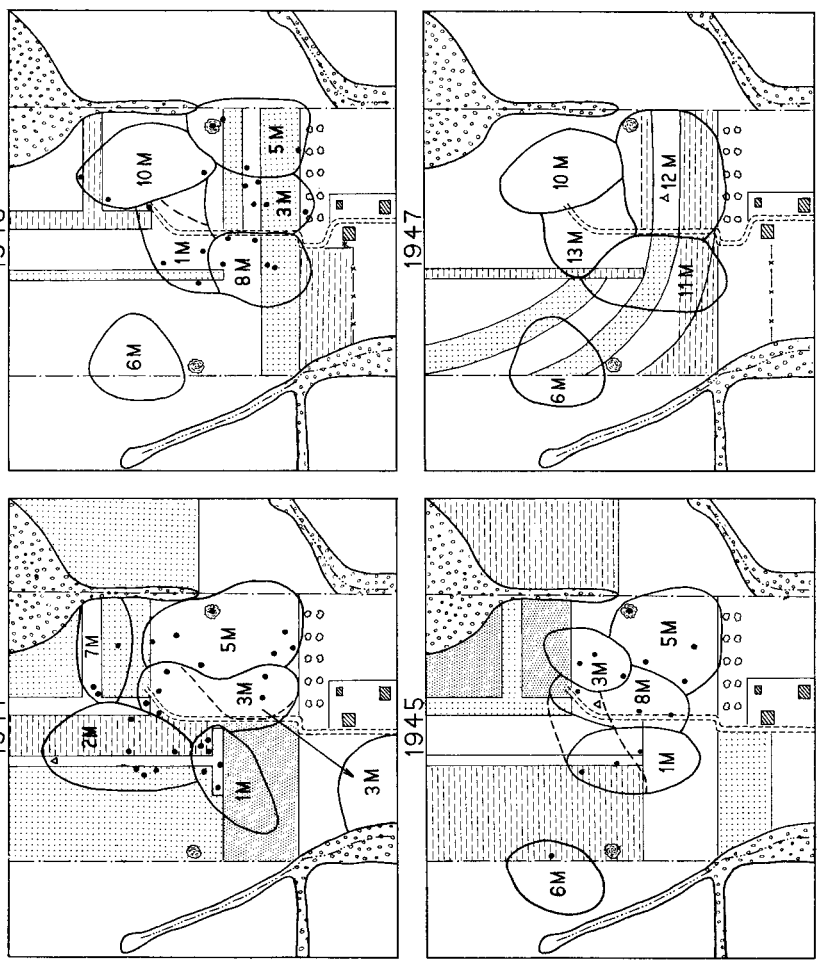


FIG. 1. Grasshopper Sparrow territories. Location of singing perches was mapped for 1944–1946 only. The dash lines inside territories for 1944–1946 indicate territorial adjustments prior to second nesting. During 1944, 3 M established a new territory, part of which is shown, and 5 M expanded his to include the area inside the dashes. In 1945, 1 M and 8 M adjusted their territories apparently due to haying; 8 M occupied the lower territory, 1 M the upper. 3 M in 1946 enlarged his territory to include area inside the dashed lines.

Grasshopper Sparrows inhabiting forested regions of the East originally were restricted to extensive natural clearings and sparsely wooded areas. They are found in such situations today in Minnesota (Roberts, 1936) and Michigan (Walkinshaw, 1940). Clearing of the land for agriculture permitted the species to spread into territory far beyond its original altitudinal and ecological limits (Todd, 1940). Forbush (1929), for example, noted that the species was rarely found in New England much above 1,000 feet, but today in Pennsylvania and West Virginia the Grasshopper Sparrow is found at elevations well over 2,000 feet. In fact, the species occurs on the Allegheny Backbone in Pocahontas County, West Virginia, at an elevation of 4,300 feet (Brooks, 1944). Changing agricultural patterns with emphasis on grassland farming appears to be favoring an increase of Grasshopper Sparrows in Georgia (Burleigh, 1958).

This sparrow depends upon man for maintenance of its habitat through grassland management, but haying usually begins in mid-June, the height of this bird's nesting season. Nests usually escape destruction from mower blades but some are crushed by implement wheels. If the nest escapes destruction by haying operations, it is exposed to weather and predators. Grass used for silage is cut early, around the first of June. This is the height of nest building by the Grasshopper Sparrow. I have found that in fields regularly cut for grass silage, resulting in early loss of cover, the population of Grasshopper Sparrows is very low. The loss of cover during the nesting season does not result in abandonment of the field or the nest, if the nest has not been destroyed. I have never noted any Grasshopper Sparrow leaving the field after haying, despite the loss of cover. This is in sharp contrast to the Henslow's Sparrow (*Passerherbulus henslowii*), which abandons a field after the grass is cut.

Somewhat colonial during the breeding season, Grasshopper Sparrows do not occupy all apparently suitable habitats, and the species fluctuates considerably in abundance from year to year.

The population on the study area varied from five pairs (20 per 100 acres) in 1944 and 1945, six pairs (30 per 100 acres) in 1946, five pairs in 1947, and one pair (5 per 100 acres) in 1948. This drop in the Grasshopper Sparrow population also was noticeable in the surrounding countryside. Fields which once supported the birds either were abandoned by Grasshopper Sparrows or held only a fraction of the original population. Since 1953, their populations began to increase in surrounding areas, but failed to do so on the old study area. From 1957 to 1962, only two breeding pairs were on the area, although the entire tract was in grass.

One cause of the population change on the study area might be attributed to grassland management. During the early part of the study the fields sup-

ported a thin stand of timothy, alfalfa, and red clover, in contrast to the dense heavy growth of alfalfa and brome grass four years later. From 1955 to 1958, the bulk of the Grasshopper Sparrow populations was located in hay and abandoned fields that supported less vigorous growth while hayfields of heavy grass, including the study area, were occupied by Henslow's Sparrows.

Oscar Root (1957, 1958, and letter) reports that at North Andover, Massachusetts, the Grasshopper Sparrow population built up to highs followed by a severe reduction the following year, and that certain areas always productive in the past were in prime shape and undisturbed yet without Grasshopper Sparrows. Similar fluctuations have been reported for the Concord region (Griscom, 1949), for Nantucket Island (Griscom and Folger, 1948), and Martha's Vineyard and Essex County, Massachusetts (Griscom and Snyder, 1953), where the species has been replaced by the Savannah Sparrow (*Passerculus sandwichensis*).

Thus it appears that populations of Grasshopper Sparrows fluctuate sharply at times in spite of available and suitable habitat. No reason can be given, but in some instances it appears that this species after extending its range into forested regions cleared for agriculture is giving ground to the Savannah Sparrow, a bird which not only occupies the same fields, but also is able to maintain its numbers when shrubs invade the area.

*Territory.*—The Grasshopper Sparrow returns to its nesting grounds usually from mid-April to early May. My earliest arrival date for north-central Pennsylvania, however, is 31 March 1945. The first arrivals are males who immediately establish territories, which they proclaim by singing the "grasshopper" or territorial song, alternated with wing flicking, all described in detail in a previous paper (Smith, 1959).

Territorial clashes, usually resulting from aerial trespassing, consist chiefly of pursuit in which the bird chases the intruder, retires to his singing perch, flicks his wings, and sings the "grasshopper" song.

"Grasshopper" or territorial songs usually are delivered from the highest perches in the territory. These may include a clump of grass, an alfalfa stalk, a tall weed, a small bush, fence post, utility wire, or tree. The birds are restricted to low perches only when high ones are unavailable. This was demonstrated experimentally by placing a wooden stake tall enough to stand two feet above the grasstops in the bird's territory. The bird would claim the high perch within minutes. The next day a still higher perch was introduced. The birds abandoned the first for the new, higher perch. Farm equipment left in the field, hay cocks, or grain shocks, all are used by the birds when they are available in their territories.

Song perches are clustered about certain singing areas, usually located near the periphery of the territory (Fig. 1). Location of singing perches may be

influenced by row crops in the territory, since Grasshopper Sparrows confine their singing perches to the vicinity of grass plots. This was particularly true of 1 M and 2 M in 1944, and 3 M and 5 M in 1946. The birds appeared to have their singing areas separate from the nesting areas. Among the birds I have studied, singing perches were from 165 to 412 feet from the nest.

The size of 22 territories plotted on the study area ranged from 1.2 to 3.3 acres (Fig. 1). The average size was 2.03 acres. Of these, 11 were between one and two acres; nine between two and three acres; and two over three acres. Kendeigh (1941) reported that the average size of six territories was 3.4 acres.

Territorial boundaries are rigidly maintained during the periods of territorial establishment, nest building, and incubation. After the young have hatched, territorial defense declines and considerable movement of birds into the territory of others takes place. The movement frequently appears to be initiated by young birds just able to fly. They may flutter into adjoining territories and the parent birds follow in answer to the feeding call.

Prior to second nesting in late June and early July territorial defense increases sharply for two to three days. The males sing the "grasshopper" song and flutter their wings. Territorial boundaries may be shifted—a response to changes or disturbances within the territories due to harvesting of hay and small grains. In one instance, 1 M shifted his territory for the second nesting in 1945 to include the eastern half of the territory of his neighbor, 8 M. The hay on this portion had been mowed early and new growth provided cover, lacking in the original territory. 8 M in turn took over the western half of 1 M's old territory. In the end, both birds had new growth and newly mowed hayfields in their respective territories. Interestingly, these two birds occupied approximately the same territories the following year. In 1946, 3 M, whose territory was bisected by a strip of field corn, took over a corner of 1 M's territory when the increasing height of the corn effectively walled off and made useless the lower half of his territory.

During the incubation period the male spends his time singing both the territorial and sustained (see Smith, 1959) songs and defending the territory, but shows little concern over human intruders. When a person appears, the bird simply ceases his singing and hides in the grass.

The female alone incubates the eggs and broods the young. (Based on data from the literature and from my own observations, the clutch size in 42 nests ranges from two to six. Of these, one clutch contained two eggs, two had three eggs, 21 contained four eggs, 17 contained five eggs, and one had six eggs.) The female sits closely on the nest. When leaving undisturbed she slips off, runs a distance through the grass, and then flies up. Upon her return she seldom approaches the nest directly, but drops down into the grass and

goes to the nest on foot, arriving by one of several well-worn paths. If flushed from the nest the female may dart off, run a short distance, arise in a short fluttering flight, and then drop to the ground again where she spreads her tail and trails her wings as if injured. At other times the female may flutter directly off the nest as if crippled or may fly from the nest to a point 25 or 30 feet away, and hide in the grass and scold.

After the young hatch, both male and female share nest duties and show greatly increased concern over human and other intrusion into their territory. (The incubation period still is unknown due largely to the difficulty of locating nests before any eggs are laid, although incomplete observations indicate that it may be 12 or 13 days.) The birds may fly in wide circles about the trespasser. They raise their crest feathers, flick their wings and tail, and when on the ground, bob up and down on their legs and utter a sharp *chi-ip* or *til-lic*. At high-intensity alarm the birds give this double note so rapidly that it almost runs into a trill. Often the male will interrupt his chipping to break into a "grasshopper" song. Less frequently, especially under situations of low-intensity alarm, the call note is a monosyllable, a sharp *tik*. If the birds are carrying food to the young at the time, they invariably eat the insect and continue their alarm. When a dog enters their territory, however, the birds drop into the grass, crouch low, and remain silent until the animal passes.

Young birds remain in the nest nine days. Michigan birds observed by Walkinshaw (1940) remained in the nest the same length of time. When out of the nest the young run mouselike through the grass and rarely appear above the grasstops.

While feeding, the Grasshopper Sparrow utters a single note, *tik* or *chip*, similar to the alarm note, but higher pitched and less sharp and vigorous. The food call of the young is a double note, *chi-ip*, similar to that of the adult but possessing a more liquid quality.

Grasshopper Sparrows no longer defend territorial boundaries after second broods leave the nest, although adults and young remain in the general vicinity until they disappear in the fall.

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