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EFFECTS OF SUMMER BURNS ON FLORIDA GRASSHOPPER SPARROWS

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Abstract.—The federally endangered Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) prefers recently burned sites in an early successional stage (Delany et al. 1985). Management of the dry prairie ecosystem for this endemic bird has usually involved late fall and winter prescribed burns. However, naturally ignited fires on dry prairies usually occur in summer (Robbins and Myers 1992). Because this endangered sparrow probably evolved with summer wildfires, we sought to understand how prescribed summer burns affected this rare species. We studied the effects of three prescribed summer fires on Florida Grasshopper Sparrows at the Kissimmee Prairie Sanctuary (1993, 1994) and Three Lakes Wildlife Management Area (1994). Sparrows occupied the burned area one week after the fire, and remained reproductively active into September at Three Lakes. On the unburned control units, territorial behavior diminished by late July. In response to summer burns, Florida Grasshopper Sparrows initiated a second bout of breeding activity. This bimodal breeding phenology is strong support to the theory that this bird has evolved with frequent summer fires. These results suggest that summer burns are beneficial for Florida Grasshopper Sparrows and that fire management plans should consider the evolutionary and ecosystem dynamics of fire seasonality on Floridas' unique dry prairie.

Dry prairies in central Florida are pyrogenic plant associations that have evolved with frequent natural fires (Robbins and Myers 1992). These prairie fires are naturally ignited by lightning strikes, primarily in the summer months (June-August) (Snyder et al. 1990). Clearly, plants have adapted to these summer conflagrations. For example, wiregrass (*Aristida stricta*) only flowers and sets seed after summer fires. It is also likely that the fauna of this system would have adapted to these major, yet seasonally predictable, disturbances.

The Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*), a federally endangered grassland sparrow is endemic to central Florida dry prairies. They have evolved in this fire adapted ecosystem, and prefer areas exposed to fire within the past 24 months (Walsh et al. 1995, Delany et al. 1985, Delany and Cox 1986). Federal

guidelines recommend prescribed burns to maintain and enhance populations of this endemic sparrow (USFWS 1988). To reduce potential nest mortality resulting from fire, nearly all burns have been conducted in late fall or winter (Walsh 1995). No studies have examined whether the timing of prescribed burns (dormant vs. growing season) affect Florida Grasshopper Sparrow breeding biology and, therefore, its potential recovery. As part of a comprehensive study of the breeding habitat requirements of this sparrow, we initiated a project in 1993 to examine the potential effect of summer prescribed fire on this endangered sparrow.

STUDY SITES AND METHODS

We censused grasshopper sparrows at unlimited radius points, counting all birds that were detected visually with binoculars, and aurally during a five minute period. Points were chosen using aerial photography, a 100 m tape, and a compass. All point centers were >50 m from unsuitable habitat (depression marsh, hammock, or different burn units) and >300 m from the nearest point center to ensure independence between points (Anderson and Shugart 1974). Due to the relatively small burn units (<200 ha) it was important to space the points such that we could fit as many as possible into each unit. All points were established in late April or early May for both years and the same points were censused before and after the fire on treatment areas. Due to limited area in similar burn classes and personnel, we reduced the number of control points that were censused after the burns in 1994. The average number of sparrows/point on a given census day was calculated by summing the number of sparrows detected on each point and dividing by the total number of points censused. We used Three-Way ANOVA to test for differences between treatments (burned vs. unburned), study sites and years.

Kissimmee Prairie Sanctuary

The National Audubon Society's, Ordway-Whittell Kissimmee Prairie Sanctuary is a 3,071-ha portion of the greater prairie mosaic that once covered much of central Florida. As part of the sanctuary management plan, a 112 ha unit was burned on 16 June 1993. This area had not been burned for four years. We censused grasshopper sparrows at six points in the treatment (burned) and an additional six points in the control (unburned). The control area was burned in June 1992. We censused the treatment area between 1 May and 20 August 1993 and between 1 May and 30 July on the control.

In 1994, a 250 ha unit was burned on 15 July. We censused 15 points in both treatment and control units (30 total) before the fire, and 11 points in the treatment, and 4 points in the control (15 total) after the fire. Both areas had been burned in the summer of 1992 by a naturally ignited, lightning fire. The control area was 240 ha and adjacent to the treatment area. Because the breeding season extended beyond 20 August in 1993, in 1994 we extended the census period through 15 September. We knew from our habitat selection study that the breeding activity on unburned areas had diminished in mid-July. Therefore, four points were randomly selected within the control to reduce the time constraint of sampling 15 points, and still document the lack of activity on unburned areas through August.

Three Lakes Wildlife Management Area

Approximately 4,000 ha of dry prairie occur on the southern portion of Three Lakes WMA, Osceola County. This property is owned and managed by the Florida Game and

Fresh Water Fish Commission. The Commission has traditionally burned on a 2-3 year rotation during the fall and winter months. In the summer of 1994, we censused grasshopper sparrows in response to summer fire using 11 points. Prairie surrounding 7 of these 11 points was burned on 22 June 1994. The remaining 4 points served as a control. Both of these areas were on the same fire rotation, and had not been burned for 3 years.

RESULTS

Florida Grasshopper Sparrow activity (mean # birds/point) continued to 9 September on prairie burned 22 June 1994, at Three Lakes WMA (Figure 1c). Both burned areas at Kissimmee Prairie (1993, 1994) had sparrow activity continuing until at least 15 August, while sparrow activity ceased on the control areas for all three burns before 1 August (Figure 1a, b, c). In 1993, sparrow activity on the unburned control area declined throughout the summer, while activity on the burned area increased after the fire (Figure 1a). In 1994, there were dramatic declines in sparrow activity on the control areas throughout the summer, while there were increases in sparrow activity on burned areas (Figure 1b, c). Three-Way ANOVA demonstrated significant burn treatment and year effects, but no differences between sites (Table 1).

We observed Florida Grasshopper Sparrows establishing territories on burned areas within one week of all three fire events. Male sparrows sang and defended territories in areas that were vacant or had very low densities (0.2 birds/point) prior to the burn. Females were also observed pairing in these new territories, increasing the likelihood of reproductive activity.

DISCUSSION

The seasonality of prescribed burns is critical to both the prairie ecosystem's dynamics, and therefore to providing optimal habitat for the Florida Grasshopper Sparrow. Winter burns may provide adequate sparrow breeding habitat, but may also have unknown effects on winter mortality or other components of this species' life history. The extension of the breeding season on one burned unit into early September, and into mid-August on two other burns, has important implications for both evolutionary ecology and endangered species management. A prolonged bimodal breeding season extending from March to September, could have important consequences for a species that appears to have particularly low reproductive success (Vickery et al. 1992). The extension of the breeding season to six months may double the number of nesting opportunities and may increase the number of pairs that attempt additional clutches. It may also give sub-dominant males a chance to breed for the first time.

The rapidity with which male sparrows began to establish territories on summer burn sites (within one week of the fire) provide strong evi-

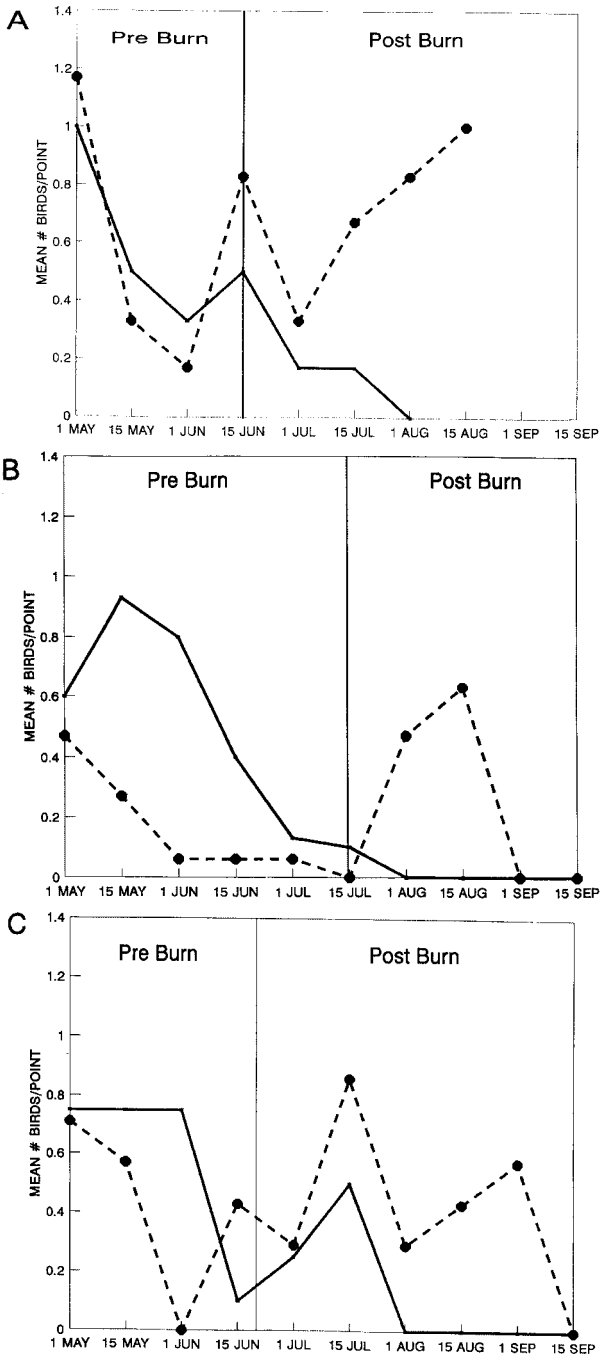


Figure 1. Florida Grasshopper Sparrow response to summer burns. **A**=Kissimmee Prairie, 1993. **B**=Kissimmee Prairie, 1994. **C**=Three Lakes Wildlife Management Area, 1994.

Table 1. Three-Way ANOVA of point-count data for Florida Grasshopper Sparrow response to summer prescribed fire at Three Lakes WMA and Kissimmee Prairie, Florida, 1993-1994.

Source	Sum of Squares	Df	Mean-square	F-ratio	P
Site	0.705	1	0.705	0.576	0.452
Year	9.940	1	9.940	8.125	0.007
Treatment	17.864	1	17.864	14.603	0.000
Error	47.711	39	1.223		

dence that Florida Grasshopper Sparrows have evolved with and adapted successfully to summer fires. Males sang and defended territories in areas that were once devoid of sparrow territories. Females paired in these new territories, indicating the likelihood of reproductive activity.

The significant year effect that we detected may be explained by the differences in sparrow activity on the control units (Table 1). In 1993 sparrow activity remained constant, but declined sharply in 1994. We observed a similar, significant pattern of increased sparrow activity on the treatment areas after all three fires. The extent and intensity of each prescribed burn are unique because each fire is influenced by seasonal weather patterns (e.g., wet vs. dry summers), daily weather (e.g., wind and humidity), and different fuel loads associated with different sites. These differences can influence the response of the flora and fauna to fire (Robbins and Myers 1992). Despite this variability, we observed similar, positive sparrow responses to three fires over two years.

Research into the effects of summer prescribed fire should be continued to determine how seasonality of burns effects sparrow reproductive success, winter habitat use and survivorship, and plant phenology. The question of when to use fire to manage this ecosystem is critical to both its function and to provide optimal sparrow habitat.

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