

**Fire effects on Cape Sable seaside sparrow demography: year
one interim report.**

An interim report to the US National Park Service, Everglades National Park,
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INTRODUCTION

Between 1948 and 1992 the wetland areas of Everglades National Park experienced 752 fires for an average of 17 fires per year (Gunderson and Snyder 1994). Fire is a necessary component of the Everglades. It maintains a habitat mosaic and prevents hardwood shrubs from invading the characteristically open Everglades marshes (Robertson 1953, Egler 1952, Taylor 1983). The Cape Sable seaside sparrow (*Ammodramus miratimus mirabilis*), an endangered subspecies endemic to the southern Everglades, relies on marl prairies that are influenced by fire regimes (Werner 1975). The sparrow lives exclusively on Federally protected land, principally within Everglades National Park (ENP). Currently ENP manages fires through prescribed burning and strategic control of naturally caused fires. Of central concern to ENP officials is the development of a fire management protocol that promotes USFWS recovery goals for this subspecies. The conception of this fire management plan is profoundly inhibited by the lack of knowledge surrounding the sparrow's response to, and recovery from, fire.

By ENP fire managers allowing a recent fire to burn through a portion of an existing study plot, I had the option of utilizing a study design that can better detect fire effects than previous research. This includes evaluating the possibility that sparrow populations are not noticeably effected by fire (except through the immediate loss of individuals), and evaluating the nature of any lasting population effects. In 2002, I proposed a detailed demographic study of individuals subjected to this fire event. This report provides initial results from the first year of this four-year study.

STUDY DESIGN AND FIRST-YEAR RESULTS

The nature of the 2001 Lopez fire allowed me to utilize a quasi-experimental design, which employs a two-group comparison without randomization (Manly 2001, Stewart-Oaten et al. 1986, Whelan 1995). The manipulation (i.e. fire) is introduced into one plot, while another is left unaffected. It is possible to utilize a quasi-experimental design here because an unplanned fire was allowed to burn through approximately 40% of an existing study plot in May 2001 (Figure 1). The effect variables of interest (see below) are monitored before and after the fire. In order to account for underlying annual variations in the effect variables, Whelan (1995) suggests monitoring the plots for equal amounts of time before and after the fire is introduced. For vertebrate populations, this typically requires two or more years of information collected before fire is introduced, followed by a further two or more years of post-fire information (Whelan 1995). Accordingly, this represents a summary of the first year's results from a four-year study plan.

The assumption in such designs is that any naturally occurring (i.e. unaccounted for) changes in density will be nearly the same in the control and burned plots. Any extreme changes in density within the burned plot can then be attributed to the fire (Manly 2001). Evidence for an effect of fire on sparrow populations is provided by a statistically significant change in the difference between the control and burned plot before and after the time of burning. On the other hand, if the two plots remain exactly the same before and after fire, then there is no evidence of an effect on sparrow population dynamics.

We have been marking individual sparrows, mapping breeding territories, and banding nestlings at this site since 1998; three years pre-fire (Pimm et al. 2002). After this breeding field season (i.e. March to August 2001), we resighted 11 of the 73 sparrows banded between 1998 and 2001. None of the 35 individuals banded in 1998 were resighted. We resighted one of the 17 sparrows banded in 1999, six of the 17 banded in 2002, and all four of the sparrows banded in 2001 just before the fire occurred. None of these resighted sparrows previously held territories within the burned area. Thus, all of these returning sparrows previously held territories in the area that did not burn, and returned to within 200m of those territories.

We banded 56 sparrows in the 2002 field season. Twenty-seven of these were males, five were females, 20 were nestlings, and three were juveniles (i.e. recent fledglings). We documented how each of these banded sparrows distributed themselves over the available habitat (Figure 2). We documented no use of the burned area by sparrows. The only use of the area south of the burn line was within small, unburned inholdings, or larger unburned 'fingers' of habitat. Male sparrows did not attempt to establish territories within the burned area, and no sparrows were observed foraging in this area. Juveniles, who typically explore a much wider array of habitats than adults (Pimm et al. 2002, Dean and Morrison 2001), also did not visit the burned area.

Taylor (1983) documented an increase in sparrow density just after fire within unburned remnants. To test for this effect, we initiated collection of detailed information on the extent of each male sparrow's territory, and conducted fixed-radius point counts. By collecting detailed territory information we can compare sparrow density, and territory sizes, before and after the burn. Our results, depicted in Figure 3, indicate that there is no increase in sparrow density within the unburned area. Further, there is no obvious change in the size of each sparrow's territory that would indicate an increase in use-pressure within the unburned habitat. As expected based on the above results, our point counts did show a marked difference in sparrow density between the burned and unburned areas.

We found 25 sparrow nests in the 2002 field season. All of these were located in the unburned area. The first nest was found 10 March, and the last on 16 July 2002. Sixteen of these nests had hatch dates before June 1st and nine had hatch dates after June 1st. This date marks the typical onset of the summer rains, and in past analyses we have documented a marked increase in nest predation rates when these rains produce localized flooding (Pimm et al. 2002). In the 2002 season, the summer rains came a few weeks early on 19 May 2002. Accordingly, most nests that were still active after the onset of these rains failed due to predation. Six nests failed during incubation, and nine during brooding. The remainder (nine nests) were successful. This produced a somewhat lower nest success rate for this field season as compared to earlier years when the summer rains came as normal (or later), but one that is still within the window of natural variability observed within population B.

Because we know a great deal about the limiting factors for the sparrow (Pimm et al. 2002), we can document some of the reasons why sparrows are not using the burned site one-year post fire. In order to document demographic changes related to the availability of food we can measure body condition of adults, fledging weight of young,

and types of food brought to nestlings. However, because sparrows did not use the unburned area, we are as yet unable to document any such effects. Similarly, we can document reasons why fecundity varies between sites by documenting differences in nest predation rates, and types of nest predators, between sites when sparrows return to the unburned area.

However, we can document changes to important vegetation components between the two sites one year post-burn (e.g., percent ground cover, presence and height of perching substrate, presence and cover of bunchgrasses). We can then evaluate any significant changes for their role in determining demographic differences between sites. Our preliminary results indicate that the response of several vegetation components was very rapid, and according to some of these metrics (e.g., species composition) the burned area is now indistinguishable from the unburned area. However, other vegetation variables, such as ground cover, have not returned. This suggests sparrows are responding to a specific set of vegetation components that do not return as quickly as other components (e.g. species composition).

CONCLUSION

Our preliminary conclusion is that Cape Sable seaside sparrows respond strongly, and negatively, to fire for at least one year post-burn. We did not observe any use of the burned area during the 2002 breeding season despite the fact that some vegetation attributes appear to have returned to their pre-burn condition. The vegetation components that have not returned are those documented to play a role in nest placement and success (Pimm et al. 2002), and thus the failure of these attributes to return may be preventing sparrow use of these burned areas. There are alternative reasons why sparrows have not returned to the burned area one year post-burn. For example, there may be difference in prey base between the two areas that we cannot document. Similarly, there may be difference in the probability of predation between the two sites that we are unable to document.

No matter the mechanism, the absence of sparrows in the burned area one year post-burn is consistent with previous results obtained by Pimm et al. (2002), but somewhat contrary to those of Werner 1975. [Werner documented use of a burned site by Cape Sable seaside sparrows one year post-burn.] In terms of promoting the recovery of sparrow population numbers, our preliminary results suggest that fire will decrease the affected population in direct proportion to the amount of area burned. This reduction in adult sparrow numbers will then decrease the population fecundity level by default (i.e. fewer breeding adults results in fewer young of the year). Combined, these two factors suggest careful management of fire with Everglades National Park such that sparrow habitat does not burn too often, or burn over very wide expanses.

LITERATURE CITED

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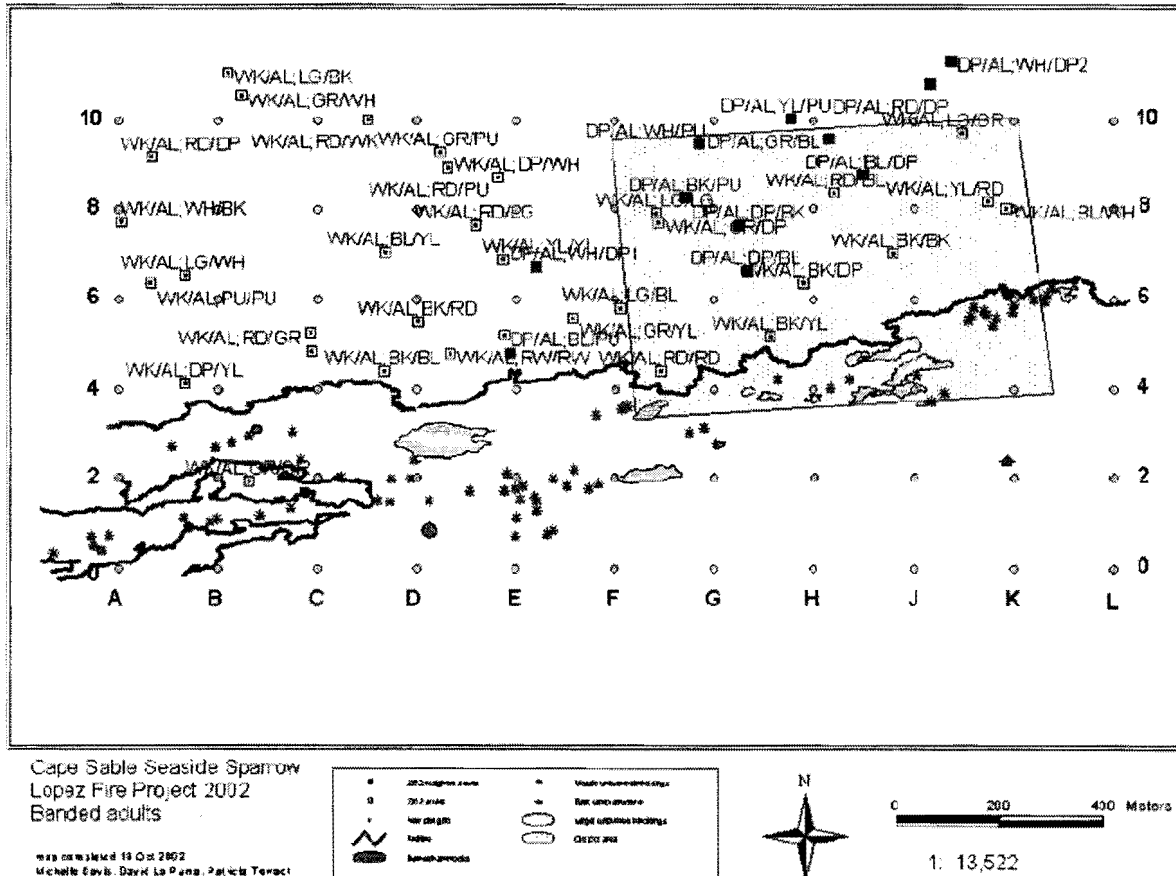


Figure 2. In 2001 we re-occupied the entirety of the former plot in order to document the effects of the May 2001 (Lopez) fire. This figure shows the sparrows banded or re-sighted during the 2002 breeding season. Notice that we observed no sparrows (juveniles or adults) using the burned area one-year post fire.

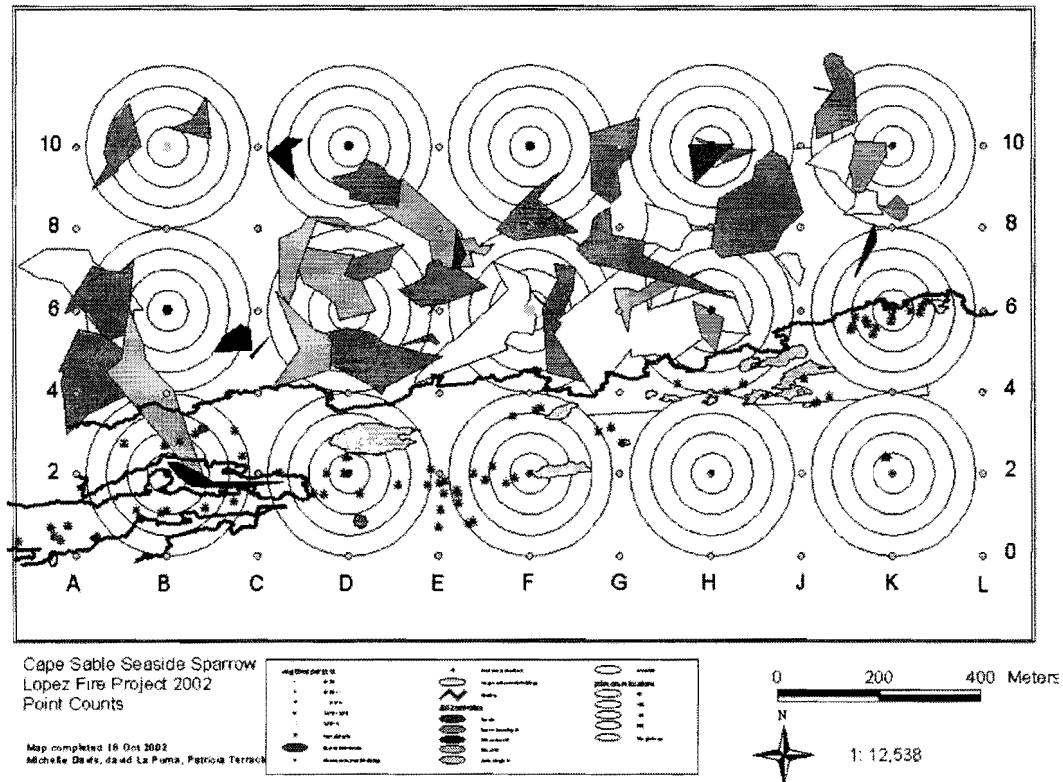


Figure 3. Results from fixed-radius point counts of Cape Sable seaside sparrows during the 2002 breeding season. The size of the red dot indicates the average number of sparrows counted per location. Pink dots represent the highest average numbers of sparrows counted at six. Blue polygons represent the documented extent of each male's territory. There is a marked difference in numbers of sparrows counted in and out of the burn one year post-burn. The only sparrows documented south of the burn line were observed using unburned inholdings.