

Fire and Flooding Effects on the Habitat of the Cape Sable Seaside Sparrow

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Background

The Cape Sable seaside sparrow (CSSS) is a federally listed endangered species whose range is entirely within Everglades National Park and Big Cypress National Preserve. Its preferred nesting habitat is the short-hydroperiod grassland known as marl or muhly (for *Muhlenbergia filipes*) prairie found on either side of the Shark River and Taylor Sloughs (U.S. Fish and Wildlife Service 1999). Recent concerns stem from population declines brought about by prolonged flooding in the sparrow range west of Shark Slough (Walters, et al. 1999).

Sparrow habitat requires periodic fire to prevent the encroachment of hardwoods (Curnutt et al. 1998) and prescribed burning is also recommended to prevent large wildfires from denuding significant portions of the critical habitat, fires that would most likely occur during the breeding season (Snyder 1991). The suitability of these short-hydroperiod prairies as sparrow habitat improves with time post-burn for at least four to ten years (U.S. Fish and Wildlife Service 1999, Curnutt et al. 1998). Taylor (1983) suggested that rate of recovery of sparrow populations after burning and sparrow density are higher on more productive sites. While fire is a natural and necessary phenomenon in marl prairies, the interaction of fire and flooding can have profound effects on vegetation structure and composition (Olmsted and Loope 1984; Herndon et al. 1991). Fire followed by flooding can result in high levels of mortality of plants that normally resprout vigorously.

We propose to document the development of habitat structure following fire at several sites within the range of the CSSS and to examine the interaction of fire and flooding in the recovery of postburn vegetation.

Recovery of Sparrow Habitat Structure after Burning

The habitat structure of marl prairies is defined largely by the aboveground parts of plants and the litter they produce. Means of describing this structure include height, cover, and biomass. Biomass also serves as a measure of fuel loading, since virtually all aboveground plant material can be consumed in fires. Herndon and Taylor (1986) have reported on postburn biomass accumulation from the area of subpopulation C. Taylor (1983) felt that the response of the sparrow population depended on the rate of biomass recovery after fire.

We will follow vegetation and litter recovery for four years at several sites scheduled for prescribed burning by the Everglades National Park fire management staff in FY2000. Before the burns, vegetation height will be measured, individual species cover will be estimated by a point-intercept method, and aboveground biomass will be harvested, dried, and weighed. Postburn height, cover, and biomass will be measured annually for four years. Herndon and Taylor (1986) found that biomass approaches equilibrium by three years at one site. Because the pattern may differ at other sites we propose to follow recovery for an additional year. The results will provide information on the relative productivity of various sites within the range of the CSSS.

Effects of Fire Season on Sparrow Habitat

Muhly prairies can burn at almost any time of the year. Historically the greatest area burned in April, May, and June (Snyder 1991), during the peak of the CSSS breeding season (Nott et al. 1998). Prescribed burning is often done during the cooler winter months because of more predictable and favorable burning conditions. Burning during the transition from dry to wet season, when fires normally burn the greatest area, is generally avoided because of potential control problems and because the sparrows are nesting. Some burning is done in the wet season after the breeding season of the year is over, but conditions often are too wet to accomplish prescribed burning objectives. An advantage of early wet season burning, however, is that there may be enough regrowth of vegetation or patches of unburned prairie (Cumutt et al. 1998) to allow some breeding activity the following year.

The timing of burns can have significant impact on the long-term recovery of the habitat. A fire that is followed soon after by flooding can result in mortality of much of the vegetation (Olmsted and Loope 1984). In the early 1990's a May/June prescribed burn in the Loop Unit of Big Cypress National Preserve was followed by substantial rain and flooding. What was formerly prairie and cypress prairie appeared from the air to be a giant lake. It was informally named Lake Walsh in honor of the prescribed fire specialist. There was so little regrowth after this event that Lake Walsh was a landmark for several subsequent wet seasons.

We propose to follow the recovery of muhly prairie after experimental burns before, during, and after the sparrow nesting season at two sites. One study site will be on the west side of Shark Slough (in the area of subpopulation A) and the other will be on the east side of Shark Slough. At each site four similar blocks of about 0.1 ha will be delineated. One block will remain unburned and the others will be burned in February, May, and July. Before the burns, vegetation height will be measured, individual species cover will be estimated by a point-intercept method, and aboveground live and dead biomass will be harvested, dried, and weighed in small quadrats. Immediately postburn we will measure height of remaining plant tissues. This has been shown to relate to the ability of sawgrass to survive flooding (Herndon et al. 1991). Heights of live tissues of selected species will be measured monthly until water levels recede significantly the first year. Vegetation height, cover, and biomass will be measured annually for four years after burning.

Because of the unpredictability of rainfall in South Florida, we cannot know how soon after the May burns the prairies will be flooded. Since the timing of flooding after fire appears to be crucial in determining the recovery of the vegetation, we need a way to look at this critical timeframe in more detail. Ideally we would burn plots weekly starting in May and continue until water levels had risen to the degree that burning was no longer feasible. Experimental prescribed burns are relatively expensive to conduct and are themselves somewhat unpredictable (too wet, too dry, too windy, too close to a holiday, etc.). We propose to use clipping of vegetation as a surrogate for fire. There is ample evidence that clipping and removal of litter can result in responses similar to those observed following fire (Smith 1960, Hulbert 1988). In the unburned control blocks we will clip vegetation in small quadrats weekly beginning in early May and ending in mid July. In essence we will be sampling the control blocks weekly using the same methods as for the other aspects of this study and the collection of biomass will be the clipping treatment. The quadrats will be marked so that they can be sampled once again the following dry season to see whether flooding influenced the recovery (cover and biomass) of any species.

Muhlenbergia Response to Flooding

CSSS habitat generally contains muhly grass and frequently is dominated by it (Nott et al. 1998, U.S. Fish and Wildlife Service 1999). There is a certain amount of mystery associated with the current distribution of muhly and the lack of reference to muhly prairies by early botanists (Olmsted et al. 1980). Even if extensive muhly prairies are a relatively modern phenomenon in South Florida, they constitute the most important habitat for CSSS today. Recent habitat shifts from muhly-dominated to sawgrass-dominated prairies are detrimental to the CSSS and are generally attributed to deeper flooding and/or more extended hydroperiods (Nott et al. 1998). Virtually nothing is known about the response of *Muhlenbergia* to flooding.

In year two of the study we propose to experimentally test the tolerance of muhly grass to different flooding regimes. Individual muhly plants in pots will be grown in outdoor pools under different hydroperiod treatments (Kirkman and Sharitz 1993). The specific depths and time periods will be chosen after analysis of water level data from sparrow habitat. The intention is to include a "normal" hydroperiod that does not apparently stress muhly, a "severe flooding" treatment such as has been observed to cause muhly mortality in the field, and a series of three or four intermediate treatments that will help pinpoint the limits of flooding tolerance of mature muhly plants. In addition, we will burn a set of plants three months before and a set one month before the flooding treatments are applied to show to what degree the tolerance of flooding is reduced by burning.

Schedule

	Year 1	Year 2	Year 3	Year 4	Year 5
Recovery after burning	X	X	X	X	X
Effects of fire season					
Experimental burns	X				
Quadrat sampling	X	X	X	X	X
Height of live tissue	X				
Clipping experiment	X	X			
Muhly response to flooding		X			
Annual report	X	X	X	X	
Final report					X

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Budget (Fire and Flooding Effects on the Habitat of the Cape Sable Seaside Sparrow)

		Year 1	Year 2	Year 3	Year 4	Year 5
Personnel						
	P.I. (0.2 FTE)	14,000	14,000	15,000	16,000	16,000
	Bio. tech. (1.0 FTE)	35,000	36,000	37,000	38,000	39,000
	Bio. tech. (0.5 FTE)	17,500	18,000			
	Botanist (0.25 FTE)	12,000	12,000	13,000	13,000	13,500
	Total	78,500	80,000	65,000	67,000	68,500
Travel						
	Helicopter	48,500	16,500	17,000	17,000	17,000
	Other	3,000	4,000	4,000	4,000	4,000
	Total	51,500	20,500	21,000	21,000	21,000
Supplies & Equipment						
	Field supplies	5,000	3,000	2,000	2,000	2,000
	Ponds/nursery supplies		10,000			
	Drying oven	5,000				
	Total	10,000	13,000	2,000	2,000	2,000
Project Total Direct Costs		140,000	113,500	88,000	90,000	91,500
Admin. & Overhead Costs	(-21.5%)	30,100	24,400	18,900	19,350	19,700
Total Funding Requested		170,100	137,900	106,900	109,350	111,200