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To the Editor:

RESPONSE TO BECKAGE ET AL.

FIRE REGIMES AND LARGE TERRESTRIAL CARNIVORES IN SOUTH FLORIDA

We appreciate the response by Beckage et al. (2005) regarding the predictive model that augmented our discussion about fire effects on black bear (*Ursus americanus floridanus*) and Florida panther (*Puma concolor coryi*) in south Florida (Maehr and Larkin 2004). Clearly, the inputs to our model were poorly verified and resulted in erroneous conclusions. We regret any inconveniences that this may have caused readers of *Natural Areas Journal*, but are glad that this problem has been pointed out. Nonetheless, the primary focus of our paper was to consider the potential impacts of artificial fire regimes on two imperiled carnivore species that exhibit tendencies to utilize upland habitats dominated by saw palmetto (*Serenoa repens*), a fire-adapted, but very flammable understory shrub. Even without the model as part of our argument, we believe that the behavior of these large carnivores and the autecology of saw palmetto provide sufficient evidence to reconsider burn prescriptions of four years or less because they may compromise important habitat features including food and reproductive cover for the bear and panther. At the very least, there can be no debate that winter prescribed fires in palmetto-dominated habitat may cause fatalities among neonatal offspring of both species, especially the black bear, because females give birth to helpless young during late February when lightning and natural fires are unlikely to occur.

It is important to know that plant species diversity is highest in frequently burned pinelands, but it is unlikely that implementing a longer, carnivore-friendly fire rotation would negatively impact those species that colonize recently burned areas. This would be especially true if fire managers implemented a landscape scale approach to fire that assured that some percentage of pinelands were burned in every year, providing constant colonization substrates for a variety of plant species (as would have the pre-Columbian landscape). We stress here that we are not advocating fire suppression to obtain cover and food conditions to promote reproduction and nutrition of bears and panthers. We are simply advocating that land managers choose a burning regime that leaves some proportion of older, dense saw palmetto on the landscape.

We recognized, as did Beckage et al. (2005), that south Florida fires could be spatially heterogeneous. In a landscape unconstrained by human infrastructure, lightning-caused fires would have burned according to climate and local site conditions, with

some consuming thousands of hectares. Even a very large fire would have left vast areas of suitable habitat for large carnivores and early successional plants. Unfortunately, because the remnants of these native landscapes are now virtual islands, fragmented by roads, agriculture, suburbs, and ownership patterns, managers must be careful to represent the full array of successional stages with which a variety of organisms evolved. While leaving some areas unburned for much longer than is currently practiced may lead to some hardwood invasion and occasional hot fires (likely a quite natural part of pre-Columbian landscapes), a fire prescription that recognizes the importance of more than just frequently burned areas will encourage the continued occupation and perpetuation of south Florida's wide-ranging carnivores. In other words, a pattern of very frequent prescribed fires in a particular management unit may promote overall local (alpha) diversity, but it may eliminate some key elements of the local community. Our approach, one that is designed to maintain the full array of conditions necessary to facilitate large carnivore occupation, would ensure that landscape scale (gamma) diversity remains high, and that bears and panthers remain a part of it.

If frequent prescribed fires are targeted to burn all pineland habitat in bear- and panther-inhabited range, it should be demonstrated that the resulting pattern of saw palmetto fruit production (often needing >6 years to recover from a fire) and cover conditions are not detrimental to the health and reproduction of these imperiled subspecies. In this sense, we whole-heartedly agree with Beckage et al. (*in press*) "that much better quantification of the natural range of fire frequency and the spatial heterogeneity of fires is required." This would have been the case even with a model that got it right the first time – there is a lot that we do not yet know about fire in what is now a very denatured landscape. In light of this, we recommend that south Florida land managers coordinate closely with those monitoring the movements of bears and panthers to measure the reproductive, nutritional, and spatial responses of large carnivores to a variety of fire regimes. Finally, we also stress that there is nothing contradictory for managers to consider the needs of listed carnivore species along with those components of the regional biota that are adapted to frequent summer fires. Such an approach will become increasingly important as public lands are increasingly looked to as refugia for regional biodiversity.

In this day of rapid development and landscape change, we must find ways to successfully manage a growing list of native species targeted for conservation. As noted by Beckage et al. (2005), plant diversity "begins to dramatically decline when fires become less frequent than every six to eight years." Certainly, this observation along with saw palmetto autecology, black bear food preferences, and carnivore reproductive patterns, can help us understand the evolutionary relations within this community and to manage it all with landscape patterns in mind. "We cannot simply return natural fires to most of these forests... However, if we understand how the trees, undergrowth plants, and animals respond to fire, we may be able to design substitute treatments that can perpetuate the forest community in some approximation of its historical conditions" (Arno and Allison-Bunnell 2002:52). We are hopeful

that constructive dialogue such as this will lead to future research that enlightens management of south Florida landscapes, including the unusual presence of two imperiled carnivores.

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