

# Pyric-carnivory: Raptor use of prescribed fires

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In this study, researchers examined how raptors responded to prescribed fires in the Great Plains ecoregion of the central United States. Most existing fire/bird research has focused on how fire impacts resident avian species during the breeding season or when overwintering, but little research has been conducted on how transient species respond to fire, especially *during* the fire event. Previous research suggests that raptors may be attracted to fires because burning vegetation injures or exposes small animals, making them vulnerable to predation. Study authors quantified and documented this phenomenon, which had not previously been formally described, calling it “pyric-carnivory.”

The study occurred at two locations in Oklahoma, USA: The Nature Conservancy Tallgrass Prairie Preserve in Osage County, and the Oklahoma State University Cross Timbers Experimental Range in Payne County. More than 200 species of tallgrass prairie plants occur at the two sites; the latter site also supports patches of oak-dominated woodlands. Plant species most abundant are big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), switch grass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*). Cattle graze both sites, and bison graze The Nature Conservancy’s site. Since the 1990s, prescribed fires have annually burned about one-third of the landscape in both locations, using a management framework known as patch-burn grazing. About 80 percent of these fires have occurred between November and March. The remaining fires typically take place from late July to early September.

To quantify the use of fire by raptors, paired counts were conducted immediately before and during 25 prescribed fires

## MANAGEMENT IMPLICATIONS

- Raptors were attracted to prescribed fires and were observed seeking small mammal and insect prey that had been flushed out, injured, or killed during the burn.
- Prescribed fire has a complex effect on the food web that varies spatially and temporally across trophic levels and taxa.



*Swainson's hawk (Buteo swainsoni) foraging in a recently burned area at the Tallgrass Prairie Preserve, Pawhuska, OK, USA. (Photo: Torre Hovick)*



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during 2013 and 2014. The fires were ignited in spring and late summer, during times of raptor migration. On the day of each of fire, two trained observers were stationed in widely separated locations with good visibility along the edges of burn areas. All raptors, both perched and flying within the burn units, were systematically counted prior to and during the fire. Standard wildlife point-count methods were used to reduce bias and to avoid counting birds twice.

Over the course of the 25 fires, the average number of raptors observed was nearly seven times greater during prescribed fires as compared to immediately before ignition. For all fires, a total of 528 raptors, representing nine species, were detected. Of those, 74 were counted prior to fires, and 454 were counted during fires. The majority of raptors were Swainson's hawks ( $n=346$ ). Red-tailed hawks and Mississippi kites were also observed in higher numbers during fires than before (see Author's Postscript, below right).

This study clearly documented that certain raptor species are attracted to active fires. Researchers suggest that Swainson's hawks, known to migrate 150 kilometers per day, likely respond to the visual cue of smoke plumes. Researchers observed raptors eating small mammals and reptiles that had been injured, exposed, or killed by the spring fires. Migrating Mississippi kites were seen foraging on "clouds" of insects disrupted during summer fires.

Migration is inherently challenging for bird populations, and a lack of available food en route can negatively impact their



American kestrels were observed before and during prescribed fires. (Photo: Torre Hovick)

reproductive success and survival. Some raptor species appear to have developed an ability to detect fire foraging opportunities along their migration routes. Even though the fires took place at different locations each year, raptors responded consistently. Land managers could consider the conservation implications of restoring fire regimes that Swainson's hawks and other migrating species would have historically encountered while traveling to their breeding grounds.

This study provides some of the first evidence showing wildlife response to the actual burning process. Raptors using pyric-carnivory to supplement their diet during migration is one example of how fire can influence food webs at all levels. Additionally, this research provides greater understanding of the complexity of fire ecology, demonstrating that meaningful, measurable events take place during a fire, and that the entire spectrum of the fire process is important.

Species (scientific name)	Prefire	During fire	Total
Swainson's hawk ( <i>Buteo swainsoni</i> )	12	334	346
Red-tailed hawk ( <i>Buteo jamaicensis</i> )	17	39	56
Red-shouldered hawk ( <i>Buteo lineatus</i> )	2	2	4
Broad-winged hawk ( <i>Buteo platypterus</i> )	2	1	3
Rough-legged hawk ( <i>Buteo lagopus</i> )	0	1	1
Northern harrier ( <i>Circus cyaneus</i> )	16	7	23
Sharp-shinned hawk ( <i>Accipiter striatus</i> )	0	1	1
American kestrel ( <i>Falco sparverius</i> )	7	2	9
Mississippi kite ( <i>Ictinia mississippiensis</i> )	1	30	31
Unidentified raptor	17	37	54
<b>Total</b>	<b>74</b>	<b>454</b>	<b>528</b>

*Species' detections immediately preceding and during 25 prescribed fires in Oklahoma, USA (2013-2014)*

## FOR FURTHER READING

- [Reinking, D. L. \(2005\). Fire regimes and avian responses in the central tallgrass prairie. \*Studies in Avian Biology\*, 30, 116-126.](#)
- [Hovick, T. J., Carroll, J. M., Elmore, R. D., Davis, C. A., & Fuhlendorf, S. D. \(2017\). Restoring fire to grasslands is critical for migrating shorebird populations. \*Ecological Applications\*, 27, 1805-1814.](#)
- [Hovick, T. J., Elmore, R. D., Fuhlendorf, S. D., Engle, D. M., & Hamilton, R. G. \(2015\). Spatial heterogeneity increases diversity and stability in grassland bird communities. \*Ecological Applications\*, 25, 662-672.](#)

## AUTHOR'S POSTSCRIPT

To supplement this brief, lead author Torre Hovick has shared a video of Mississippi kites converging upon a summertime prescribed fire. [Click Here](#) to view.

