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Germination of the federally endangered Michaux's sumac (*Rhus michauxii*)

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ABSTRACT

The federally listed Michaux's sumac (*Rhus michauxii* Sarg. [Anacardiaceae]) is one of the most endangered shrubs in the southeastern US. The endangered status of this fire-adapted species may be primarily attributed to fire suppression. Many hard-seeded plants in fire-adapted ecosystems can survive high temperatures and germinate in response to scarification caused by high fire temperatures. Unfortunately, little is known about the germination strategy of Michaux's sumac. Using seeds collected from Virginia Army National Guard, Maneuver Training Center, Fort Picket, that were subsequently manually scarified, we discovered that imbibition of intact seeds was prevented by endocarp impermeability. We then examined if dry heat, as an analogue for wildfire, could be used to break this physical dormancy. Replicated (n = 3) dry heat treatments applied at 60, 80, 100, 120, and 140 °C (140, 176, 212, 248, and 284 °F) for 5 and 10 min durations, as well as a nontreated control, yielded no germination after 4 wk. All seeds were subsequently manually scarified. During the next 4 wk, a range of 47.8 ±4.8 to 56.7 ±12% germination was observed for scarified seeds of the 60 and 80 °C (at 5 and 10 min) treatment groups, not significantly different than the 61.6 ±6.2% germination observed with scarified control seeds. Very low germination was observed when seeds were exposed to 100 °C for 5 min; all longer duration and higher treatment temperatures were lethal.

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KEY WORDS
fire ecology, heat shock, scarification, Anacardiaceae

NOMENCLATURE
Plants: USDA NRCS (2011)
Animals: ITIS (2011)

Michaux's sumac (*Rhus michauxii* Sarg. [Anacardiaceae]) is one of the rarest shrubs in the southeastern US (Fleming and Ludwig 1996) and has been listed as a federally endangered species since 1989 (Murdock and Moore 1993). In 1993, the largest population of *R. michauxii* (approximately 20,000 individuals) was discovered at the Virginia Army National Guard, Maneuver Training Center, Fort Picket, in the piedmont of Virginia (Fleming and Ludwig 1996). This dioecious plant rarely exceeds 1 m (3 ft) in height and persists only in disturbed environments, explaining its relative abundance in military training areas of Fort Pickett. Outside of Fort Pickett, the only other Virginia population is located in a mowed railway right-of-way. The decline of *R. michauxii*, due to its dependence on regular disturbance to reduce woody competition, has been attributed to fire suppression (Murdock and Moore 1993; Emrick and Jones 2008).

Complete understanding of the germination requirements of endangered plants is an absolute requirement to effectively manage populations, and little is known of the germination requirements of *R. michauxii* (Wilkinson and others 1996). Many *Rhus* species of North America display physical dormancy and require scarification for germination (Li and others 1999a, b). The model of Baskin and others (2000) suggests that physical dormancy is an ancient derived state within the Anacardiaceae and may have evolved in response to drying climatic conditions. The importance of physical dormancy as a mechanism of survival and recruitment in fire-adapted ecosystems has been well established and reviewed for the fynbos of South Africa (Kruger and Bigalke 1984), the chaparral of California (Keeley 1991), and the scrublands of Australia (Bell and