Classic Article

Introduction to Robert R. Humphrey's Article

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As ecologists, we stand on the shoulders of those pioneers before us, and from Robert Humphrey's shoulders we developed a deeper appreciation for fire's role in the ecology of desert grasslands in the American Southwest. Personally, I am honored to have met him and, since 1986, to have walked the same hallways at the University of Arizona and the same study sites at the nearby Santa Rita Experimental Range. Reprinting Humphrey's *The Desert Grassland, Past and Present* very rightly recognizes the significance of his scholarship, but also honors his pioneering efforts to promote fire as a management tool in the face of criticism and personal threats to his career. I would like to provide background about the man and his times, his contributions to the development of the fire ecology discipline, and how his work contributes to the modern concept of disequilibrium ecology.

Humphrey was born in 1904 and passed away in 2002, at the age of 97 years. He attributed his longevity and love of botany to his parents who both had long lives and obtained BS degrees in botany from the University of Minnesota (Warburg 1998). Like his parents, he earned a BS degree in botany from University of Minnesota and continued there to earn MS (1930) and PhD degrees (1933) in ecology. He was introduced to deserts of the American Southwest in 1930 as an assistant to Forrest Shreve, Director of the Carnegie Desert Laboratory in Tucson, Arizona, USA. His dissertation examined the ecology of the boojum tree (*Fouquieria columnaris* [Kellogg] Kellogg ex Curran) in Baja California, Mexico, under the guidance of William Cooper.

Nearly two decades of professional field work on western US rangelands provided the foundation for his scholarship and teaching about fire and range ecology. From 1933 to 1935, he worked for the Forest Service Rocky Mountain Forest and Range Experiment Station in Tucson, Arizona, USA, evaluating the effectiveness of practices to control burroweed (*Isocoma tenuisecta* Greene) (Humphrey 1937; Figure 1) on the Santa Rita Experimental Range (http://cals.arizona.edu/srer). He performed range surveys and livestock grazing plans for the USDA Soil Conservation Service (now Natural Resources Conservation Service) from 1935 to 1948 throughout the western US, including many Indian reservations.

As a professor of Range Ecology from 1948 through 1966 at the University of Arizona, Humphrey's career included writing several publications, mentoring students, and advising land managers and ranchers. His most influential scholarship during that time addressed the critical role of fire in maintaining desert grasslands by controlling woody plant abundance (Humphrey 1953 [reprinted here], 1958). Combining historical sources and field observations, he described how grasslands and fires were common when Euro-Americans arrived, and how woody plants began to increase and eventually dominate former grasslands after fires became less common. Hum-

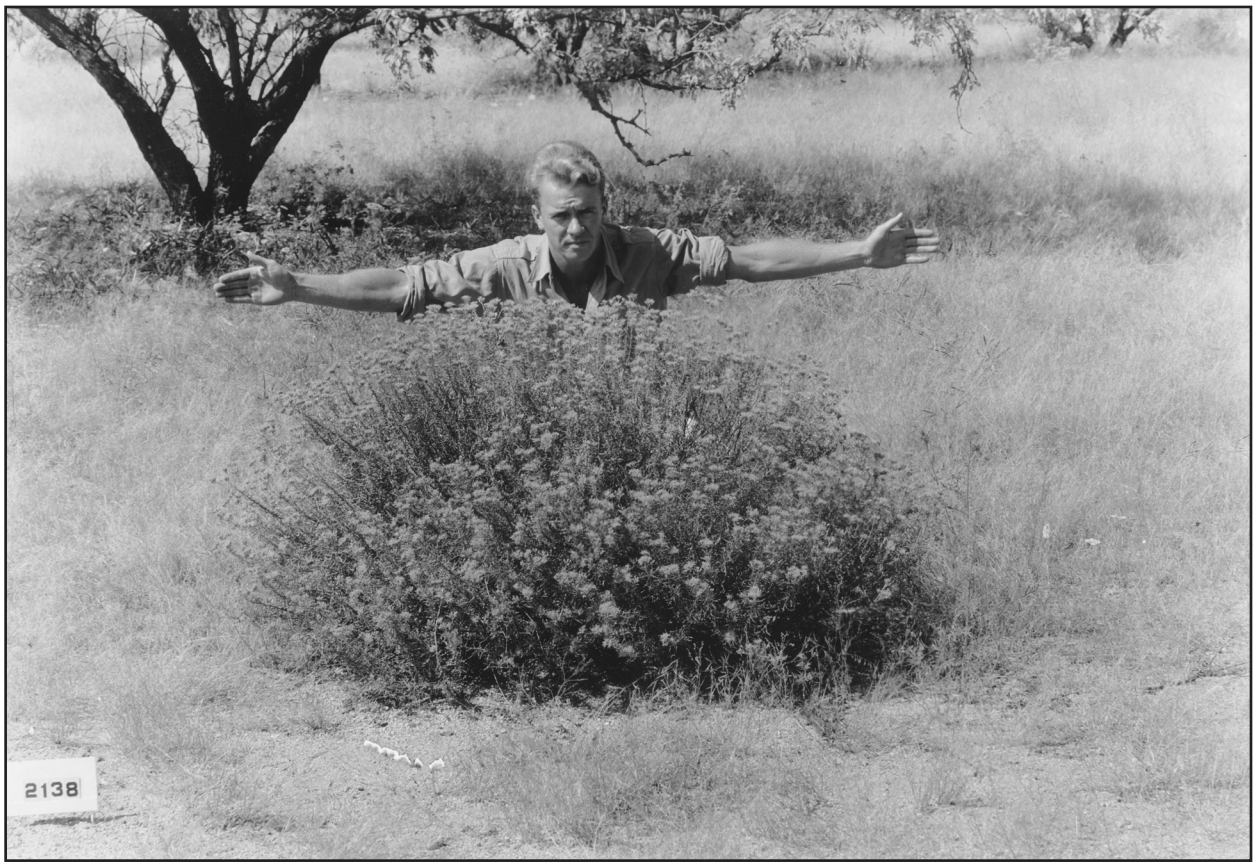

Figure 1. Robert Humphrey behind a very large burroweed (*Isocoma tenuisecta* Greene) plant on the Santa Rita Experimental Range near Tucson, Arizona, USA, in 1934. Image courtesy of Santa Rita Experimental Range Digital Database (http://cals.arizona.edu/srer).

phrey's critical review included an assessment of five proposed mechanisms for the vegetation change: 1) introduction of domestic livestock, 2) competition with grasses, 3) rodents, 4) changes in climate, and 5) suppression of fire. He concluded that the suppression of fire was the primary cause for the change, but he also recognized that excessive livestock grazing practices from the 1880s to the 1920s reduced grasses and thus reduced the fuel to carry fires and any competitive advantage to grasses. He argued that fire was the primary cause because woody plants continued to increase in density and cover in areas where livestock were removed and grass increased; therefore, the absence of fire was allowing woody plants to thrive.

Humphrey faced criticism and threats for his views that fire should be re-introduced to maintain grasslands, just as Harold Weaver (van Wagtendonk 2014) and John Phillips (van Wilgen 2012) had faced when they encouraged the use of fire. The Forest Service threatened to get him fired from the University of Arizona if he continued to advocate the use of fire in his classes, but he held his ground and continued teaching and promoting the role of fire (Warburg 1998). According to Humphrey, he advised ranchers and others, "If you want a brushy range, keep your fires out. If you want a grass range to provide forage for your animals, burn it periodically." (Warburg 1998). He summarized his lecture materials into the first textbook on range ecology (Humphrey 1962) and placed significant emphasis on the role of fire.

Humphrey's work is now widely cited to support the concept of disequilibrium in ecology (Westoby *et al*. 1989) where, for example, increased woody abundance in desert grasslands following the cessation of fire is not easily reversed when fire is re-introduced (McPherson 1995). In desert grasslands, the disequilibrium results when the woody mesquite (*Prosopis* spp. L.) reaches a size large enough to re-sprout quickly after being top-killed or resist combustion altogether (Figure 2). In other words, a long period without fire has allowed a threshold to be crossed from a system in which frequent fire controlled woody plant abundance, to a system in which some other mechanism is needed to control woody plants because they are now large enough to resist fire. It is interesting that Humphrey's work is cited to support disequilibrium theory because he frequently referenced equilibrium-based concepts of climatic climax and fire disclimax to explain why woody plants increase in the absence of fire.

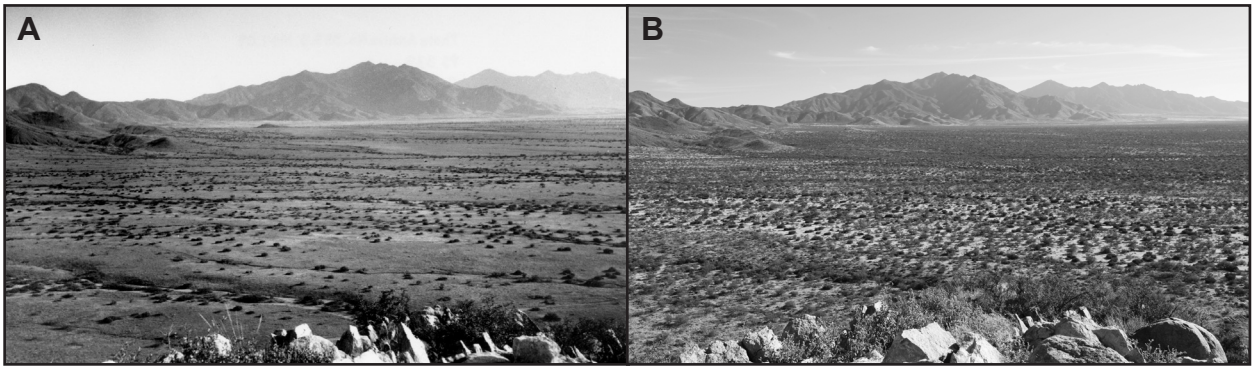

Figure 2. Increase of velvet mesquite (*Prosopis velutina* Woot.) on the Santa Rita Experimental Range between 1904 (A) and 2012 (B) where there is no record of fire during that period. Desert hackberry (*Celtis pallida* [Klotzsch] Liebm.) is the primary woody plant present in 1904 (Photo Station 33; http://cals.arizona.edu/photos/PS333/ps333.htm). Image courtesy of Santa Rita Experimental Range Digital Database (http://cals.arizona.edu/srer).

After retiring in 1966, Humphrey wrote two books devoted to his fascination with the boojum tree (Humphrey 1974) and vegetation change along the US-Mexico boundary (Humphrey 1987). Both provided him the opportunity to perform extensive field work accompanied by his wife, Roberta. The former publication was a continuation of his PhD dissertation. The latter publication was a continuation of his historical research on vegetation change, and in it he used repeat photography of the 258 boundary monuments between El Paso, Texas, and San Diego, California, USA, to document changes between the 1890s and the 1980s (Humphrey 1987).

In an oral history interview four years before his death, Humphrey said, "I think if there is one thing I'd like to be remembered for having contributed, it's the study of the effect of fire on the vegetation" (Warburg 1998). He was fortunate to see that contribution confirmed in his lifetime, and with this re-printing of *The Desert Grassland, Past and Present,* we are reminded of and celebrate his achievement.

ACKNOWLEDGEMENTS

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