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Special Issue: The ecology of *Quercus*-dominated forests in the eastern United States

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The ecology, disturbance history, and dynamics of *Quercus* forests have been a focus of forest researchers throughout the world (Abrams *et al*. 1999, Gonzalez-Espinosa *et al*. 1991, Petit *et al*. 2002, Valladares *et al*. 2002). The *Quercus*-dominated forests of the eastern United States have received some of the closest attention because of their complexity (Abrams 1992, Arthur *et al*. 1998, McEwan *et al*. 2011, Sork *et al*. 1993). This scientific interest is additionally motivated by the abundance of this genus coupled with its high economic value. These two characteristics were noted as early as 1785, when the Italian naturalist Luigi Castiglioni (1983, p. 25) provided this description of the eastern United States: "The major part of the woods consists of oaks, namely the red, the white, the dwarf, called scrub oak by the inhabitants; and the type with chestnut leaves," and residents were using "huge oaks . . . to build ships and in part were sent elsewhere as lumber." The dominance of *Quercus* and its economic importance in the eastern United States continued well into the early 20th century, when forest researchers began to notice and document the conversion of *Quercus* forests to different tree species (Abrams and Downs 1990, Hix and Lorimer 1991). The recognition of a potential future decline in the abundance of *Quercus* triggered a flurry of research focused on seedling and sapling germination and regeneration (Gilbert *et al*. 2003, Dey *et al*. 2008, Hart and Kupfer 2011, Jevon *et al*. 2021). As researchers work to untangle the complexities of *Quercus*-dominated forests, there has not always been agreement among scientists about how to interpret the data sets we have developed; however, there has always been agreement that researching these ecosystems has high scientific and forest conservation value.

Therefore, as the scientific community has conducted over two centuries of observation and research into the ecology of *Quercus*-dominated forests in North America, it seemed appropriate to Dr. Ryan McEwan, then editor in chief of the *Journal of the Torrey Botanical Society*, to initiate a Special Issue of the journal focused on this topic. The special issue has experienced a few delays, but it is my honor, as the current editor in chief, to bring to completion this collection of research papers. The articles in this issue represent our current state of the knowledge about *Quercus* in the eastern United States; however, the authors, despite their extensive expertise in these ecosystems, readily point readers to topics where our knowledge is still limited and identify additional research opportunities. I am pleased to share with the readers of the *Journal of the Torrey Botanical Society* six articles from invited authors that help us better understand *Quercus*-dominated forests, to wit:

Abrams, Nowacki, and Hanberry contrast anthropogenic land use, fire, and climate as drivers of mesophication and the subsequent reduction in the dominance of *Quercus* within forests of the eastern and central United States.

Dee, Stambaugh, and Dey excavated 180 *Quercus muehlenbergii* seedlings to compare the ages of roots *vs*. shoots from an established burning and thinning experimental study area in eastern Kansas. Their results have implications for forest managers and forest demographers.

Nowacki and Thomas-Van Gundy provide a landscape-level examination of the relative importance of fire *vs*. climate in determining the geographic location of the ecotone separating northern mixed forests from *Quercus*-dominated southern broadleaf forests in Wisconsin and Minnesota.

Abrams, Hanberry, and Ruffner document reductions in *Quercus* spp. and increases in *Acer rubrum* L. using historical land survey records and present-day vegetation survey data from old-

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growth and second-growth forests in western Maryland.

Abadir, Marschall, and Stambaugh reconstructed historical fire frequency and seasonality using fire scar records in Tennessee. Their results will assist The Nature Conservancy in meeting their conservation goal of improving the *Quercus-Pinus* ecosystem within Bridgestone Nature Reserve.

Beasley, Carter, Coates, Keyser, and Greenberg compared overstory and understory tree species across four silvicultural treatments (control, shelterwood, prescribed fire, and shelterwood-prescribed fire). Their research highlights the need for more field-based experimental research in uncovering the complexity of *Quercus* regeneration patterns in the Central Appalachian Mountains.

Literature Cited

Abrams, M. D. 1992. Fire and the development of oak forests. Bioscience 42: 346–353.

Abrams, M. D. and J. A. Downs. 1990. Successional replacement of old-growth white oak by mixed mesophytic hardwoods in southwestern Pennsylvania. Canadian Journal of Forest Research 20: 1864–1870. doi.org/10.1139/x90-250.

Abrams, M. D., C. A. Copenheaver, K. Terazawa, K. Umeki, M. Takiya, and N. Akashi. 1999. A 370-year dendroecological history of an old-growth *Abies-Acer-Quercus* forest in Hokkaido, northern Japan. Canadian Journal of Forest Research 29: 1891–1899. doi.org/10.1139/cjfr-29-12-1891.

Arthur, M. A., R. D. Paratley, and B. A. Blankenship. 1998. Single and repeated fires affect survival and regeneration of woody and herbaceous species in an oak-pine forest. Journal of the Torrey Botanical Society 125: 225–236. doi.org/10.2307/2997220.

Castiglioni, L. 1983. Viaggio: Travels in the United States of North America 1785–87. Syracuse University Press, Syracuse, NY. 487 pp.

Dey, D. C., D. Jacobs, K. McNabb, G. Miller, V. Baldwin, and G. Foster. 2008. Artificial regeneration of major oak (*Quercus*) species in the eastern United States—A review of the literature. Forest Science 54: 77–106.

Gilbert, N. L., S. L. Johnson, S. K. Gleeson, B. A. Blankenship, and M. A. Arthur. 2003. Effects of prescribed fire on physiology and growth of *Acer rubrum* and *Quercus* spp. seedlings in an oak-pine forest on the Cumberland Plateau, KY. Journal of the Torrey Botanical Society 130: 253–264. doi.org/10.2307/3557544.

Gonzalez-Espinosa, M., P. F. Quintana-Ascencio, N. Ramirez-Marcial, and P. Gaytan-Guzman. 1991. Secondary succession in disturbed *Pinus-Quercus* forests in the highlands of Chiapas, Mexico. Journal of Vegetation Science 2: 351–360. doi.org/10.2307/3235927.

Hart, J. L. and J. A. Kupfer. 2011. Sapling richness and composition in canopy gaps of a southern Appalachian mixed *Quercus* forest. Journal of the Torrey Botanical Society 138: 207–219.

Hix, D. M. and C. G. Lorimer. 1991. Early stand development on former oak sites in southwestern Wisconsin. Forest Ecology and Management 42: 169–193. doi.org/10.1016/0378-1127(91)90023-O.

Jevon, F., A. Lang, M. Ayres, and J. H. Matthes. 2021. Limited evidence that larger acorns buffer *Quercus rubra* seedlings from density-dependent biotic stressors. American Journal of Botany 108: 1861–1872. doi.org/10.1002/ajb2.1740.

McEwan, R. W., J. M. Dyer, and N. Pederson. 2011. Multiple interacting ecosystem drivers: Toward an encompassing hypothesis of oak forest dynamics across eastern North America. Ecography 34: 244–256.

Petit, R. J., S. Brewer, S. Bordacs, K. Burg, R. Cheddadi, E. Coart, J. Cottrell, U. M. Csaikl, B. van Dam, J. D. Deans, S. Espinel, S. Fineschi, R. Finkeldey, I. Glaz, P. G. Goicoechea, J. S. Jensen, A. O. Konig, A. J. Lowe, S. F. Madsen, G. Matyas, R. C. Munro, F. Popescu, D. Slade, H. Tabbener, S. G. M. de Vries, B. Ziegenhagen, J.-L. de Beaulieu, and A. Kremer. 2002. Identification of refugia and post-glacial colonisation routes of European white oaks based on chloroplast DNA and fossil pollen evidence. Forest Ecology and Management 156: 49–74. doi.org/10.1016/s0378-1127(01)00634-x.

Sork, V. L., J. Bramble, and O. Sexton. 1993. Ecology of mast-fruiting in three species of North American deciduous oaks. Ecology 74: 528–541. doi.org/10.2307/1939313.

Valladares, F., J. M. Chico, I. Aranda, L. Balaguer, P. Dizengremel, E. Manrique, and E. Dreyer. 2002. The greater seedling high-light tolerance of *Quercus robur* over *Fagus sylvatica* is linked to a greater physiological plasticity. Trees-Structure and Function 16: 395–403. doi.org/10.1007/s00468.002.0184.4.