

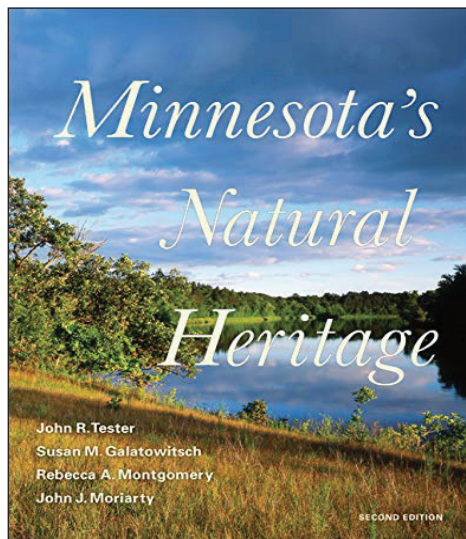
**Minnesota's Natural Heritage, Second Edition**, by John R. Tester, Susan M. Galatowitsch, Rebecca A. Montgomery, and John J. Moriarty. 2021. University of Minnesota Press, Minneapolis, MN. 496 pages. \$49.95 (Hard cover). ISBN 978-1-5179-0357-2.

There are two clear reasons to read and recommend *Minnesota's Natural Heritage*, one for students and the other for readers in general, including myself. Two anecdotes can introduce these reasons. First, I have a historical map of North America that I often use in classes, and among its details are some fine seventeenth-century drawings of *Castor canadensis* Kuhl (American Beavers) on their haunches, eating fish. Lately, when discussing this map, I have begun asking classes what beavers really eat, and almost invariably, after a long pause, someone offers, "um,...fish?" I remain surprised how little my students, many of whom are environmental studies students, actually know what beavers eat, how they live, or why they matter in the environment. Kids these days know a lot, but many have small experiences of the flora and fauna around them. Although *Minnesota's Natural Heritage* is a broad and encyclopedic overview of a vast and multidimensional topic, it would make an excellent course book to introduce to students in ecology, physical geography, conservation, environmental science, or related topics to basic ideas and examples of environmental systems.

A second anecdote: Some years ago, a colleague set out to visit a different Minnesota state park every weekend to get to know the state and its environments. This project, which I still hope to copy, was a reminder of how much variety the state has to offer, and how much there is to learn. For those who fall into routines and repeatedly visit the same places, or who lack the time to visit remote corners of the state, or who are reading at home on a winter evening and making plans for next summer, this book provides a surprisingly excellent and enjoyable armchair field trip.

This volume, a 25<sup>th</sup> anniversary update of John Tester's 1995 edition, provides an overview of natural environments and natural history in the state. *Minnesota's Natural Heritage* reviews major concepts (landscape change, climate, ecological principles) and major biomes and ecosystems (deciduous forest, northern forest, grasslands, wetlands, lakes, rivers, and streams), with overviews of major flora, fauna, and ecosystem processes. This updated edition gives attention in each section to climate-change impacts and restoration. A final chapter reviews major threats to environments and resident species, such as climate change, pollution, and invasive species, as well as restoration approaches. The book is richly illustrated with large-format photographs, excellent explanatory figures, and updated maps.

*Minnesota's Natural Heritage* presents a very approachable balance of range and depth for a general audience. It also represents current research from a network of scientists with long experience in the region. The authors have decades of primary research experience in Minnesota's forests, grasslands, and wetlands. They draw on their own fieldwork and that of their colleagues, ranging from John Tester's studies of *Anaxyrus hemiophrys* Cope



(Canadian Toad) in “Mima” mounds in the 1960s to recent data from herpetological surveys, wetland restoration and invasive species studies, and forest ecology. The book offers intriguing details for the curious, such as early accounts of fire succession, bog ecosystem dynamics, or life histories of stream invertebrates, native mussels, or *Polyodon spathula* Walbaum (American Paddlefish, which dates to the Cretaceous period!).

A striking aspect of a 25-year update is the degree to which ecological knowledge can advance over a few decades. The new edition reflects expanded information on topics such as invasive species and their impacts (e.g., earthworms and lampreys), climate impacts, and fire ecology. Restoration strategies have evolved for repairing urban watersheds, wetlands, and prairies. Emerging approaches in ecosystem management include nutrient control in agricultural waterways, watershed management incentives, and agreements to reduce dead zones from Lake Winnipeg to the Gulf of Mexico. Climate impacts have reshaped all these topics in 25 years, with wide-ranging impacts on how we think about conservation of species and habitats.

A weakness that remains in this 2021 volume is slim attention to the region’s residents before European arrival. Like many accounts, this one addresses presettlement flora and fauna and the impacts of clearing for agriculture or of logging, but it brushes briefly over how the land was inhabited before 1860. Who lived in these environments, and how did they use or modify the landscapes? By now, evidence on these points is increasingly available, and environmental writers are increasingly responsible for exploring it. This omission reflects, in part, the tradition of ecology that has, until recently, been demographically narrow (largely white and male). In another edition, one hopes that Indigenous perspectives would have more focused representation.

Also cursory is the discussion of some threats in the final “Future” chapter. To be fair, impacts of invasive species, climate change, and landcover modification appear in earlier chapters. But the final chapter would feel more complete with more recent figures reflecting climate-change projections, models of ecosystem shifts, or maps of land-use changes. Similarly, the text is mostly gentle in treating issues of agricultural intensification and its impacts on water, soil, and biodiversity. Agricultural politics are sensitive, and this book targets a wide audience, not just committed conservationists. Still, as one of the primary drivers reshaping the state’s natural heritage, land-use change deserves more direct discussion. One wishes for a little less “Minnesota nice” on topics like this.

Natural history is not something that we teach much anymore, but that does not mean that we do not need it. At the introductory level, students do need an approachable, readable, thorough overview of the web of interconnecting components of natural environments. Failing to understand this complexity, and to recognize and name some of its components, can mean failing to understand why natural resources—our natural heritage—deserves protection. For a general audience, there is pleasure in understanding basic ecosystem function and the life history of familiar organisms, such as the number of maple seedlings and their survival rates in an acre of forest, or the number of hosts in the life cycle of a *Ixodes scapularis* Say (Black-legged Tick). Descriptions in this book are very readable, sometimes almost lyrical in evoking the experience of being in an ecosystem.

A virtual field trip or a general introduction might be a sufficient agenda for a volume like this, but these, obviously, support an underlying policy agenda. Recollections of familiar places, and verbal portraits of the unfamiliar, whet the appetite for new excursions, new spring flowers to see, and warblers to watch. Given that we care for—and seek to conserve—only the things we know, this highly readable volume reminds readers of the environments they cherish. Many of the chapters also explicitly note successes in conser-

vation policy, such as broad voter agreement on funding programs, or progress in wetland protection laws. In an introductory presentation hosted by the University of Minnesota's Bell Museum of Natural History, author Susan Galatowitsch noted that she would like every state legislator, land-use planner, and administrative judge to read this book. I hope they do. I hope thousands of voters and residents do as well, to recall why it is important to protect, and restore, the lands and waters that we inherit and will pass on. This volume offers an important contribution to that goal. Readers will enjoy it, and faculty would do well to ask their students to read and learn from it.

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