BOOK REVIEWS

Cedar Bog Symposium III – Proceedings from the Meeting held 10 February 1996. Robert C. Glotzhober, editor. Ohio Biol. Info. Publ. No 3; 1997. x + 124 p. $15.00.

During the past century, Cedar Bog Nature Preserve, Champaign County, Ohio has received considerable attention because of its unique flora and fauna. This unusual assemblage of plants and animals is located in an alkaline fen with an open sedge meadow surrounded by northern white cedars (*Thuja occidentalis* L.). This ecosystem, more common in northern latitudes, is maintained by the flow of cool ground water which moderates temperature extremes, maintains the distinctive biota, and contributes to the establishment of an organic soil.

Cedar Bog Symposium III is a collection of papers of varying length presented at a meeting held at The Ohio State University 10 February 1996. This was the third such meeting and symposium in the past 25 years. The first (King and Frederick 1974) was held in 1973, the second (Glotzhober, Kochman, and Schultz 1989) in 1987. Together, the three volumes present 45 papers plus extensive bibliographies covering various aspects of Cedar Bog's history, geology, and biology. Collectively, 11 groups of organisms have been studied, at least to some extent. These include the vascular plants, mosses, lichens, algae, myxomycetes, fungi, mollusks, fish, and the insect orders Orthoptera, Lepidoptera, and Odonata. Among the three volumes there is a nice mixing of authors without any one voice dominating. In this review, papers from the three symposia are designated by the year in which they were published, 1974, 1989, or 1997, without full references.

Like its predecessors, Cedar Bog Symposium III concentrates on those aspects of Cedar Bog that are most interesting or unusual including the source of the ground water so crucial to maintaining the fen, the rare vascular plants, and the unusual associated wildlife. The proceedings are organized into four sections: physical sciences; historical perspectives; plant sciences; and bacteriology, entomology, and zoology.

Physical Sciences. Two of the four papers in Symposium III deal with tracing the source of ground water. Forsyth (1974) concluded that, based on glacial features, the primary source of the water is from northeast. Price and Pushkar (1989), using ground water flow models, and Hillman and Kenoyer (1989) and Kenoyer and Hillman (1989), using geochemical tracers, supported Forsyth's conclusion. Cheng (1997), using a combination of ion concentrations, also supported Forsyth's original observation, and provides information on the recharge along the flow path. Justice (1997) examined the interaction of the ground water flow and soil type occurrences. He presented an informative explanation of marl formation at Cedar Bog and, based on muck soils formed over marl deposits, indicates a once larger sedge meadow.

Gilbert (1974), studying air temperature inversions in the "swamp" and surrounding old field, concluded that most inversions occurred between mid-morning to late afternoon. In contrast, Clemens (1997), using more sophisticated equipment and conducting longer experiments, provided evidence that inversions are a nighttime phenomenon. Inversions are important to the health of Cedar Bog because airborne pollutants may persist for a sufficient time to damage biota. Clemens concludes that pollutants are presently dispersed naturally and with reasonable efficiency, but he cautions that the potential expansion of the nearby highway may change these results.

Richard and others (1997) re-visit the influence of buried Teays River Valley in supplying ground water to Cedar Bog, a concept proposed by Richard (1974). Using a variety of techniques, including seismic refraction and geodetic gravity data, the authors conclude that water in the buried Teays River and its tributaries provides artesian pressure that raises the water table and aids the survival of the bog during dry periods.

Historical Perspectives. Jaworski (1997) discussed the important role of Florence Murdock (briefly mentioned by Thomas, 1974) in the preservation of Cedar Bog. In another paper, Jaworski (1997) cited hard-to-find records to describe the physical impacts of efforts to drain Cedar Bog. Jaworski's work complemented that of Glotzhober (1989), who compiled terminology used by various authors to describe the type of plant communities within Cedar Bog, and mapped plant community distributions on aerial photos. Blosser (1997) presented refreshing information on the relationship between the floral and faunal resources of Cedar Bog to human activity surrounding the area over the past 10,000 years.

Plant Sciences. From her comprehensive floristic survey of Cedar Bog, Frederick (1974) discussed disjunct species. Cusick (1989) reviewed rare, state-listed vascular plant species. McCormac (1997) added 52 new plant records to the flora. He included in his survey not only the open fen meadow and cedar thickets, but also the old fields and deciduous woods surrounding the wetlands. Not surprisingly, 12 of the new records were nonnative species of disturbance.

Stuckey (1974) discussed pre-1900 floristic studies of Cedar Bog, including the discovery of *Valeriana ciliata* Torr. & A. Gray which was named and described as new to science in 1841. Windus (1997) presented a 5-year extensive survey of flowering characteristics of *V. ciliata*, and included in her discussion management recommendations for the continued survival of this species.

Jaworski (1997) reported the results of a study in which he counted annual rings in white cedar (*Thuja occidentalis*) removed from the fen meadow. He concluded that the invasion of white cedar increased between 1945 to 1965. Walker (1989), using genetic studies and an analysis of the distribution of age classes of *T. occidentalis*, suggested the rapid cedar invasion was related to drought-induced disturbances.

Bacteriology, Entomology, and Zoology. Davis (1997) discussed the history of Eastern massasauga rattlesnakes in Ohio, and specifically those in Cedar Bog. When comparing information obtained from his collections at Cedar Bog, he demonstrated that a reduction in total length of these snakes is occurring. Accounting

for the fact that his measurements may be biased by having collected juveniles, nevertheless, he was concerned that females may not be reaching their full reproductive potential. Davis cautions that successional vegetation changes in the field adjacent to Cedar Bog may have interfered with the snakes' ability to bask, which is particularly important to pregnant females. Laux and Tuke (1974) pointed out that there was a localized population increase when this area was an open hay field.

Glotzhober (1997) synthesized historical and recent collecting records of the insect order Odonata from Cedar Bog, which include 13 newly reported species. This study represented the recognition of another insect order at Cedar Bog. His study included occurrences of Odonata in other strongly alkaline fens in the surrounding counties.

Cedar Bog has been the focus of intensive studies since 1973. Increasingly, more sophisticated approaches have been used to support original concepts or add new information. However, much remains to be done. Only a small fraction of the diversity of invertebrates and vertebrates has been studied. Each symposium points out the drastic changes that have taken place in the size of the open fen meadow, and relates those changes to the lowering of the water table. What is needed are extensive quantitative studies that include long-term monitoring to document ecological changes. Information from such studies can be incorporated into management recommendations to reverse these trends. Windus (1997) is to be commended for conducting a five-year study and drawing management conclusions from her data.

The contents of Cedar Bog Symposium III are a valuable addition to the growing knowledge of one of Ohio's best known wetlands. I hope that additional surveys of animal diversity, documentation of ecological trends, and recommendations for long-term preservation will be included as topics in Cedar Bog Symposium IV.

Literature Cited

Glotzhober RC, Kochman A, and Schultz, WT, editors. 1989. Proceedings of the Cedar Bog Symposium II; 14 Nov 1987. Ohio Historical Society, Columbus, OH. 95 p.

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An Introduction to Soils for Environmental Professionals. Duane L. Winegardner. 1996. CRC Press, Inc., Boca Raton, FL. 270 p. $75.00.

Duane Winegardner's *An Introduction To Soils For Environmental Professionals* does an excellent job of providing a text for the beginning environmental scientist. This could be used as a introductory text on soils for resource managers and other related environmental specialists.

The text lays a sound basic format to study soils. Chapter 1 outlines reasons for understanding soils from an environmentalist's viewpoint. Specifically, he relates the soils to a "dynamic" system to help assure professional environmentalists have a complete understanding of soils.

Soil Classification is reviewed in Chapter 2. The author does an excellent job of reviewing the key components of classifying soils including particle size, soil consistency, particle shape, structure, and texture. He covers 3 major classification systems: Unified Soil Classification System (USCS), American Association of State Highway and Transportation Officials (AASHTO), and US Comprehensive Soil Classification System. There is not a lot of detail in this chapter, but it is sufficient for the beginning environmental professional.

Chapters 3 through 7 cover the major soil concepts; "Mineralogy," "Mechanics," "Physics," "Chemistry," and "Microbiology." "Mineralogy" covers crystal formation, chemical mineral relations, silicates, oxides, carbonates, sulfates, and mineral weathering. "Mechanics" is one of the best chapters in the book. It not only reviews the subject, but also provides examples, a useful way for students to learn concepts. Winegardner discusses volume and space relationships, such as porosity, void ratio, and percent moisture then provides an example to show how to figure volume and space relationships.

"Soil Physics" covers major issues including hydrogen bonding, solvent properties, and physical properties (density and viscosity). The author reviews the relationships between soil and water including a discussion of surface tension, capillarity, air exchange, and heat transfer. Practical examples are missing in this chapter. "Soil Chemistry" includes weathering, fixation of element (ion and pH), adsorption, chemical buffering, organic chemical diffusion and volatilization. Again, practical applications and examples would have been valuable.

"Microbiology" discusses the relationships of microbes and soils. Major topics are methane formation, transformation of carbon, nitrogen transformations, utilization of hydrocarbons, biotransformation of sulfur, iron usage, and degradation of pesticides.

Chapters 8 and 9 flow well together. The first deals with sampling techniques and provides examples of methods used to collect soils. This moves right into the next chapter which discusses analytical procedures. The student sees the connection between sampling and selecting the tests to be conducted. Logically, Chapter 11 should have occurred next. It discusses how soil data can be managed, presented and interpreted. Instead, Chapter 10 discusses agricultural considerations. I found this placement confusing and out of place. Agriculture could be discussed but then other topics should also be reviewed, such as Urban, Recreation, Wildlife, etc. Also missing is a section on soil erosion and sedimentation as a source of pollution, a serious omission in a text aimed at environmental professionals. We cannot talk about soils in an environmental context without discussing the water pollution problems caused by improper management of soil resources.

Chapter 12, "Case Histories," is excellent in illustrating some key soil-related environmental problems such as soil pH, oil field brine, soil venting for gasoline, heavy

metals and soil bioremediation. Again soil erosion and sedimentation, the number one pollutant of our natural resources, is not mentioned. The text includes an Appendix on USCS classification system and soil glossary terms. These are great resources for the text.

As a whole, it is a text for beginning environmental professionals. The author does a good job of covering the main topics on soils. It would be complete if sections were added on soil erosion and sedimentation.

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A Color Atlas of Plant Structure. Bryan G. Bowes. 1996. Iowa State University Press, Ames, IA. 192 p. $65.95 hardcover.

The moment one opens this modest sized text it becomes evident that such a complex subject as plant structure and physiology can effectively be condensed into a highly attractive and practical reference. British author Bowes has produced a concise book, including more than 380 illustrations, most in color, of plant structure—typically at the microscopic level. As only 15% of the atlas is actual text, its most pragmatic use will be as a visual aid to learning plant anatomy.

The text is organized into eight chapters that follow a logical sequence in understanding plant structure: "Introduction," "The Plant Histology," "Apical Meristems," "The Green Leaf," "The Stem," "The Root," and "Sexual Reproduction." The high quality glossy paper provides for outstanding images, covering the scale from x6,400 magnification of a willow (*Salix*) pollen grain to a life-size longitudinal section of avocado (*Persea americana*). The basic format of each chapter presents several pages of text followed by many pages of photographs, usually three or four per page. There is also frequent use of color diagrammatic art that, in many cases, better illustrates the plant part being described. Text reference to the sequential illustrations are denoted parenthetically by decimal numbers for the appropriate chapter (for example, 2.8, 2.9, 2.10, etc.). Within the caption for most illustrations is a boxed key that lists representative plant structure by numbers. These same numbers are then superimposed with leader lines onto the portion of the illustration being described. This system works well for clarity, except in the case of black numbers placed over dark areas of the illustration (white numbers are used too infrequently in such instances).

The stated purpose of the atlas is to relate the fundamental knowledge of plant structure "clearly, briefly, and precisely," as student time devoted to plant morphology is reduced by increasing content in other areas. In this regard, this reference will likely achieve its purpose. The considerable repetition of structural and functional terminology in the captions of microphotographs serves well as an aid in learning such terminology. However, the format of the atlas, with text and photographs separate, does not seem to facilitate learning as best it could. The text introduction to each chapter is supercondensed with terminology that is presented visually only after flipping through many pages in search of the specific reference. A better blend of text and photographs would be preferable. Not surprisingly, the limited text is referenced by on 18 bibliographic citations. Conversely, the glossary is more comprehensive than the average botany text, as it describes at least 380 technical terms within 11 1/2 pages. Overall, typographical errors and word omissions appear quite rare. The caption for photo 5.3 is missing the word "leaf," whereas in the glossary under "Cellulose" the term "chains" is replaced by "drains."

Aside from typical explanations of plant structure, there is an occasional reference to applied sciences, as with reference to intensive research on the functioning of chlorophyll molecules in light reactions of photosynthesis. A full understanding of this basic process may perhaps lead to highly efficient commercial (laboratory) production of plant starches, minus the temporal delays of pollination, fruit set, maturation, and/or growing season.

Magnified images throughout the atlas are often of familiar cultivated and ornamental plant species, and even weedy species (in the latter case these may be perfectly benign plants in Britain). Species frequently used to demonstrate plant structure include: flax (*Linum usitatissimum*), corn (*Zea mays*), ground ivy (*Glechoma hederacea*), bean (*Phaseolus vulgaris*), and pea (*Pisum sativum*). No doubt, Bowes made ready use of images from his own files, and that of Glasgow University, some of which depict counterparts to North American species. Such plants include European beech (*Fagus sylvatica*), European alder (*Alnus glutinosa*), and small-leaved linden (*Tilia cordata*), among others. Quite surprisingly, the preservation of detail stem structure is apparent in a transverse section of the fossil seed fern *Lyginopteris*. The evident secondary xylem, phloem, and pith with vessels compares favorably with microphotographs of living plant tissues.

In a text such as this, one would generally not expect to gain insight into historical events. However, in illustrating latex secreting cells (laticifers) within the root of *Taraxacum officinale*, the reader is informed that another species of *Taraxacum* was cultivated as an alternative source of rubber to the rubber tree (*Hevea* sp.) in the Second World War.

Were it not for the extensive photo captions and occasional text, one could easily retitle this book as "Art in the Plant Kingdom," such is the diversity of form and beauty found at both the structural and cellular level. In summation, this highly illustrative textbook, or atlas, will be a fine compliment to undergraduate and graduate students enrolled in general or specialized plant anatomy courses.

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