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BOOK REVIEW

Synthesis of the North American Flora, Version 1.0 by J. T. Kartesz and C. A. Meacham. ©1999. CD-ROM interactive software. ISBN 1-889065-05-6 $495.00. MS Windows 3.1, NT, 95, 98 or 2000 operating system. Minimum system requirements: Pentium 90 MHz-class processor, 32 MB RAM, 25 MB free hard drive space, SVGA display (800 by 600 pixel resolution) with 16 colors. Available from the publisher: North Carolina Botanical Garden, University of North Carolina at Chapel Hill, CB #3375, Totten Center, Chapel Hill, NC 27599-3375.

Botanists working with the vascular flora of North America have long needed a comprehensive, authoritative source of names of vascular plants and their synonyms coupled with information on their geography, common names, biological attributes, and uses. This publication on CD-ROM comes very close to filling that need. The amount and quality of the data included in the *Synthesis*, and its ease of use, are very impressive.

The purpose of the *Synthesis* is to "produce an accurate and comprehensive database on the taxonomy, nomenclature, phytogeography, and biological attributes of North American vascular flora in combination with an effective software program for accessing the database." John Kartesz has created the database and Chris Meacham the software; both have done exceedingly well. The scope of the project is so grand that one could be forgiven for being skeptical about its comprehensiveness, accuracy, and effectiveness. But after using it for some months in connection with editing the Orchidales for *Flora of North America*, I am very favorably impressed by its completeness and by how easy it is to use.

The *Synthesis* actually began with the two checklists of the vascular flora of North America written by John Kartesz (Kartesz 1994; Kartesz and Kartesz 1990). The geographical scope of the *Synthesis* has been expanded to include North America north of Mexico (including the continental United States, Canada, the French islands of St. Pierre and Miquelon, and Greenland), as well as Hawaii and the Caribbean islands of Puerto Rico and the U.S. Virgin Islands. The taxonomy in the earlier checklists has been revised and now includes 22,006 accepted species. Obvi-

ously the author could not be a specialist on all members of this flora, but he has effectively relied on published literature and on the counsel of a large group of taxonomists who have either reviewed his work or provided original contributions. The taxonomy presented reflects, in addition to the author's insights and decisions, the most recently published studies as well as the opinions of specialists. The synonymy, which probably includes well over 300,000 names, permits the user to find most names that have been used in our flora; even some as yet unpublished names have been included. It is unfortunate, however, that the basis for the taxonomy is not referenced because it would be useful to know whose opinion is being followed. The nearest one can come to determining the authority for a particular taxonomy, therefore, is to check the list of "taxonomic, nomenclatural, and/or phytogeographic data contributors and reviewers" and to infer what input the listed authorities may have had.

Information on the distribution of about 28,000 taxa is given to the state level or its equivalent. For most occurrences some form of documentation is available. For example, when a map is displayed and the cursor is placed on a state or province, a fly-over window displays the documentation. Sometimes this may cite a published flora or monographic study, a reference to a Natural Heritage Program report, or a voucher specimen in an herbarium. Sometimes it simply states "present." A random sample of 50 taxa showed that documentation was provided for about two-thirds of them. In some families, for example the Poaceae, no documentation is provided. This means that user satisfaction will vary depending on the group being queried. In addition to documentation, the states in which a taxon occurs are color-coded to indicate whether it is present, rare, extirpated, or extinct. An interesting feature is the use of cross-hatching to indicate that a taxon's occurrence there is questionable. The inclusion of even unlikely reports will be very useful to the monographer who may wish to follow up every lead. Lists of the phytogeographical literature and periodicals consulted are provided.

The *Synthesis* includes information for each taxon under the headings: major plant group, habit, duration, nativity, weeds and invasive plants, habitat, morphology, trophic level, rarity and endemism, human use plants, toxicity, Native American medicinal uses, plants that attract, and U.S. federal lands. This part of the database is not as complete as those on nomenclature and phy-

togeography. Much of the information seems to have been developed in connection with specific contracts, usually from U.S. federal agencies, and the information is not complete for the entire flora area. Exceptions are rarity and endemism, for which extensive use was made of reports from the Nature Conservancy, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the Canadian rare plants project. Information on Native American medicinal use also is relatively complete inasmuch as it incorporates a two-volume work on the subject (Moerman 1986). But, for example, only a few habitat types are included and no mention is made of weediness in Canada. The section dealing with biological attributes is an interesting addition to the database but is not its major strength.

I found the software to be relatively intuitive to use, and when I was confronted with problems the documentation was thorough and clearly presented. The windows are well arranged and can be easily customized. It is very easy to perform the basic operations of listing taxa in various ways and to relate names to geography. The software also facilitates questioning the data and combining name, geography, and biological attributes in a variety of ways. One can, for example, list all members of a genus for a single state or group of states, or list all taxa for one or more states and provinces. The lists may comprise only accepted scientific names, with or without authority, or may include synonyms (which may be arranged in thesaurus or checklist format) or common names. One can create lists of woody plants, aquatic plants, exotic plants, toxic plants—you name it. The taxonomic and geographic information then can be combined with biological information, for example: all woody taxa used by Native Americans in Ontario. In all cases the lists created can be saved as a file.

From my point of view, the most important shortcoming of the *Synthesis* is that the phytogeographical data are given only to the state/province/territory level. This is a serious problem in western United States, Alaska, and Canada where state-level units are very large and the generalized coloring of these areas does not provide much understanding of distribution. I have been told, however, that the database is now being supplemented with county-level data, where it is available; that will enhance the display of distribution patterns for many regions but it will not do much for northern or western Canada or Alaska, where county-level

subdivisions are lacking. It should be noted, however, that while distribution for the Northwest Territories is displayed by the general coloring of the entire territory, the occurrence of species on each of the islands in the Canadian Arctic Archipelago is documented separately; the new territory of Nunavut is not included. The authors are presently working on the completion of documentation. Even when it is done, however, problems will remain in assessing the distribution of taxa whose circumscriptions have been changed by taxonomic study, or in verifying the identification of range extensions.

Plans for future updates are almost as ambitious as the *Synthesis* itself. It is proposed that future editions will include information on introductions, degree of invasiveness, national endemism, a U.S. national rare plant list, illustrations, expanded morphological categories, a random access (polyclave) key, and much, much more.

Finally, a concern that I would have before purchasing the *Synthesis* is its cost. If purchased directly from the North Carolina Botanical Garden, the price is U.S. $495.00 plus shipping (Canadian $756.00; all sales should include two free upgrades). While I am sure this represents its true value, not many individual botanists will be willing or able to pay this price. However, libraries, governmental agencies, and consulting firms will find it a bargain, for the *Synthesis* is a gold mine of information.

The *Synthesis* is not only a completely synonymized, searchable checklist of the flora of North America, but it can be used to create checklists to suit any need. What is more, the list of accepted names is constantly being revised as new taxonomic studies are published or as volumes of the *Flora of North America* appear in print. In that respect it should be noted that the *Synthesis* is not a substitute for *Flora of North America,* but rather a helpful companion to it. The *Synthesis* does not have keys to genera and species, descriptions, bibliographic citations for names and basionyms, outline maps, or discussion of taxonomic problems; but it does permit the manipulation of names and the linking of information to those names in ways that a hard-copy flora cannot.

For years there has been talk of computerizing taxonomic information. John Kartesz and Chris Meacham, with help from a host of collaborators, have slowly and methodically been doing something about it. The *Synthesis* presents the botanical com-

munity with a very useful, modern botanical tool that integrates nomenclatural, phytogeographic, and biological information in a way that once could only be dreamed about.

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