

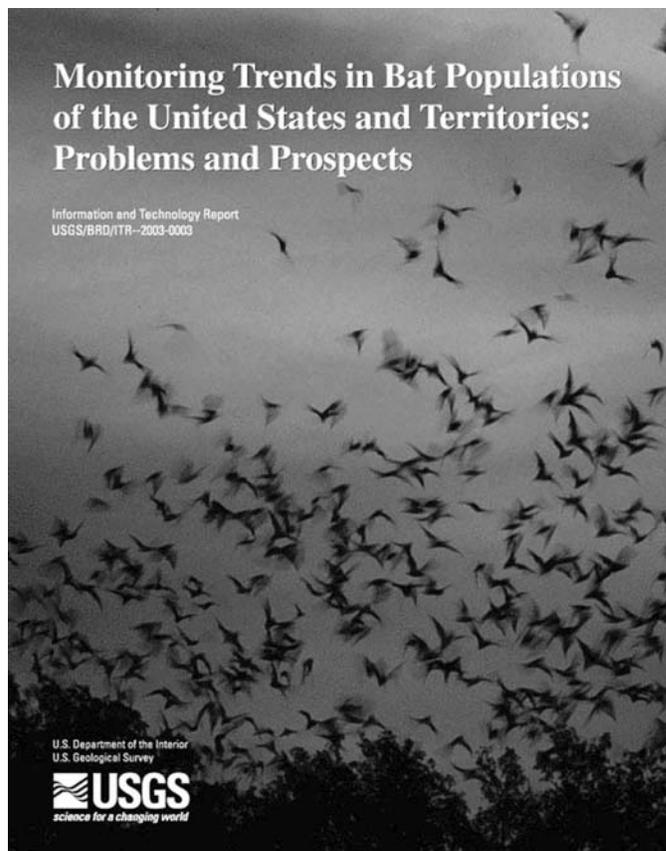
Monitoring Trends in Bat Populations of the United States and Territories: Problems and Prospects

O'Shea, T.J., and Bogan, M.A., eds., U.S. Geological Survey, Biological Resources Discipline, Information and Technology Report, USGS/BRD/ITR-2003-003, 274 p. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (1-800-553-6847) or on the internet at <http://www.fort.usgs.gov/products/publications/21329/21329.asp>. No cost.

Bats are notoriously difficult to census because of their behavioral patterns and nocturnal habits. Many bat species are also widely perceived to be declining in numbers, generally as a result of direct or indirect human impacts. The U.S. Fish and Wildlife Service lists four bat species and five subspecies as endangered, and others are candidates for threatened or endangered status (before USFWS dropped the candidate categories). Most bat species have low reproductive rates, and many tend to congregate in large numbers in relatively few locations, making them vulnerable to decline. For these reasons there is a need for techniques to monitor bat populations reliably and consistently. This collection of papers from the Biological Resources Discipline of USGS provides an excellent review of the historical problems related to monitoring bat populations, the present state of the art, and promising new directions in this field.

This book includes a brief introduction and two major sections. Part I is a collection of papers by recognized experts in the fields of bat ecology and wildlife monitoring techniques. In the first paper, Thomas Kunz provides an excellent review of historical techniques used for censusing bats and discusses many of the problems and biases associated with these techniques. He also describes some of the recent advances in counting techniques, including ultrasonic detection and identification systems and computerized thermal imaging procedures.

The next few papers describe techniques and potential difficulties in counting specific groups of bats in a wide variety of conditions. Brazilian free-tailed bats (*Tadarida brasiliensis*) are generally found in very large colonies in relatively few sites, and Gary McCracken describes several methods for counting this species. Merlin Tuttle describes possible ways of monitoring bat species that hibernate in caves and mines, and he cautions about the various problems and biases that can affect these counts. Foliage-roosting, solitary bats in the genus *Lasiurus* present a different set of monitoring problems and responses to habitat change that are discussed by Timothy Carter, Michael Menzel, and David Saugey. Ruth Uzzurum and three co-authors describe counting methods that have been used with flying foxes in the genus *Pteropus* in U.S. territories in the Mariana Islands and Samoa in the South Pacific, and they report current population trends of these species. Population trends and the current status of the three species of pollinating bats in the southwestern U.S. are the subject of the paper by Theodore Fleming and co-authors. Michael Bogan and co-authors present data on the western bats that use crevices or cavities for roost sites. This group of 25 species is generally underrepresented in counts because of difficulties in locating roosts or observing bats within roosts. Rare bats in the bottomland hardwood forests of the southeast, discussed by Mary Kay Clark, present similar censusing problems. Bat species that use buildings as roost sites pose unusual monitoring conditions, as described by Thomas Kunz and R. Scott Reynolds. The longest paper (109 pages) in Part I is a summary and analysis of the USGS bat population database by Laura Ellison and co-authors. This paper provides a basic description of the data base that is accessible on the internet at



<http://www.fort.usgs.gov/products/data/bpd/bpd.asp>. Bat population trend analyses are provided in 66 pages of tables for all species with adequate counts.

Although the title of the publication specifically refers to bat populations of the U.S. and its territories, Allyson Walsh and co-authors describe the United Kingdom National Bat Monitoring Programme. However, this paper is valuable as a reminder that issues of declining bat populations are not restricted to the United States, and it describes the use of transect and point-count techniques for counting dispersed bats. John Sauer reviews national monitoring programs for other wildlife groups, particularly birds. Although the list of key words for this paper includes "bats," bats are never mentioned elsewhere in the text or abstract of this paper. While Sauer provides a valuable, critical review of the difficulties of monitoring other wildlife groups, he missed the opportunity to relate these observations to the problems presented in monitoring bats.

Part II is a series of reports from a workshop on monitoring bat populations. The major topic areas include: (a) analytical and methodological problems in assessing bat numbers and trends; (b) categorizing bat species, species groups, and regions for priorities in establishing monitoring programs; and (c) a review of existing information and monitoring programs. Each report includes an issue description and rationale, and means to resolve the critical uncertainties surrounding the issue.

Five major conclusions and recommendations are drawn from the workshop reports: (1) the natural history of bats poses many challenges to population monitoring; (2) major improvements are needed in methods of estimating numbers of bats; (3) objectives and priori-

ties of bat population monitoring need careful consideration; (4) monitoring bat populations on a broad scale will require strong commitment and well-planned sampling designs; and (5) information exchange among bat specialists should be enhanced.

In conclusion, this book provides a valuable resource covering a wide range of bat species and monitoring issues. I recommend it highly for anyone engaged in bat monitoring or having an interest in this field.

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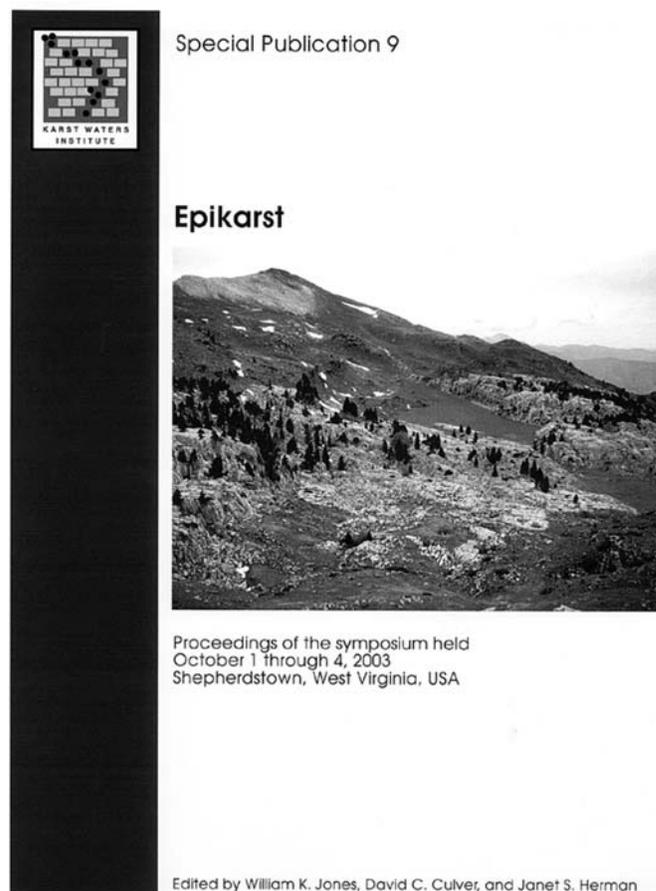
EPIKARST

William Jones, David Culver, and Janet Herman, eds., Karst Waters Institute Special Publication 9 (2004). Charles Town, WV, 160 p. soft-bound. ISBN 0-9640258-8-4. \$32 (US) plus shipping. Order on-line at <http://www.karstwaters.org>, or from Publication Sales, c/o E.L. White, 4538 Miller Rd., Petersburg, PA 16669-9211, publications@karstwaters.org.

Epikarst: Special Publication 9 of the Karst Waters Institute includes the proceedings of a four-day meeting held in Shepherdstown, WV, in October 2003. The meeting brought together an interdisciplinary group of hydrologists, biologists, and geoscientists in an effort to better understand and define epikarst. In any other terrain the “epikarst” might simply be described as the regolith: the weathered top of the rock zone. However, in karst this weathered bedrock zone takes on a special meaning. Hydrologically, the epikarst often represents an upper water-bearing zone (the subcutaneous zone), which may be linked to solutionally enlarged fissures and conduits below. Its boundaries were not well defined or agreed upon either before or after the meeting. The result is a publication unlike any of its kind: a collection of papers that addresses the unique hydrologic, geomorphic, and ecologic characteristics of the epikarst. Applied hydrogeologists and ecologists who are interested in karst systems will find this collection of papers to be an invaluable resource.

The meeting proceedings include 21 technical papers, bounded by an editor’s introduction and conclusion, and tied together by a common theme: describing the epikarst in the hope of better defining it. The authors represent eight countries, and include some of the world authorities on the topic. Papers describe a number of field sites across the globe, while others are strictly process-based. The text is well organized, beginning with two papers that define the nature of the epikarst zone. Interestingly, several of the papers begin with their own description of the epikarstic zone, all of which are slightly different! Topics address the geochemical evolution and characterization of epikarstic waters, application of stable isotopes, role of contaminant storage and transport, on-site wastewater technologies, and the geomorphic evolution of epikarst. Several papers consider the biota and ecology of the epikarst, with special emphasis on cave drip-water pools supplied by epikarst drainage. All papers are in English, are concise, and appear to be well written and edited. The many photos and diagrams are clear, though some show the fuzziness of being scanned. All photos and graphics are in black and white, with the exception of a series of color graphs linked to one paper.

The editors, who also served as the meeting organizers, hoped to revise the definition of epikarst, stressing that a “common vocabulary, starting with a common definition, is a strong starting point for improved communication across disciplines.” An initial working def-



inition presented before the meeting takes on a longer, more complex character after four days. Clearly this is the result of the many specialists and their unique perspectives from diverse fields. An interesting addition to these proceedings is an informal round-table discussion that seeks a refined definition of the epikarst taken after all of the paper presentations. For those who know little about the epikarst, this may be a good starting point.

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