



The Caves of Burnsville Cove, Virginia: Fifty Years of Exploration and Science

William B. White, Editor, 2015. Springer, Cham, Switzerland, 479 p., 7.8 × 10.2 inches, ISBN 978-3-319-14390-3; hardbound \$159.99, softbound \$149.99; ISBN 978-3-319-38544-0; e-book \$109.00, ISBN 978-3-319-14391-0.

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Burnsville Cove is a small limestone valley in west-central Virginia, at the border of Highland and Bath Counties. It occupies an area of approximately 50 km² and as of 2013 it contained 97 surveyed caves with a total combined length of more than 112 km. Three caves are more than 10 km long: Butler-Sinking Creek System, Chestnut Ridge Cave System, and Helictite Cave. For more than 40 years the caves in the cove have been explored and mapped by cavers of the Butler Cave Conservation Society, many of whom live in the area and own property there. This is their story, assembled and edited by William B. White, who has done a remarkable job of bringing together the stories of exploration and many scientific studies in Burnsville Cove.

This book presents a detailed summary of the exploration history of the caves, maps and descriptions of the cave passages, and the scientific research produced in the Cove over the last 60 years. Roughly half of the book (11 of 24 chapters) is devoted to exploration, which rightly begins with Breathing Cave, a classic maze cave (9914 m long as of 2013), the only large cave known in the cove prior to 1958. Exploration and surveying began in the 1940s, with major discoveries found in the late 1950s. Its geology and development were the subjects of one of the earliest cave geology theses, written by George Deike, then a graduate student at the University of Missouri. Chapter 18 contains a compressed version of this pioneering study. Butler Cave, discovered in 1958, figured more prominently in both the history of the Butler Cave Conservation Society and the developing understanding of the caves and their hydrology. Butler Cave itself is much more linear than Breathing Cave, and consists of a major trunk passage containing an underground stream, which follows the axis of a syncline.

The exploration of all of the major caves, and some of the minor ones found after the discovery of Butler Cave, are chronicled. For many of the caves, the stories of exploration and major discoveries follow in roughly chronological order. Especially informative and riveting is Gregg Clemmer's description of the initial exploration of the Chestnut Ridge System (nearly 34 km as of 2008) and the value of persistence in exploration. The difficulty of the cave made multi-day trips the norm, and a short description of the techniques used is included. Many of the cave entrances in Burnsville Cove were accessible only by digging, and nowhere was this more the case than in Barberry Cave, where three entrances were excavated, including construction of a 20 m deep shaft – Big Bucks Pit. In a trip-by-trip account, even more detail is provided by Lucas for several caves, including Helictite Cave (11.7 km long as of 2008). How useful such details are, for readers interested in topics beyond exploration, remains to be seen; but taken together, the eleven exploration chapters compose a remarkable chronicle.

An interesting aspect of Burnsville Cove is the large number of cavers who have moved there, which led to the founding of the Butler Cave Conservation Society in 1968, with the initial goal of managing and conserving the Butler Cave Sinking Creek System. A chapter by Fred Wefer and Keith Wheeland outlines its history. Membership in the BCCS is by invitation, and it is arguably the most exclusive caver organization in the USA. In a separate publication, Maria Pérez and John Wilson (2019) use BCCS as an example of what they call "caver villages" and explore their sociological aspects. One of the important activities of BCCS is land acquisition, as described in a chapter by Wheeland. BCCS owns a 25 hectare parcel of land that contains the only known entrance to Butler Cave, as well as a 33 hectare parcel containing one of the entrances to the Chestnut Ridge System. Other parcels are owned by individual BCCS members. The Society has been fortunate in that the land has clearly been purchased both to maintain access and to

protect the land. These two goals can come into conflict, as in the case for bat protection, but in Burnsville Cove there has no such conflict.

The remaining ten chapters are devoted to scientific studies in Burnsville Cove. An overview covers a range of topics not included in the other chapters. There are five chapters on geology, and one each on hydrogeology, meteorology, mineralogy and geomorphic evolution. It is important to keep in mind that all of this research was done without the benefit of government funding. This was not by choice, although such a choice would have been made by some authors; but it was a necessity based on the general lack of respect given to speleological studies of any kind. White reviews a number of interesting scientific topics that arose from exploration of the Burnsville Cove caves. Among them are paleoclimate, the origin of moonmilk, and the cause of the “breathing” phenomenon in certain caves, which was investigated using reversing fans at entrances. Noticeably absent is any discussion of biology, beyond the sentence that dismisses Burnsville Cove as not being a biological hotspot. This is in part because no BCCS members have a strong interest in the topic, and because the fauna appears to be rather depauperate. Nonetheless, there are cave-limited species, including the amphipod *Stygobromus conradi*, whose type locality is Breathing Cave.

One important fact that emerges from this study is that the caves are developed in the Silurian Tonoloway Limestone rather than the Silurian-Devonian Keyser Limestone, as was thought to have been the case for decades.

Nevin Davis provides a thorough review of the hydrogeology of the cove, and delineates the four major subsurface basins. These included some of the earliest systematic tracer tests conducted in the USA. Although a bit difficult to read, it is the best overview map in the book, as it also includes line drawings of the major caves. His map of the drainage basins is also reproduced in the supplemental material available at the publicly available website (extra.springer.com).

The chapter on meteorology, by Fred Wefer and Phil Lucas, is one where the absence of modern data and equipment is most apparent. The description of temperature variability is fine, but it was done in the absence of data-loggers such as those now available (e.g., the ubiquitous Hobo™ instruments), which were not available at the time.

The chapter on minerals and speleothems is especially good, reflecting White’s long-standing interest in the topic. The final chapter on geomorphic evolution of the cove is very thought provoking, and White includes the recent ideas on deep-seated phreatic origin of the system, as developed by Dan Doctor and Benjamin Schwartz.

This volume is perhaps the most comprehensive study of any limestone cave system. However, I have one overall criticism, that of the quality of maps. The copious use of original cave maps adds a great deal, but historical accuracy would not have been compromised by the inclusion of area maps. This is especially true in introductory chapters where there is over-use of poorly reproduced topographic maps lacking annotation. Wonderful digital maps are available these days, but do not appear in this volume. Nevertheless, it is a remarkable publication and belongs on your bookshelf, notwithstanding its high price.

This is among the first volumes in the series of books on Cave and Karst Systems of the World, edited by James Lamoreaux, and the first one about a U.S. cave system. While the price is high, the series does make literature on cave exploration and research more readily available, at least for those with access to a research library. PDFs of individual chapters can be also be purchased at the Springer website.

References:

- Pérez, M.A., and J.M. Wilson 2019, Caver communities and organizations: cultural and historical considerations, p. 260-266. In W.B. White, D.C. Culver, and T. Pipan, 2019, *Encyclopedia of Caves*, 3rd edition, Academic/Elsevier, Amsterdam.