

## Alluvial Geoarchaeology: Floodplain Archaeology and Environmental Change Cambridge Manuals in Archaeology

By A.G. Brown

Cambridge University Press, England, UK  
1997, 377 p.

ISBN 0-521-56097-7 £65.00 hardcover

ISBN 0-521-56820-X £22.95 paperback

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People have always lived near rivers and along river valleys because they provide many of life's essentials: a reliable water supply, food, fuel, building and tool-making materials, and transportation routes. As Ratty says in *The Wind in the Willows*, he lives "By [the river] and with it and on it and in it. ... It's brother and sister to me, and aunts, and company, and food and drink, and (naturally) washing." Not surprisingly then, in many places archaeology revolves around rivers and floodplains. As such, an understanding of how rivers work is fundamental to the interpretation of the archaeological record. In this wide-ranging and detailed review, Brown surveys the study of alluvial sediments and fluvial processes as they relate to archaeology, a topic he defines as alluvial geoarchaeology. He has compiled a scholarly synthesis of a broad array of work from several disciplinary areas including fluvial sedimentology, geomorphology, paleoecology, and geoarchaeology. His focus is on the biophysical characteristics that make alluvial environments distinctive. Brown is concerned with the effect of alluvial processes on the archaeological record, the impact of environmental change in alluvial environments, and the influence of these changes on human populations. While trying to avoid a determinist viewpoint, Brown examines the interaction between climate and cultural signals.

Following a short preface, acknowledgments, and an introduction,

which focusses on the River Nile, Brown's book is divided into two parts (Part I, Principles; Part II, Applications) followed by three short Appendices ("River flow and sediment transport," "Flood frequency analysis," "Documentary evidence and wetland perceptions"). An extensive 33-page reference list and two indexes, subjects, and sites and rivers, follow the discussion.

Part I consists of four chapters.

These cover "Floodplain evolution."

"Alluvial environments over time,"

"Interpreting floodplain sediments and soils," and "Floodplain ecology, archaeobotany and archaeozoology." This segment deals with "physical and biological processes of alluvial environments that affect the formation, survival and bias of archaeological evidence from alluvial sites" (p. 3). Brown introduces the structure and composition of the floodplain, reviewing the characteristics of rivers and fluvial processes. Perhaps more than in other landscape settings, artifacts in river valleys can undergo transport and deposition. Thus, an understanding of how river processes influence taphonomy may be critical to evaluating the age and significance of artifacts. Alluvial sediments also preserve other materials, such as pollen and plant remains, that can provide a context for the archaeological record. Brown views the floodplain as the container of the river's history (p. 17). Waterlogging and burial in the floodplain can also preserve archaeological materials. Hence alluvial geoarchaeology has a role to play in cultural resource management (p. 44).

Part II contains six chapters dealing with "Artifacts from floodplains and rivers," "The rise and fall of forested floodplains of North-West Europe," "Buried sites," "Managed floodplains," "The cultural archaeology of floodplains," and "People, floodplains and environmental change." Here, Brown's focus is on "relationships between human activity and the alluvial environment" (p. 4), particularly when investigating the "memory" of sediments as preservation locales (p. 2). Throughout these chapters, a pervasive theme is the impact of human modification on the river system affecting flow regimes and sediment supply. Because of alluviation and channel migration, archaeological sites are often

buried, and may be revealed by a later episode of erosion or by human activity. Alluviation may be linked with land use changes in the catchment. Brown notes episodes of increased alluviation in Britain in the Late Holocene, such as during the Roman occupation when river management began (p. 226). Purposeful modification of the fluvial system, through irrigation, channel modification, and flood control measures, are perhaps the most obvious human impact on rivers.

Why do people live on floodplains despite their hazards? In the last two chapters, Brown's focus shifts from biophysical aspects of floodplains to cultural, social, and economic factors. Like Ratty, Brown points out that floodplains offer diverse food resources, such as plants, fish, and waterfowl, often within a relatively small compass (p. 282-284). In many cases, these resources are both dependable and abundant. Against this, we may set the dangers of floodplain living, in particular, the destruction wrought by floods. Brown briefly reviews some conceptual approaches to the analysis of human response to flooding.

Brown chooses to frame his discussion primarily through detailed case studies. For archaeology, he chooses sites where "interpretation has involved an element ... of the reconstruction of a fluvial palaeoenvironment from stratigraphic evidence" (p. 5). Although there are nods to other areas, such as Australia (p. 184-189), Brown draws his examples primarily from northwest Europe, and mainly from England, especially from the major and well-studied river systems of the Thames and Severn. The development of terrace sequences, for example, is mostly discussed with respect to the Thames valley (p. 150-167). As such, he is dealing with places that have a long record of human occupation and where there is a long history of landscape modification through agriculture, deforestation, and deliberate engineering. Indeed, Brown comments on the interconnectedness of climate and landuse factors (p. 235), and the difficulties of disentangling these signals in the sedimentary record. Nevertheless, he believes that "most floodplains are ... artifacts of human activity" (p. xxi) because "the vast majority, if not all, contemporary

floodplains have to a greater or lesser degree been altered by human activity during the last 10,000 years" (p. 1).

Brown emphasizes that the relative strength of the cultural and climatic signals in alluvial sediments varies with time and place. As he remarks, "ever since there has been *any* human impact on vegetation there has been *some* human impact on catchment hydrology and sediment yield" (p. 313). Hence the alluvial record can be viewed "as being the *product* of climate as modified by human alterations of catchment characteristics and human land use" (p. 313). At least for the UK, "in the Mesolithic it might be accurate to regard the alluvial record as essentially a climatic signal blurred by human impact, by historical times it can be argued ... that we have a land use signal blurred by climatic variation" (p. 313). In this regard, Canadian rivers would provide an interesting contrast to the majority of examples that Brown discusses. Here, I suspect that most of the postglacial fluvial sedimentary record reflects climate and environmental factors, with the main anthropogenic impact on river systems occurring only in the last few centuries following European incursion.

Brown's examples are drawn mostly from temperate rivers that rarely experience winter freeze-up. For Canadians, the lack of consideration of winter conditions and processes connected with river ice is a significant omission. The coverage does not include lakes, which often form part of the river network, especially in glaciated areas. The discussion of the activity of beavers (p. 113-114) would have benefitted from more attention to the North American literature. Overall, I found his discussion uneven when he was dealing with North American examples, perhaps because he is not as conversant with the area and the literature. Because of the book's geographic focus, readers will need to be familiar with the terminology of British and European glacial/interglacial sequences and the broad chronology of human history and archaeology.

I did notice a few slips in the text. Canadians may be startled to find the Oldman River transposed to the "mountainous and semi-arid areas of the USA" (p. 36). I was intrigued to learn that

North American floodplains are "cleared and tamed" (p. 112), which is not a description I would apply to most of the river valleys in northern Alberta! "Palaeolithic hand-axes" (p. 92) are not a component of North American lithic assemblages. Some complicated diagrams are reduced to such a small size that they are practically illegible (p. 90) and some diagrams reproduced from other sources lack supporting information, such as legends (p. 220). As a Canadian, I was irritated that Brown's definition of North America (p. 167) consists only of the lower 48 United States.

This is not a book for the faint-hearted. It is not an introductory text, nor is it a "how-to" book. Although there is some explanatory material, Brown presupposes a good deal of background knowledge of fluvial processes and vocabulary of archaeological and historical events. The many terms and site names in the text would, I suspect, confound an introductory student. Researchers contemplating studies in alluvial settings will have to look elsewhere for detailed methodologies. Similarly, readers wanting to work with environmental indicators, such as pollen, plant macroremains, molluscs, and insects (p. 134-145), will need to turn to more specialized texts. This book will mainly be of value to graduate students and professionals working in geoarchaeology. Other Quaternary geoscientists will also find it useful for broadening their perspective on alluvial sediments.

Brown has a pleasant, literate writing style with occasional excursions into humour. Reading this book is therefore a pleasure rather than a chore. This is a considerable achievement given the complexity of the subject matter. My brief review does not really do justice to the book. I found it interesting, well written, and informative. Despite its British focus, I can certainly recommend it to Canadian readers.

## The Diatoms: Applications for the Environmental and Earth Sciences

Edited by Eugene F. Stoermer and John P. Smol

Cambridge University Press  
1999, reprinted 2000, 469 p.  
US\$115.00, hardcover  
ISBN 0-521-58281-4

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Can it be true that diatoms make up 25% of the earth's biomass? Are diatoms present in almost all aquatic environments, globally numbering in excess of  $10^4$  species or even  $10^5$  species? Can diatoms be found in the wind, in the rain, in moss, and close to our very core, within the human lungs?! Apparently so, and their sensitivity to specific physical, chemical, and biological conditions makes them one of the most useful organisms on earth for assessing environmental change.

Editors Gene Stoermer (University of Michigan, Ann Arbor) and John Smol (Queen's University, Kingston) have collated 22 review papers of varying lengths aimed at summarizing the main applications and uses of diatoms within the environmental and earth sciences. This book is essentially global in coverage and is packed with 100's of references to studies providing summaries of methodologies, concepts of project design, and environmental interpretations based on diatoms. The Canadian reader will definitely feel at home, with 7 of the 38 contributors being Canadian, thus providing extensive coverage on diatom applications in many areas that are important to Canada such as the Great Lakes, Arctic ponds, estuaries, coastal environments, and lakes, streams, and rivers of the continental interior. Topics of enduring interest, such as acid rain, tree lines, water quality, and water level change are given thorough coverage.

The main emphasis of this book is clearly focused on the use of diatoms to