

APRIL  
2005  
VOL. 46

new technology, and new ways of living were required to conquer the arid West” (p. xvi); (2) “water projects were the product of an elite group with a strong interest in construction” (p. xvii); and (3) “the California experience . . . is typical of conflicts over water use in the West” (p. xix). But he does not really challenge any of these views. To counter the aridity thesis or the generalizability of California’s experience with water development, Kupel would need to construct a comparative structure. Donald Pisani and Donald Jackson, among others, have challenged the water elite thesis, and Kupel’s broad claim that Arizona’s history reflects public aspirations for development adds little. Actually, the structure of *Fuel for Growth* is inadequate to sustain a historiographic perspective. While Kupel demonstrates knowledge of western water history in the preface and conclusion, the book as a whole does not engage significant questions in the literature.

Overall, the narratives of water development in Phoenix, Tucson, and Flagstaff are the strongest aspects of *Fuel for Growth*, and this book will be most important for scholars with particular interest in these stories. *Border Oasis* should appeal to a broader audience, for Ward does an admirable job of telling a complex story about the politics of technological and environmental change.

KARIN ELLISON

Karin Ellison holds a Ph.D. from the Program in Science, Technology and Society at the Massachusetts Institute of Technology. Her interests include multiple-purpose river development, the environmental history of nuclear technologies, and federal regulation of scientific research.

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### **The Rhine: An Eco-Biography, 1815–2000.**

By Mark Cioc. Seattle: University of Washington Press, 2002. Pp. xiii+263. \$29.95.

Probably no river in the world has engendered such a flood of books, reports, poetry, songs, and works of art as the Rhine. As Western Europe’s premier river; as real and imagined frontier between principalities, nations, and empires; as military barrier; and as corridor of civilization and commerce, the Rhine has been a perennial object of mythical, aesthetic, scholarly, and practical reflection since Roman times. It might seem that nothing remains to be said, but Mark Cioc’s “eco-biography” of this great river proves otherwise.

This is the first comprehensive account of the fate of the Rhine at the prolix hands of modernity. After an initial chapter describing the physical features of the Rhine watershed and the river’s annual flow-regime, Cioc goes on to detail the process by which the river has been gradually transformed from a braided, island-ridden, flood-prone, fish-rich, biodiverse, marshy, and unpredictable natural stream into a straightened, confined,

controlled, polluted, bridged, dammed, urbanized, and industrialized corridor of modernity. He takes a generous view of environmental history and in successive chapters shows how river engineering, coal and steel production, and finally the chemical and hydroelectric industries all contributed to destroying the Rhine as past generations knew it. The final two chapters are devoted to making up the ecological balance in terms of the loss of biodiversity and to an account of efforts undertaken since the 1970s to restore the Rhine to a semblance of its preindustrial self.

This is an impressive book. Cioc provides rich technical and historical detail on all facets of the Rhine's ecological demise: river engineering, flood control, shipping, coal mining, steelmaking, the chemical industry and its effluents, sewage treatment, riverine ecosystems, hydroelectricity, and even fish ladders. The third and fourth chapters are especially compelling, perhaps because the focus on specific projects and geographical sites allows for a more narrative style. In chapter 3 Cioc describes the nineteenth-century reengineering of the river at the behest of different German riparian powers: first Johann Gottfried Tulla's "improvement" of the upper Rhine for purposes of flood control and land reclamation, then Eduard Adolph Nobiling's projects on the middle Rhine aimed at facilitating navigation, especially through the "romantic" Rhine gorge between Mainz and Bonn. Chapter 4 is about the advent of coal mining and steel production on the Rhine and its ramified environmental effects. Here, in a pathbreaking account, Cioc zooms in on the hydrological reconstruction of the Westphalian coal and steel region by coalitions of industry and local government. The requirements of industries and municipalities were met by dint of a constructed division of labor among the three Rhine tributaries flowing through the region: the Ruhr became a freshwater conduit, the Lippe a feeder for canals, and the Emscher was transformed into the common sewer. Though this solved the problems of water supply and disposal in the Ruhr region it did nothing for pollution on the lower Rhine, which was regarded by German industrialists (wrongly, as the downstream Dutch ceaselessly insisted) as an inexhaustible "ultimate sink."

The enormity of Cioc's topic—spanning nearly two hundred years of very eventful European history, more than 700 miles of river, and four riparian nations—has inevitably entailed some serious corner-cutting. One of the less felicitous shortcuts is the unreflexive use of an assumed "natural state" of the river as a benchmark for calibrating degrees of ecological damage, a strategy questioned by Richard White in his influential book on the Columbia River. This recourse to "nature" is well institutionalized in environmentalist politics and management, but it fails to do justice to the Rhine's protean history as a true "organic machine," or even to the "ecological" aspects of that history. The upshot is that Cioc's account, especially in its later chapters, sometimes reverts to inventories of injuries done to the

APRIL  
2005  
VOL. 46

river and their effects on its biological communities and the chemistry of its waters, as if these were self-evident facts—in particular, self-evident to the historical actors.

It may well be the case that aside from a few visionaries like Robert Lauterborn (or Jacques P. Thijsse in the Netherlands) ecological concerns were hardly foremost in the minds of the victims and even of vocal opponents of riverine modernization. Economic and public-health problems like dwindling fish stocks and the quality of industrial and drinking water, as Cioc also notes, were the preeminent issues until the 1980s. In short, framing the ongoing struggle over the “development” of the Rhine exclusively in terms of an ecological drama can obscure ecological histories, as well as reveal them.

These quibbles should not be allowed to obscure this book’s impressive achievement. It is erudite, well-written, and informatively illustrated, and it will unquestionably serve for years to come as an obligatory point of departure for further research into the environmental dimensions of the Rhine’s turbulent history.

CORNELIS DISCO

Cornelis Disco, who teaches at the Center for Studies of Science and Technology at the University of Twente in the Netherlands, is currently working on a book detailing the coconstruction of the Rhine and its cities.

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### **Empty Pastures: Confined Animals and the Transformation of the Rural Landscape.**

By Terence J. Centner. Champaign: University of Illinois Press, 2004. Pp. 189. \$35.

This concise, hard-hitting book addresses the effect of industrial agriculture on the American rural landscape. But unlike Ingeborg Boyens, who documents the agricultural malaise in Canada in *Another Season’s Promise* (2001), Terence Centner is more concerned with those changes in agricultural production that influence public issues such as water and air quality and soil fertility.

Centner argues that agricultural specialization, especially monoculture and the intensive confinement of animals, creates serious socioeconomic and environmental problems. Vertically integrated corporate structures, with their emphasis on specialization, are undermining the traditional rural order and exacerbating environmental concerns. Animal waste disposal and practices associated with concentrated animal feeding operations are contributing to water, air, and soil pollution. Interestingly, Centner does not lay the entire blame on corporate agriculture. The privileged position occupied by agriculture has obscured the fact that farmers have not always been the best stewards of the land. Centner sees a worsening situation, as