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Review of *Groundwater Exploitation in the High Plains* by David E. Kromm and Stephen E. White

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Groundwater Exploitation in the High Plains. David E. Kromm and Stephen E. White, eds. Lawrence, KS: University Press of Kansas, 1992. xiv + 240 pp. Maps, tables, photos, and references. \$27.50 cloth.

This volume focuses on irrigation water use, specifically the history of groundwater development and use, i.e. its "exploitation," on the High Plains. Starting in the southern part of the High Plains in the 1930s groundwater irrigation moved rapidly northward through western Oklahoma, western Kansas and into much of Nebraska after World War II. Rocks of different ages in the High Plains comprise the aquifer popularly known as the Ogallala Aquifer but is more appropriately called the High Plains Aquifer by the U.S. Geological Survey. Depletion of the aquifer as indicated by water-level declines, greatest in the drier southern and western High Plains, has generated a lot of attention and local, regional, and national concern. Use and overuse of water as perceived by some has or will result in adverse socio-economic and environmental impacts. Several of the eleven authors of this book present a rather gloomy future for most of the High Plains. That prospect is tempered as other authors examine technological and management techniques that might significantly reduce adverse impacts.

Editors Kromm and White contribute three chapters and their nine colleagues author an additional eight. Each author provides a long and valu-

able list of references; tables, photos, maps, and figures are used widely throughout the text. The quality of the illustrations is excellent except for three maps that appear to have suffered in reduction.

In the preface and elsewhere, the authors stress the important differences in hydrologic conditions, as well as differences in legal systems, institutional arrangements, economic constraints, and attitudes that prevail throughout the High Plains.

The descriptions of the High Plains and its water problems by Kromm and White are adequate considering the limitation of twenty pages or so of text allotted to each author to address complex issues. Physical, demographic, water-use trends and problems related to quantity and quality are discussed. One of the problems facing the authors and others is that of obtaining reliable historical or current data on irrigated acres. Their source for the period 1959-1987 from the U.S. Census of Agriculture indicates that 10,394,424 acres were irrigated in 1987 in the High Plains. Other sources suggest that figure is low. Kromm and White state that irrigated acres continue to decline and that a 19% reduction in acres irrigated occurred from 1978-1987. However, the figures may reflect less dependence on irrigation during the wet period of 1983-1987. Some reduction in irrigated acres did occur to the south in recent years; however, in Nebraska and elsewhere since 1987 irrigated acres have increased. One unfortunate error is the misinterpretation of the hydrologic term "specific yield" by suggesting that only 15% (the specific yield of the aquifer) of the *water* in the aquifer can be recovered. Actually, depending upon economics, much of the water can be recovered—85% of the aquifer is rock matrix.

In a chapter on the history of irrigation technology, Donald E. Green does not mention the development of the reverse hydraulic rotary machine in the 1940s and the impact of the technology on water use. Green indicates a lack of faith in technology being able to address problems. On the other hand, J. T. Musick and B. A. Stewart describe the emerging technological advances in irrigation and suggest a note of optimism for the future. Rebecca S. Roberts in a clearly written, well researched and illustrated chapter reviews differing approaches to groundwater management in the region. She takes a somewhat philosophical approach to management and interjects a note of optimism: "Communities have the potential, although not all will choose to exercise it, to resolve the difficulties of the commons."

Otis W. Templar addressed the very complex subject of water law concisely and objectively. M. Duane Nellis describes how remote sensing and Geographical Information Systems can provide water-resource information to decision makers. He rejects, unfortunately in my view, the value of meters and

some other methods of collecting data on water use and quality as impractical because of operator resistance.

Wayne A. Bossert (northwestern Kansas), Steve Gaul (Nebraska Sandhills), and Lloyd V. Urban (Texas High Plains) present insightful discussions of groundwater management in their respective subject areas. Issues are fairly represented and each writes of a growing citizen awareness of problems as an optimistic note for the future.

In the foreword to the book, Gilbert F. White suggests that the editors and their colleagues have provided insight that "can help fashion a truly sustainable human occupancy of the High Plains." He cautions that such sustainability will also involve consideration of related dryland use and climate integrated with resources in adjoining regions. He also suggests that these concepts apply in achieving a balance not only in the High Plains but elsewhere in the world as well. **Vincent H. Dreeszen**, *Conservation and Survey Division, University of Nebraska-Lincoln*.