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## Mohamed T. El-Ashry and Diana C. Gibbons eds., *Water and Arid Lands of the Western United States*

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catered to local and regional water nuances.

Chapter seven, *The Cost of Water: Cash, Commodities and Capitalism*, explains how water scarcity and antiquated water infrastructure have contributed to the rise of water as a commodity in the twenty-first century. Due to increasing demand for water, overused supply, and the high costs of replacing infrastructure, Marks concludes that the price of water will continue to rise into the near future. Because of a widespread belief that water is a readily accessible, reusable resource, the price Americans are willing to pay for water is often below its true value. Finally, to demonstrate how individuals profit from the demand for water (especially during times of shortage), Marks examines T. Boone Pickens' plan to sell billions of gallons of his underground "Mesa Water" throughout the Texas Panhandle.

In chapter eight, *Can Our Water Be Saved?* Marks concludes that humans must realize the limited nature of water and change their water use habits accordingly. For example, Marks suggests that states should: use water more efficiently; limit non-priority uses such as lawn watering; collectively manage groundwater and surface water; capture storm water and allow it to replenish aquifers; and include environmental costs in the price of water. In order to improve water conservation, Marks urges readers to only use "what is necessary." Finally, Marks highlights the pervasive problems of non-point source pollution and suggests how utilizing porous driving surfaces and changing drainage approaches can help ameliorate it.

In essence, *Aqua Shock* provides a readable overview of critical issues relating to water in the United States and elicits the need to find common ground solutions that better preserve and protect the resource. Anyone looking for an informative, entry-level narrative should consider reading this book because it explains the current hydrological predicament in the United States and provides some solutions readers can engage in to help relieve some of the problems. Alternatively, experienced water law practitioners and advanced water scholars may find this book remedial and less beneficial because the author wrote the book for inexperienced water practitioners and individuals interested in water regulation and reform.

*Todd Likman*

**Mohamed T. El-Ashry and Diana C. Gibbons eds., *Water and Arid Lands of the Western United States*, Cambridge University Press, New York (2009); 415 pp.; \$55.00; ISBN 978-0-521-11822-4; paperback.**

Cambridge University Press released *Water and Arid Lands of the Western United States*, a compilation of essays edited by Mohamed T. El-Ashry and Diana Gibbons, in paperback. This volume investigates agricultural and municipal demands on water supplies and water management in the American West. The editors chose the essays to show how the West can avoid expensive supply-side projects and

subsidies by controlling demand and relocating existing water supplies, all while improving environmental quality.

Chapter One, *The West in Profile*, written by the collection's editors, outlines the geography of the West and describes where the West's waters originate. The editors summarize Western water legislation, including the compromises states have struck for sharing water sources. The chapter explains the factors that influence Western water demand. First, the editors argue that municipalities' pricing practices create no incentive to conserve water in the long-term. Next, the editors note that irrigated agriculture obtains water from state or federal water projects subsidized by taxpayers. The editors argue that taxpayer subsidies for projects that bring water to irrigated agriculture create another disincentive to water conservation; however, increasing costs of water procurement negates this disincentive by increasing costs of water procurement. Finally, the editors report that modern agriculture's pesticides and salts degrade the water run-off from crops. The editors argue that regulators should impose fines upon water users responsible for this degradation and that the regulators adopt a comprehensive water quality management scheme.

Chapter Two, *The Great American Desert Transformed: Aridity, Exploitation, and Imperialism in the Making of the Modern American West*, by Norris Hundley, Jr., focuses on the history of Western settlement. Hundley cites four interrelated stages of development and traces water-use and/or policy in each stage. First, from the 1840s to 1900, the government encouraged private interests to exploit the region's natural resources with low-cost development projects. During this period, Western states developed their water laws. Most states abandoned the East's riparian laws in favor of a new priority-based system borrowed from mining regulations. Second, from 1900-1940, the government developed more efficient ways to extract the region's resources while investing in infrastructure and fostering local manufacturing and labor. At this point, scientific advances in farming and irrigation, as well as in mining practices, increased the demand for water, as did the growing Western population. Third, from 1941 to the 1960s, government funding, especially for war-related industries, increased Westerners' dependence on Washington, D.C. Government funding also intensified resource development, industrial growth, and infrastructure-creation. During this time-period, huge public projects dammed rivers to provide electricity, increasing pressures on Western cities to find water sources for their growing populations. States also battled for control of river water, especially that of the Colorado River. As a result of one of these battles, the United States Supreme Court in *Arizona v. California*, 373 U.S. 546 (1963), held that Congress has ultimate authority over interstate rivers. Hundley's fourth category, the period from the 1960s to the present, signals an era where people are aware of the cost of past policies of use and growth—for example, air and water pollution and loss of wilderness. Pressure for massive new water projects subsided in the 1980s as costs soared and the West's population-growth rate decreased. However, Hundley argues that the

West must abandon past attitudes and find new approaches to water management in the face of legal uncertainties and jurisdictional confusion amongst water management agencies.

Chapter Three, *The Central Valley of California*, by Charles V. Moore and Richard E. Howitt, provides an overview of economic development, including water management and water legislation, in California's Central Valley. Moore and Howitt predict that California's water institutions are about to change substantially. Historically, water costs and use followed two phases of development: the local development era (1887-1935) and the governmental development era (1935-1985). During the local development era, the water district—a public corporation organized under general state laws to provide irrigation water for lands within its boundaries—developed and sold water. The state entered water development planning more directly when someone published a privately drawn water plan for the valley in 1920. In 1931, California's state engineer achieved the same results through a private plan, and, after the Depression, the United States Bureau of Reclamation took it over. The resulting federal project, known as the Central Valley Project (CVP), made long-distance water transfers the normal procedure. During the era of governmental development, water districts—both those for irrigation and those for municipalities—had to unite to obtain water service.

By 1960, California's government re-emerged as a water manager with the State Water Project (SWP). Under this project, the government moved more water south, at a higher cost due to a difference in water pricing to SWP contractors. Because of complex legislation, local water districts continue to govern groundwater use. Moore and Howitt list current problems for irrigated agriculture in the Central Valley: urban growth, over-drafted groundwater due to pumping, and decreasing water quality. The authors suggest that alternative policy solutions, including reallocating existing supplies and/or changing technology to adjust the supply-demand imbalance could resolve these problems. The authors, recognizing the bureaucratic resistance such solutions face, propose the creation of markets to effectuate transfers of low-value water areas. The idea is to use water districts as providers of information and impartial brokers for existing supplies, rather than as providers, builders, and allocators of new supplies.

Chapter Four, *Land and Water Management Issues: Texas High Plains*, by Ronald D. Lacewell and John G. Lee, discusses the implications of aquifer mining through a case study of Texas' High Plains region. The authors discuss the impact of aquifer mining on agriculture and soil erosion and present policy options they hope will affect a smooth transition to dryland farming. After brief descriptions of the region's geography, Lacewell and Lee describe how farmed acreage on the High Plains has increased with time through irrigation water from the Ogallala aquifer. Although crop production is possible in the High Plains without irrigation, irrigation allows for much higher production levels. By 1980, though, the region had exhausted more

than one-fifth of the water available in the aquifer. In order to supplement the aquifer, farmers have considered expensive water transfer plans and more economically feasible capillary water pumping plans. Some farmers have also employed water conservation techniques, such as reducing run-off by creating small earth dams in crop rows (called furrow dams) and managing water-robbing soil erosion through stubble-mulch tilling (through which a farmer plows and cuts only the roots of plants and leaves the biomass above ground, thereby reducing evaporation in the topsoil). Lacewell and Lee then discuss innovations in irrigation techniques that may also help conserve water, including a departure from flood irrigation and sprinkler systems to low-energy precision application (LEPA) systems and drip irrigation. Such technological innovations could increase a farmer's expected profits, providing an incentive for farmers to adopt them. Lacewell and Lee are careful to point out, however, that these solutions are short-term. The new technological solutions will not diminish the total amount of water pumped by 2010, but they will minimize the adverse effects of a crop production transition in the area.

Lacewell and Lee provide charts demonstrating an increase in dryland crop acreage from 1973-1982, which they expect will continue to increase over time. The transition to dryland farming will force some farms, especially those on more vulnerable lands or in smaller farming communities, out of business. The authors present policies that may ameliorate the worst aspects of the transition to dryland crop farming. They discuss the viability of long-term land retirement, cost-sharing programs, the federal crop commodity program, cropping pattern restrictions, adjusting and regulating the pumping of the Ogallala, and a tax on water. The authors conclude that the federal government did not design its policy (including its commodity program) in order to minimize the adverse effects of a transition from irrigated to dryland production. In fact, the government's policy may even enhance these negative effects. After considering the policy options, Lacewell and Lee support regulatory options, as well as a water tax that would aid in soil and water conservation. They argue, above all, for flexible commodity programs and for funding research and education because they believe the changes will help to develop new technology to improve farming systems and to transfer information to farmers.

Chapter Five, *Water Resources of the Upper Colorado River Basin: Problems and Policy Alternatives*, by Charles W. Howe and W. Ashley Ahrens, focuses on the water resources of the Upper Colorado River Basin ("the Upper Basin"). The Upper Basin has access to 2,894,000 acre-feet of surplus water per year. The authors articulate that the Upper Basin is not and will not be short of water if Upper Basin states use their supplies in an economically reasonable way. Howe and Ahrens argue that the inefficient and outdated institutional framework of public water agencies and supervised water markets hampers sensible methods of water allocation. They advocate for institutional reform, including the establishment of a basin-wide agency that, with the help of new information technologies, acts as a focal point for the exchange

of information, and the enforcement and regulation of policies.

Howe and Ahrens note that one cannot separate the Upper Basin's water management from its land use and management. The major economic activities of the Upper Basin include agriculture, cattle and sheep raising, the mining of metallic minerals, and recreation. Although Upper Basin projects do not consume all of the available water, the Lower Basin currently uses the remaining water—no flow reaches the river's original terminus, the Gulf of California. If the authors are correct about the projected expansion of economic activity in the Upper Basin, this growth will sacrifice the Lower Basin's uses of water. The authors provide detailed descriptions of the Upper Basin's sub-basins' surface hydrology as well as of consumptive water use patterns—especially for low-value agricultural uses. The authors also estimate the values of this water to farmers and to farming states, as well as the value of water in instream uses. Additionally, Howe and Ahrens discuss water quality issues, with a focus on salinity, in the Colorado Basin.

The authors identify various conventional steps (i.e. the creation of salt-sediment reservoirs) and unconventional steps (i.e. on-farm measures such as modified cropping patterns and irrigation management) that the Upper Basin could take to improve water quality. The authors include a cost-estimate of these steps. In addition, Howe and Ahrens discuss the potential for intrastate and interstate water markets involving the Upper Basin. The authors acknowledge some shortcomings of water markets, including a lack of a basin-wide agency to study and influence the water market process. Notably, Howe and Ahrens provide a series of recommendations, including the formation of an interstate river basin commission to act as a focal point for study, enforcement, and monitoring of agreed upon policies, and the formation of a long-term agreement with the Lower Basin states, through which the Lower Basin would pay the Upper Basin not to develop new uses for a portion of the water during a specified time. Since the appropriations doctrine fails to recognize conservation at the state level as a beneficial use of water, the authors recommend that states consider legislation that recognizes water conservation. Also, they suggest redefining "beneficial use," so that the term reflects the availability of modern water management methods. Finally, they suggest that state governments buy water rights from designated low productivity-high salinity lands to facilitate the retirement of those lands.

Chapter Six, *Growth and Water in the South Coast Basin of California*, by Henry J. Vaux, Jr., reports on population growth and water availability in the South Coast Basin of southern California. Despite the availability of substantial quantities of imported water, the South Coast Basin faces the prospect of intensifying water scarcity due to population growth and legal developments that have diminished the amount of water currently available for importation. Vaux discusses the implications of a shrinking water supply for the South Coast Basin and several alternative means for adapting to water scarcity. After providing

a concise summary of 70 years of water contracting in the South Coast Basin beginning in the twentieth century, Vaux reports that, had these contracted-for supplies remained unimpaired, they could have supported the projected population of the South Coast Basin well beyond the year 2020 at per capita use levels somewhat above the historical trend. However, political and legal conflicts have reduced water development activities. For example, the United States Supreme Court's decision in *Arizona v. California* awarded Arizona an additional one million acre-feet of the Lower Basin's Colorado River allocation, and in 1982 the United States Supreme Court awarded another 52,000 acre-feet of this allocation to Native Americans. The amount of water supplied to the South Coast Basin from the Owens Valley is also precarious because valley residents have pumped more water from their aquifers than the South Coast Basin's municipalities had anticipated. Also, Owens Valley residents are now lobbying to require the South Coast Basin to assess the environmental effects of groundwater pumping before they will allow the Owens Valley to permit future extractions. Similarly, environmental groups have challenged the South Coast Basin's municipalities from diverting streams feeding Mono Lake. Additionally, Vaux discusses alternative means for adapting to water scarcity including the construction of new impoundment and conveyance facilities, changing water-pricing policies and a development of market-like institutions through which one could voluntarily transfer water. Ultimately, Vaux is optimistic that implementation of appropriate water allocation policies will overcome most potential legal problems.

In Chapter Seven, *Toward Sustaining a Desert Metropolis: Water and Land Use in Tucson, Arizona*, by William E. Martin, Helen M. Ingram, Dennis C. Cory, and Mary G. Wallace, the authors argue that Arizona, in general, and the city of Tucson, in particular, exemplify a shift from water development to water management. Arizona has agreed to manage its water resources through a groundwater management law that mandates safe-yield of aquifers (i.e. no overdraft) by 2025, with the state sharing in the costs of the project. The safe-yield goal of the groundwater law reflects concern with future generations and with environmental externalities related to overdraft. The authors note, however, that many elements of traditional water policy (characterized by development), including its largely economic motivations, have survived and are evident in the new management era. Reaching a safe-yield in Tucson depends upon total reuse of effluent—the authors emphasize that no other city in the country has accomplished this goal. In addition to the burdens of this lofty goal, the authors acknowledge that state bureaucracies must face the challenges of compliance with new legislation, including the Arizona Groundwater Management Act - legislation that requires them to support a large planning and enforcement staff. Ultimately, the authors argue the perceived costs to the public of the current management-based policy will determine whether more substantial policy and political change will occur in the state.

In Chapter Eight, *Water Management Issues in the Denver, Colorado, Urban Area*, by J. Gordon Milliken, Milliken argues that Denver has grown and flourished under laws, customs, and an institutional culture formed by traditional values. Continued growth threatens these values because it requires increasingly scarce and distant resources, especially water. Milliken notes that reformers now call for a reduction in inefficient use of water, an increase in economic efficiency through reallocation, and better protection of the public interest. After outlining the history of Colorado water law, Milliken describes the aggressively conservative water provision policies Denver historically held toward nearby suburbs, such as Aurora and Westminster (the suburbs reconciled with Denver in 1982 through the Metropolitan Water Development Agreement, which binds the municipalities to mutual development of water for metropolitan use). Denver's own growth alone has, for 70 years, required it to rely on trans-mountain diversions of water from western Colorado through the Continental Divide. Environmental groups have long opposed the expansion of Denver's water systems' supplies. The groups claim that restricting water will restrict urban growth and development and allow other water uses to flourish (i.e. tourism, agriculture, and recreation). Growth, however, continues. The Army Corps of Engineers is preparing a system-wide environmental impact statement of the metropolitan Denver water supply to help determine the need for new water supply and storage facilities based on forecasts of growth to 2035. Demonstrating that no one has updated this edition of *Water and the Arid Lands of the Western United States*, Milliken projects a significant water deficit by 1989. Milliken suggests several alternatives in water supply and demand management including a reallocation of agricultural water supplies, a policy encouraging the use of groundwater, various conservation measures, water pricing to reduce demand, and a regional growth management plan supported by political consensus. Milliken concludes by reminding his readers that the tensions between tradition and change, as well as between persistence and reform, will determine the Denver area's future environment, culture, and economy.

The volume's editors composed the final chapter, *New Water Policies for the West*. El-Ashry and Gibbons report that the time-honored strategy of increasing water supplies and correcting water quality degradation through capital-intensive projects has reached its limits—financial, environmental, and legal obstacles have overwhelmed it. They argue that the West should replace structural water development with alternative water management schemes that incorporate all environmental and third-party costs. The editors argue that the natural response to water markets will include, in cities, focusing on water conservation programs, which are cheaper than locating and/or developing new water supplies. Similarly, in agricultural communities, higher water use efficiency will make more water available for recreation or waste dilution—reducing saline and toxic return. Ultimately, the editors remind their readers that the arid



west will have to live within its limited water budget, and that water markets will ease competition allowing western states to thrive in an era of scarcity; however, they urge action now, before crises govern water management.

It is important to realize that neither the editors nor the authors appear to have revised this volume or its paperback edition. Therefore, it does not provide the most up-to-date information. Nevertheless, *Water and Arid Lands of the Western United States* remains a valuable source that makes a broadly-supported case for the shift away from development to management and conservation approaches to the Western water resource – a shift that is still relevant today. Laypersons with an interest in water-law will benefit from the volume's detailed histories (both legal and anthropological) as well as from its geographic and topical scope. The source also continues to serve practitioners interested in a comprehensive reference volume.

*Sarah Felsen*

**Joseph W. Dellapenna and Joyeeta Gupta, Eds., *The Evolution of the Law and Politics of Water*, Springer Science + Business Media B.V. (2008); 413 pp; \$169.00; ISBN 978-1-4020-9866-6; hardcover.**

Co-editors Joseph W. Dellapenna and Joyeeta Gupta collaborated with over twenty contributors from around the world to present a well-organized overview of global trends in water law and policy. Joseph Dellapenna is a professor of law at Villanova University in Pennsylvania, and Joyeeta Gupta is a professor of climate change law and policy at the Vrije Universiteit Amsterdam and of water law and policy at the UNESCO-IHE institute for Water Education in Delft. The editors organized this book into five distinct parts with a total of twenty-three chapters; the reader may conveniently examine each part or chapter separately or successively. Conceptually, the book is organized by case studies or thematic chapters to focus on water law as it discusses the evolving characteristics of national as well as supranational and regional water law and politics across the globe; the body of customary international law as well as current trends in international water law; and challenges for the twenty-first century. Many of the authors weave in a wealth of relevant historical information to enable a distinctive exploration of the interrelation between culture, religion, government, and law in water governance and management.

*The Evolution of the Law and Politics of Water* focuses on key research questions including: (1) How has water law and policy evolved through the centuries? (2) What were the motivating factors that led to changes in legal and social practices? (3) Why is it that after 5,000 years of governing the water resource, we do not appear to be closer to understanding and addressing water governance? (4) What are the current challenges facing governance today? (5) What is the role of water law in the evolving structure of water governance in the twenty-first century? The editors address these complex questions by