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## William Blomquist et al., Common Waters, Diverging Streams: Linking Institutions and Water Management in Arizona, California, and Colorado

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resolving conflicts within a river basin or for coordinating multiple uses. The Code resolves disputes through private bargaining among property owners, or in the ordinary civil courts.

Chapter 3, *Reforming the Reform? Policy Debate under Chilean Democracy* discusses the policy debates within Chile about reforming the Code. Non-use of water is a major issue at the center of the debates. After an initial attempt to move to a "use it or lose it" scheme that redefined property rights in water, the government focused on improving economic incentives for water use and allocation. On one side of the debate, the government proposed charging fees for nonuse of water. On the other side, opponents favor levying taxes on water rights ownership regardless of actual use. However, the government has not yet adopted either alternative. Either alternative would require a massive effort to set up and maintain a new administrative system to oversee collection.

Chapter 4, *the Results of Chilean Water Markets: Empirical Research Since 1990* focuses on how water markets in Chile worked in practice rather than in theory. Bauer argues that researchers focused almost entirely on the buying and selling of water and ignored other issues critical to integrated water resources management. After summarizing several studies of Chilean water markets, the chapter turns to the issues lacking research, which include social equity and river basin management. The author uses case studies from two river basins to illustrate problems arising from conflicts between consumptive and non-consumptive uses and the inadequacy of the Water Code in dealing with how to interpret and enforce the relationship between the two types of rights.

The final chapter, *Conclusions and Lessons about the Chilean Experience* focuses on two categories of issues. First, the chapter identifies and discusses issues that were of little concern when the government adopted the Code in 1981, but that are critically important today. Second, the chapter discusses the lessons that integrated water resources management can learn from a free-market water rights system. Bauer concludes that while a free-market economic system addresses issues of water scarcity, legal and political institutions are required to deal with water conflicts, and for that reason, the Chilean experience confirms the need for an interdisciplinary approach in forming water management policy.

Kate Iverson

**WILLIAM BLOMQUIST ET AL., COMMON WATERS, DIVERGING STREAMS: LINKING INSTITUTIONS AND WATER MANAGEMENT IN ARIZONA, CALIFORNIA, AND COLORADO**, Resources for the Future, Washington, D.C. (2004); 205 pp; \$30.95; ISBN 1-891853-86-4, softcover.

*Common Waters Diverging Streams* provides an empirical survey of three of the most complex water management schemes devised, all located in the Western United States. Because water is a scarce resource in the arid west, water management is critical to the continued growth and sustainability of major metropolitan areas, agriculture, and industry while maintaining the environmental needs of the local ecosystems. The authors highlight the importance of conjunctive management of groundwater and surface water systems in three prominent western states—California, Arizona, and Colorado. The authors focus on these three states because each state developed a different management scheme, all producing different results. Each state battles a similar problem, how to divide a scarce resource efficiently and equitably among competing uses.

Conjunctive management consists of the coordinated use and storage of surface and groundwater systems. Water managers can encourage water users to draw on surface water sources, such as rivers and reservoirs, during times of plentiful water, thereby allowing groundwater sources to recharge. In times of drought, water users may then utilize groundwater supplies and allow in-stream flows to remain constant to support environmental needs. As the price of real estate rises along with heightened environmental concerns, the construction of large above ground storage reservoirs becomes less appealing, and the utilization of underground aquifers for long and short-term storage of surplus water becomes more attractive.

As the authors explain, the idea of conjunctive management has existed for at least 75 years. However, physical and institutional barriers often frustrate the progress towards effective conjunctive management. Additionally, the perceived purpose of water management may significantly affect the institutional choices used for conjunctive management.

After introducing the concept of conjunctive management, the book dives into a detailed survey of each state's development of water rights and attempts at conjunctive management. First, the authors explain how California developed a decentralized approach to water management, which led to a hodgepodge of conjunctive management projects varying from basin to basin. Next, the book chronicles Arizona's recent, statewide reorganization of its water management, which led to a dramatic increase in underground storage of surplus water. Finally, the authors detail Colorado's staunch adherence to the prior appropriation system of water rights, leading to a limited use of conjunctive management specifically tailored to maintain in-stream flows for senior water rights holders and environmental needs. The authors point out the successes and shortcomings produced by the differing water management institutions in each state.

In the final section of the book, the authors examine the future of water needs and possible management solutions. The reality is that the

American West is one of the fastest growing regions of the country and the growth trend does not appear to be slowing down. The authors present conjunctive management as a feasible tool for water managers in the face of increased need for water from expanding urban communities, sensitive environmental concerns, and downstream flow obligations. The book does not merely point out the flaws in the existing infrastructures and propose idealistic models and goals. Instead, the authors attempt to balance the reality of competing water users and suggest realistic improvements each state could strive for in order to fully realize the benefits of conjunctive management.

David B. Oakley

**THOMAS V. CECH, PRINCIPLES OF WATER RESOURCES: HISTORY, DEVELOPMENT, MANAGEMENT, AND POLICY**, John Wiley & Sons, Inc., (2005); 468 pp; List Price \$93.95; ISBN 0-471-48475-X, hard-cover.

*Principles of Water Resources* outlines the complex field of water resources. Mr. Cech's textbook interprets water terminology, data, viewpoints, and complex topics in terms understandable to the layperson. *Principles of Water Resources* provides illustrative charts and graphs, along with a glossary and clear subheadings. Each chapter highlights policy issues, giving the reader an idea of the big picture involved in water resource issues. Additionally, Cech provides the reader with the key concepts and questions for discussion.

The textbook begins with the historical context of simple and complex water resources issues. Early civilizations obtained water and constructed irrigation projects with a wide variety of methods, all easily outlined. From the ganats, the underground water delivery system created by ancient well diggers in Africa, to the Roman cisterns and aqueducts, the book describes early water delivery systems in detail. Cech also depicts the irrigation systems of Egypt, China, the Middle East, India, Spain, Portugal, and North America. The textbook describes each country's initial stages of development, along with the intricacies of transportation and hydropower needs.

The next few chapters outline the natural physical processes of water, including climate and weather patterns, surface and groundwater processes, and the interaction between surface and groundwater hydrology. While Doppler radar, snow tubes, snow cores and snow pillows measure precipitation, evaporation is measured with Class A evaporation pans and by using a pan coefficient. Dendrochronology, which is studying tree rings, along with studying ice rings and ocean coral, all monitor climate change. Cech educates the reader about weather patterns, especially drought and floods, and how they can affect a water supply. Then, Cech explains the paramount physiographic