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Guest Editorial: Water and Agriculture in the American West

> An examination of the rainfall map of the United States reveals clearly that the Great Plains environment has a far lower water supply than is found in the region east of the 98th meridian. From the time that men first crossed the line as explorers down to the present, there has been in this region a constant and persistent search for water. (Walter Prescott Webb, 1931)

The 'constant and persistent search' for water Webb so eloquently talked about as far back as 1931 still continues, if anything with increased intensity and compelling urgency. This relentless quest for water is nowhere more manifest than in irrigated agriculture (the largest single consumer of water) in the chronically water-short American West, the focus of this special issue of *IJWRD*. Several factors have contributed to this watershed 'phenomenon': increasing competition for existing water supplies; decreasing quantities of undeveloped water sources; growing demands for water transfer from agriculture to environmental and urban uses; competing water demands among uses and users, and the consequent proliferation of conflicts among multiple stakeholders; the need for revamping archaic water laws and institutions struggling to cope with dramatically altered water problems of today and the years ahead; growing concerns about water-quality problems; and the pervasive concern for water conservation, among others. It was to address these issues in a systematic and rigorous fashion that the Western Regional Research Project (W-190) on 'Water Conservation, Competition and Quality' was initiated in 1994. The papers featured in this special issue of *IJWRD* encapsulate some of the original work carried out by the W-190 team of researchers to address these problems of current and continuing concern. A brief overview of the papers is presented below.

The opening paper by Gopalakrishnan presents an overview of research carried out under the W-190 Regional Research Project on water conservation, competition and quality during its first five-year period (1994–99) and sets the context for the work reported in this special issue. The overview paper by Gollehon and Quinby examines three measures of irrigation in the West: irrigated agricultural area, water used in irrigation, and the value of crops produced. Of particular interest to water allocation is that irrigation accounts for almost 90% of total consumptive water use in the West. The authors recognize that agriculture will find it increasingly difficult to continue consuming water at this level given future increased competition for the resource in non-agricultural sectors.

The two immediately following research papers investigate various issues attending water transfer from irrigated agriculture into competing uses. Green and Hamilton discuss institutional and hydrologic impediments blocking trans-

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fers of agricultural water to other sectors. Michelsen, Booker and Person employ a rational expectations model to analyse the determinants of water prices, and use this information to assess the benefits of proposed water transfer policies.

Green and Hamilton further investigate the extent to which agriculture can create additional water to be made available for redistribution to other water-hungry sectors by adopting improved irrigation technology. Several western states have adopted, or are considering adopting, agricultural water conservation policies encouraging irrigators to improve their on-farm irrigation efficiencies with the expectation that water savings can be distributed to non-agricultural needs without reducing water consumed in agricultural uses. Green and Hamilton demonstrate that policymakers should be cautious in promoting these supposed 'win–win' policies. They simulate a base case which demonstrates that, under the return-flow hydrologic systems characterizing the West, policies encouraging farmers to increase their irrigation efficiency can backfire by decreasing the water supply to other agricultural and non-agricultural water users and decreasing instream flow. The paper by Schaible also recognizes the potential shortcomings of water conservation policies encouraging increased irrigation efficiency, but contends that, in the context of Pacific Northwest agriculture, such policies might generate substantial water savings.

Given the institutional and hydrologic impediments frustrating water transfers in many parts of the West, and the ambiguity underlying agricultural water conservation policy, conflicts between agricultural, municipal, industrial and environmental uses will probably continue to be generally resolved in the political or judicial arenas. Colby and d'Estree provide a systematic examination of the costs, benefits and effectiveness of various dispute-resolution mechanisms. Supalla applies game theory to evaluate the potential effectiveness of the Platte River Cooperative Agreement between the US Secretary of the Interior and the states of Nebraska, Colorado and Wyoming as a dispute-resolution mechanism.

Two final papers discuss issues concerning how western water institutions might be adjusted to better meet the challenge of satisfying increasing and changing social demands for high-quality water. Huffaker, Whittlesey and Hamilton offer legal and hydrologic justification for operating a more flexible version of the prior appropriation system (i.e. one better able to accommodate water transfers from agriculture to other sectors) on an equal footing with parallel water doctrines designed to protect public uses in water (e.g. the public trust doctrine). Huffaker, Frasier and Hamilton examine a recent line of federal court cases to determine the extent to which states can defend the constitutionality of state-imposed restrictions on water exported to neighbouring states if they can show that water transferred within the state is subject to similar restrictions. Huffaker *et al*. conclude that such a defence is legally non-productive, and thus not worth the opportunity costs of restricting intrastate water transfers.

The papers in this special issue, as the foregoing discussion shows, have attempted to capture, to some extent, the complexity and diversity of water-resource management problems that confront turn-of-the-century agriculture in the American West and offer a glimpse of looming water issues in the new millennium. These emerging issues include climate change and its impact on irrigated agriculture, changing configuration of water demand, animal waste management from concentrated animal feeding operations (CAFO), precision agriculture and the effects of site-specific management, contingent water market-

ing, innovations in water laws and institutions, 'native' water rights (e.g. Native American and Native Hawaiian), to name but a few. It is ironic that the abundance and diversity of unresolved issues in western water management stand in such sharp contrast with the sheer, forbidding aridity of the vast western terrain. Happily, the search for solutions continues unabated in the true pioneer tradition of the American West. This special issue of *IJWRD* is, it is hoped, one more important step in this ongoing search.

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