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Preliminary Findings from Western Water Assessment's "Water Rights and Climate Change Project"

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The Western Water Assessment's "Water Rights and Climate Change" project arose out of concern expressed by water managers and others that the calendar dates attached to water rights may increasingly become "out of step" with hydrographs affected by climate change. Shifting hydrographs have the potential to affect the functioning of water rights in many ways, modifying yields, demands, and reliabilities of water systems.

To date, this issue has not been the subject of scholarly inquiry or real-world disputes, even though many areas in the West are already experiencing earlier snowmelt. Climate models are nearly unanimous in projecting that this trend will continue and intensify further, suggesting that the mismatch between calendar dates in water rights and actual hydrologic conditions will grow in salience. We recently issued a report entitled *The Impact of Earlier Spring Snowmelt on Water Rights and Administration: A Preliminary Overview of Issues and Circumstances in the Western States* which provides a reconnaissance level review of this issue in the 11 westernmost conterminous states. The report categorizes the states by trends in snowmelt occurrence and the presence/absence of explicit timing provisions regarding the exercise of water rights (see Table 1). Four states—Colorado, Idaho, Utah and Wyoming—chosen from the four corners of Table 1, were investigated in detail to illustrate the range of circumstances seen in the region. The report's tentative findings, conclusions, and recommendations are summarized below:

Irrigation Water Rights Appear to be Lengthening (and Growing)

The earlier onset of spring snowmelt has increased the length of the irrigation season in many locations. As expected, in states that do not feature calendar dates on these rights (but rather are silent or simply define rights as corresponding to the irrigation season), it is generally believed that these rights are being exercised earlier and longer. Perhaps more surprising, however, is that in states that do define water rights in terms of specific calendar dates, we did not find examples where a serious effort has been made to enforce these dates. As long as the water is used beneficially (and in a similar way and location as historically done), and in lieu of any protests from other water users, earlier diversions are generally seen as appropriate and are not deterred. In fact, the distinction among the four states that do and do not require time of year limitations in water rights seems to have very little significance in current practice.

Administrative Flexibility is Being Exhausted

Systems of water administration generally have sufficient flexibility built into them to accommodate year-to-year hydrologic variability. This same flexibility is being drawn upon to accommodate more fundamental (long-term) shifts in climate and hydrology, although this reality may not be readily obvious—after all, on-the-ground, climate change can be indistinguishable from climate variability. However, it appears that, at least in the four states that were the subject of case studies (Colorado, Idaho, Utah, and Wyoming), the extent of available flexibility may be near an end. Colorado water administrators, for example, report that "gentleman's agreements" regarding diversion schedules among water users are eroding, and in Wyoming, the growing frequency of late-season calls is focusing more attention on early season water-use practices.

Legal Disputes Associated with Water Rights Timing are Not Yet Apparent

Despite repeated inquiries to water rights attorneys and ongoing literature searches, we did not find any evidence of a lawsuit in any western state that can be directly attributed to the mismatch between timing elements in water rights and the shifting hydrograph associated with climate change. This lack of litigation is perhaps explained by the apparent legality and common practice of modifying diversion schedules to meet shifting hydrologic conditions, and in those situations where such actions are

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presumably barred, the failure of injured parties to appreciate the role of this behavior in creating observed problems. We did not encounter any water rightsholders arguing for more scrutiny or enforcement of water rights terms. Nonetheless, some interviewed parties suggested that this period of calm is expected to erode in coming years, with the first wave of lawsuits perhaps focusing on better defining the discretionary limits (and obligations) of water administrators.

Winners and Losers Are Tough To Predict

Beyond the simple observation that senior water rightsholders are almost always better off than junior water rightsholders, it is difficult to predict the distribution of winners and losers (and their responses) associated with the growing mismatch between hydrology and timing elements in water rights. To the extent that water rights do not include time of year restrictions (or feature timing restrictions that are not enforced), seniors are in a position to increase water diversions often at the expense of juniors—an advantage perhaps most evident during late-season low-flow periods. Conversely, a strict enforcement of timing elements in water rights may protect junior rightsholders from an expansion of senior rights, although these juniors are likely to be negatively impacted by demand patterns that are increasingly out of synch with their rights.

Table 1. Hydrologic and Legal Trends in Streamflow Timing in the 11 Westernmost Conterminous States [2]

Inclusion of Timing Elements in Water Rights	Trend Toward Significantly Earlier Spring Snowmelt	
	Strong	Weak / Inconclusive
(A) Explicit Timing Requirement. Statutes, rules and/or case law explicitly require time of year limitations in documents establishing water rights	• Washington • California (post-1914) • Idaho (post-May 1967) • northern Utah • northwestern Montana (stream adjudications)	• New Mexico • Utah (except northern) • Montana stream adjudications (except northwest)
(B) Some Attention to Timing. Statutes, rules and/or state-prescribed application forms require that time of year be stated in the application for a right, but are silent as to whether time of year must be included in documents establishing water rights	• eastern Oregon • eastern Arizona • northwestern Montana (permits) • Nevada (permits) • western Wyoming (transfers)	• Oregon (except eastern) • Arizona (except eastern) • Montana permits (except northwest) • Eastern Wyoming (transfers)
(C) Silent on Timing Issues. Neither statutes, application forms, nor case law generally require time of year limitations as an element of water rights (though exceptions exist such as transfers and recreational rights)	• western Wyoming (except transfers) • Nevada (stream adjudications) • California (pre-1914)	• Colorado • Eastern Wyoming (except transfers)

[2] This categorization is imprecise in many respects. For example, since many basins within a state have widely varying altitudes, it is difficult and inherently imprecise to categorize entire states as having a uniform signal regarding earlier snowmelt. Yet, since legal regimes referring to the timing of water rights are uniform within a state from basin to basin regardless of any elevation changes, it was necessary to use the state as the standard unit of analysis.

The salience of case-specific factors makes further generalizations difficult. One wildcard in any situation is the interplay between direct-flow rights and storage rights. For example, in one case, holders of storage rights junior to direct-flow irrigation rights surmised that a significantly earlier snowmelt would provide an enlarged early season window for filling reservoirs before irrigation commenced, as the irrigation season is not based solely on the onset of warmer temperatures and snowmelt, but also on the length of daylight (which does not shift due to climate change). Other important considerations in any given locale may include the modification of return flow regimes, the water needs for environmental protection, water quality impacts, power generation patterns, and the functioning of interstate agreements. Of the sixteen interstate water apportionment compacts found in the eleven western states, at least six compacts (affecting eight states) feature formulas that rely, to various degrees, on key spring calendar dates [3]. These agreements were negotiated, literally, in a different climate, well before global warming was a concern in the water management community (or elsewhere).

Concluding Thoughts and Recommendations

Our review of the relationship between climate change and the functioning of water rights has led us to two overriding conclusions: first, significant on-the-ground problems associated with the growing mismatch of rights and hydrographs have yet to emerge, even though snowmelt in many locations has advanced several weeks; and second, this period of calm may not last much longer. It remains unclear exactly where and how intensely these problems may be manifest, and whether they will present as legal or water management problems. In a state that explicitly requires that water rights be exercised within specific calendar dates, it is reasonable to expect lawsuits to emerge, likely initiated by juniors harmed by increased consumption from seniors that have expanded their season of use. In a state without such timing requirements, the issue perhaps is better characterized as a management problem, as water rightsholders— especially juniors—search for means to manage reduced yields and higher vulnerabilities within their water rights portfolios. Problems at the interstate level may be particularly difficult to resolve, as the zero-sum nature of compact apportionments can be a formidable barrier to resolving disputes through compromise and negotiation. In those settings, litigation may be unavoidable. Further speculation is difficult to support and may be largely irrelevant, as the other impacts and challenges to water resources associated with climate change may subsume or overwhelm the specific issue of water rights timing.

In lieu of a better vision of what the future entails, we conclude with only two simple recommendations. First, if they are not already doing so, we encourage water managers to design and operate their models in a way that considers how shifts in the hydrograph may influence the yield and vulnerability of their water rights portfolios. And second, states and municipalities should expect the demands on water administrators to increase, and should make appropriate investments in personnel, budgets and training.

[3] This subject is explored in the WWA working paper: "The Effect of Changing Hydrographs on Compact Apportionments in the Western United States: A Preliminary Analysis of Potential Trouble-Spots" (Kenney et al., 2007): http://wwa.colorado.edu/current_projects/pdfdocs/western_us_compacts_paper.pdf.