Overview of Western Water Assessment's "Water Rights and Climate Change Project"

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Introduction

In recent years, the hydrograph of most Western rivers has shifted toward an early onset of spring snowmelt runoff tied to increasing temperatures (Stewart, et. al 2005, Regonda, et. al 2005). Under the prior appropriation system, surface water rights in the western U.S. may be limited to time of use components such as specific annual starting and ending dates or by broad terms such as "irrigation season." Changes in streamflow timing have the potential to impact western water rights in at least two ways: 1) the timing of diversions and 2) the length of the growing season. First, if spring runoff comes earlier, water rights holders may wish to divert, store and use water starting at an earlier date. Second, earlier runoff is correlated with warmer spring temperatures, which could potentially lengthen the growing season, resulting in increased demands. The relationship between earlier snowmelt and the timing of water rights has not been studied, so the WWA launched the "Water Rights and Climate Change Project," in summer 2007. It will identify how changes in the timing of spring snowmelt may impact the administration of prior appropriation surface water rights in the western U.S.; assess how a mismatch between hydrographs and temporal elements of surface water rights could cause administrative and legal complications; and identify the mechanisms available to remedy these complications. This article provides an overview of project goals, methods, and preliminary findings.

Project Steps and Completed Tasks

Over a 12-month period, Kenney, Klein, Goemans, and Alvord will conduct literature reviews, interviews with key water administrators, and in-depth analysis of state water laws. A literature review, an overview of Colorado water law regarding timing issues, and a review of timing language found in western interstate compacts are complete. They can be found on the Project's website (see On the Web box). Researchers assessed evidence of a change in snowmelt timing and reviewed statutes and administrative processes for water rights for all 11 western states. They developed a typology categorizing states based on snowmelt signal and time of use legal regimes (Table 1). The project will then select 4-6 case study states to analyze water rights decrees to better understand how temporal limitations will affect future appropriations if spring snowmelt continues to run-off earlier. Interviews with water administrators in these states will further help identify potential solutions to this problem.

Table 13. Hydrologic and Legal Trends in Streamflow Timing in the 11 Western States (Preliminary Assessment)

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 fixed time of year limitations in documents establishing water rights.	• Washington (stream adjudications and possibly permits) • California • Idaho • Northern Utah • Northwestern Montana (stream adjudications)	• Northern New Mexico • Utah (except northern)
(B) **Some Attention to Timing.** Statutes, rules and/or state-prescribed application forms require that fixed 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)	• Arizona (except eastern)
(C) **Silent on Timing Issues.** Statutes, application forms, water decrees, or case law may include fixed time of year limitations as an element of water rights, but it is not required.	• Western Wyoming (except transfers) • Nevada (stream adjudications)	• Colorado

Table 13: Preliminary results from an assessment of hydrologic changes and legal regimes. Certain states have varying strengths (strong or weak/inconclusive) of early snowmelt signal and are placed in multiple categories, however note that legal regimes are uniform in each state. This typology is currently under review, and comments, revisions, and other relevant observations are strongly encouraged (see On the Web box for contact information).

Preliminary Findings

An assessment of snowmelt trends and legal and administrative documents shows that earlier snowmelt in western states could potentially create problems for water rights that are limited by specific calendar dates or a season. The trend in

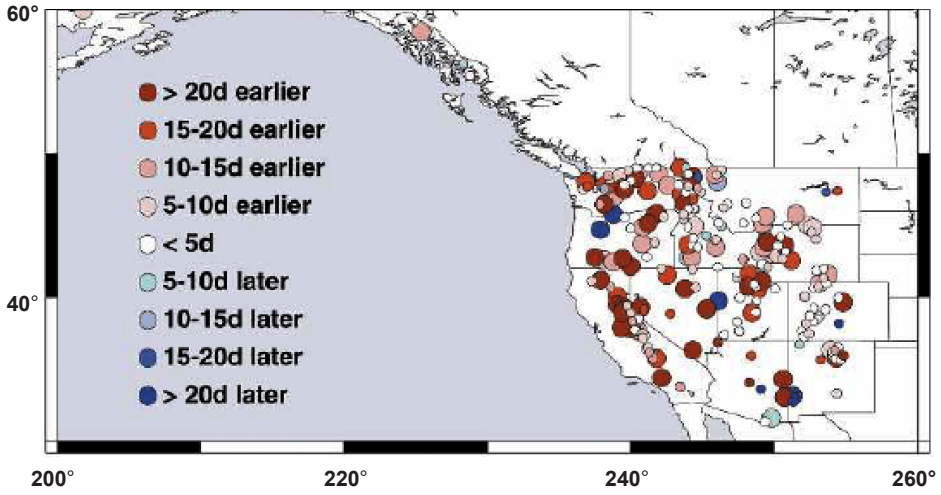

Figure 13: Stewart et., al 2005 finds that spring pulse onset of snowmelt based on gauge station data from 1948-2000 is most prominent in the Sierras and Cascades in the Pacific Northwest. However, some stations are reporting later onset of snowmelt, making it difficult to characterize strength of early snowmelt by state [Stewart, et al., 2005, Figure 2a].

earlier snowmelt and runoff is most pronounced in the Pacific Northwest, occurring as much as four weeks earlier compared to gauge records from the second half of the twentieth century (Stewart et al., 2005, Regonda et al., 2005) (Figure 13). The trend toward earlier runoff is much less pronounced (and more difficult to statistically document) in most other regions of the West. In most mountains below 8200 feet, there is a negative correlation between earlier runoff and elevation; earlier runoff has been more prominent at lower elevations.

Research of western interstate compact apportionments showed great diversity in how the timing of diversions is specified. Of particular interest is that six out of the sixteen compacts surveyed include specific spring dates (and thus are presumably sensitive to a change in snowmelt timing); eight states are signatories to these six compacts, with Colorado a signatory to four.

A wide range of water rights across the West are potentially threatened directly or inadvertently by earlier timing of spring snowmelt. A review of state statutes, administrative rules, online application forms, and case law also revealed varying degrees of time of use components ranging from states that require specific calendar dates for all water rights (e.g., CA, WA, ID, UT) to those that do not (e.g., NW, WY). In at least one state (CO), temporal components vary from specific calendar dates, to unspecified "season" of use, to no mention of time of use limitations depending on the water right and type of use. Thus, there are at least three types of water rights that can potentially be problematic with earlier snowmelt and streamflows: rights defined by explicit dates can be threatened by changing supply and demand patterns; and rights defined as "seasonal" can expand along with the demand season, likely detrimental to more junior rightsholders. Finally, rights with no time of use limitations potentially put all junior rights at risk because senior rights-holders can divert when water is available, resulting in potential injury to junior water right holders who are restrained by junior standing and/or time of use limitations. Research in coming months will identify additional vulnerabilities associated with at-risk rights and potential administrative and management solutions. Visit the project web site for project materials, updates, and contact information (see On the Web box).

References

Regonda, S.K., B. Rajagopalan, M. Clark and J. Pitlick, 2005: Seasonal cycle shifts in hydroclimatology over the western United States, *J. Clim.*, 372-384. http://civil.colorado.edu/~balajir/my-papers/regonda-etal-jclim.pdf

Stewart, I.T., D.R. Cayan and M.D. Dettinger, 2005: Changes toward earlier streamflow timing across western North America, *J. Clim.*, 1136-1155. http://earth.boisestate.edu/home/jmcnamar/seltopics/2006/stewart_timing.pdf

On the Web

The majority of materials and initial project papers (drafts) are available on the "Water Rights and Climate" website: http://wwa.colorado.edu/current_projects/water_rights__climate_change.html. These materials are being made available in draft form in an effort to generate attention, feedback, and insights from the water resources community.

- Please direct corrections, comments and questions to project leader Doug Kenney at Douglas.kenney@colorado.edu.
- For a review of early snowmelt studies, see the article by Udall and Bates, "Climatic and Hydrologic Trends in the Western U.S.: A Review of Recent Peer-Reviewed Research" in the January 2007 issue of the Intermountain West Climate Summary available at: http://wwa.colorado.edu/products/forecasts_and_outlooks/intermountain_west_climate_summary/January_2007.pdf