WATER BANKING IN COLORADO: AN EXPERIMENT IN TROUBLE?

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ABSTRACT

This presentation reports on the progress and problems of the Arkansas River Basin Water Bank Pilot Program in Colorado. The term "water banking" has been used to describe a variety of ways of trading use of water; the legislature's choice in Colorado was a non-profit brokerage mechanism trading only stored surface water. This experiment in modifying traditional prior appropriation law reduces transactions costs and delays in transfers of water, to increase flexibility for the benefit of the holders of agricultural water. Such flexibility is expected to become increasingly desirable in conditions of scarcity and shifts from structural to non-structural approaches to supply. The Colorado experiment is described, to try to explain how a great theory with substantial appeal in principle has been so far socially unacceptable (as of the time of paper submission). The goal is to alert irrigation people to another case of social management being critical to success, regardless of technical charms.

PRESSURE TO MOVE WATER

The need for municipal water supply has dramatically increased with urban growth in the Western U.S., paralleling urbanization in the rest of the world (Western Water Policy Review Advisory Commission (WWPRAC) 1998, USDOA and USDOI "Water 2025"; Gleick et al. 2002). The legal background for problems in moving water under the prior appropriation system is well described elsewhere (WWPRAC 1998, NRC 1996, NRC 1992). The Colorado urbanization has already moved a great deal of water to cities, as USCID members and others will already know, with no known effective constraints on growth from water supply problems (Nichols et al. 2001). Meanwhile, adverse pressure on small agriculture in marginal areas is strong (see especially USDA Economic Research Service, many items, e.g. McBride 2003, and Agricultural Policy Analysis Center).

"WATER BANKING"

There are several uses of the term "water bank" (MacDonnell et al. 1994), including informal trading of rights to withdraw from a well-defined pool, as in the case of Snake River Plain operations or within Reclamation projects, or at the other end, suspension of legal hindrances and operations by a capitalized agency

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as in the California Drought Water Bank (Easter et al. 1998, Jercich 1997, Thompson in Anderson and Hill, Eds. 1997). The shared fundamental is reduction of the transactions costs of moving water, making it more like other resources. Because water is complex in externalities of use and necessity, moving it toward the purely economic realm ("commodification") is controversial (Brown and Ingram 1987, WWPRAC 1998). Economic theory of increasing welfare by moving resources to those uses with the highest value also suggests that non-market values and externalities should also be considered. Non-agricultural public interests in water uses may eventually use water banks, also. Salinity reduction may call for easier changes in water use, to decrease salt loading from deep percolation onto marine shales (Gates et al. 2002), and there may eventually be outlets for conservationist willingness-to-pay for riparian and wetlands habitat.

For agriculture, potential applications for climate information and seasonal forecasts are being identified (see website of National Ocean and Atmospheric Administration Office of Global Programs for updated research reports; Gleick 2000). In Colorado, response to forecasts is limited by inflexibility in water management and allocation (Wiener 2002, 2003, 2004). The "water bank" idea would allow responses to pre-season forecasts, in-season re-allocations, and well-informed multi-year interruptible supply contracts, or dry-year options plans to meet municipal supply firming goals with a higher value for water than farming during drought years. There may be connections between flexibility of management of the valuable water asset, and financial success in farming and capacity to intensify or adapt to new markets.

THE COLORADO CONTEXT AND EXPERIMENT

In the context of visible landscape changes, the impacts of large water transfers away from agriculture, and legislative rejection of growth management, the Colorado Governor's Commission on Saving Farms, Ranches and Open Space (2000), reached findings similar to polls (Fix et al. 2001) and national sentiment favoring agriculture and its land base (Hellerstein et al. 2002). Citizen approval of interruptible supply contracts (or "dry-year options") was also reported by city officials in 2001 and after. Drought-stimulated public discussion of water issues in 2002 and afterward has confirmed policy-making level acceptance of both agricultural preservation, and supporting changes in water law (e.g. Colorado Water Congress, Agricultural Outlook Forum, Statewide Water Supply Initiative meetings, news coverage).

Colorado's East Slope provides an interesting contrast between the South Platte Basin, which includes most of the Denver metropolitan area, and the Arkansas River Basin, which includes Colorado Springs, Pueblo, and the areas southward and eastward. In terms of agriculture, average field size is 37 acres in the Arkansas (1/4 1/4 section minus lanes) and 127 acres in the South Platte (1/4 section, minus area not covered with center pivot irrigation system) (Frasier et al.,

1999). Agriculture was the source of 1.5% of South Platte income in 1990, but it was 7% of Arkansas Valley income, excluding Colorado Springs and its county, and if one also excludes the City of Pueblo, the farming counties that use Arkansas River water got 26% of their income from agriculture (Howe and Goemans 2003). Comparing the farming counties, net income per farm acre was $73 in the South Platte, versus $26 in the Arkansas (1990 and 1994 data combined; illustrative use only). Crop sales from the South Platte for 2002 were $414,500,000, versus $120,465,000 for the Arkansas (and adjacent ground-water using Baca County) (Co. Ag. Statistics Service.) on less than twice as many acres harvested (1997 Census of Ag. data, National Ag. Statistics Service).

In the South Platte, federal, municipal and private water projects import a substantial amount of trans-basin water from the Colorado River Basin. In Colorado only that amount of water which could legally be moved was exported, so it can be used "to exhaustion" in the area of destination (WWPRAC 1998, Corbridge and Rice 1999). The Northern Colorado Water Conservancy District, client for the Colorado-Big Thompson Project, provides shares of water without retaining ownership of return flows after the first use. These shares are transferable at will and almost no cost. This project provides an average of 270,000 A'/year – enough to support a market. This has likely worked in a cause-and-effect relationship with a high density of "plumbing" in the South Platte, increasing the physical transferability. The Frying Pan-Arkansas Project's client Southeastern Colorado Water Conservancy District retained ownership of return flows from an average import of 69,000 A'/year, perhaps not enough to establish a market alone. Except for re-allocation of project water, transfers in the Arkansas need water court adjudication, except under very limited or emergency conditions. Transactions costs have been very high (Howe and Goemans detail this comparison, 2003). The costs of moving water have affected the amounts moved, and the frequency of moves (Howe 2000, Howe et al. 1986) and very likely the parties to whom it is moved. Again following Howe and Goemans, with very low transactions costs, the size of transfers in the South Platte have been far smaller than in the Arkansas, and the number of agriculture-to-agriculture transfers for the study period examined (before the onset of the wet late1990s or the very dry recent period) was 34% of the total, and the volume of water moved was 26% of the total. In the Arkansas, with water court involved, agriculture-to-agriculture transfers for the same period were less than 2%, and most water transfers have been very large transfers to cities, often involving almost all of a ditch. The secondary social impacts have been notorious, including loss of farming, adverse impacts on ranching due to loss of local hay and feed production, leading to decreased local economic activity, decreased tax bases and government and school finance, and so through the economy. Howe (and colleagues, all references) and Weber (1990) have provided analyses of secondary impacts and the rationale for improved water markets.

The public concern with "dried up towns" has surged now and then, and reached an unusually high level in 2000 and 2001, ahead of awareness of the drought which peaked in 2002. That led to several more of the many attempts to legislate a requirement for mitigation of the economic impacts of large water transfers. So far, none of about 18 "mitigation" bills has passed, but there is persistent concern and will be more attempts (number widely used, e.g. Ann Montano Esq. at Colorado Ag. Outlook Forum, February 2004); this has helped maintain awareness and supported management innovation as well.

The legislature's explicit goals for the Arkansas River Water Bank Pilot Program included simplification and improved approval process for leases, loans, and exchanges, including interruptible supply agreements for stored water (note "stored" limitation), reducing transactions costs, increasing information available, and helping agriculture realize value of water without forcing severance from the land (HB01-1354, 2001, C.R.S. 37-80.5-101 et seq.; amended HB 03-1318, 2003).

There are environmental implications from moving water, both beneficial and adverse to the area of origin. In the case of Boulder County (Crifasi 2002), only 1 percent of water body surface is "natural"; the rest is agricultural or municipal in origin. And, 18 to 20% of riparian vegetation in the study area is along ditches and canals. The portion of local ecologies supported by water distribution and irrigation "inefficiency" may be very high farther away from the mountains, where tributary inflows to main stems may be largely ephemeral. Troublesome impacts on soil and weed infestations in formerly-irrigated areas not intensively managed are also feared; in the case of the Rocky Ford Ditch "first half" sale, concluded in the 1980s, only 12% has been claimed fully re-vegetated (Southeastern Colorado Water Conservancy District Board meeting 15 April 2004). But moving water away from some lands may be a great benefit where deep percolation is dissolving salts from underlying marine shales, with return flows accumulating very high salinity. The lower Arkansas often exceeds 4,000 mg/l, with localized higher concentrations in the water table (Gates et al. 2002). This lowers crop yields, even with high water applications to flush root zones, and increases costs for drinking water treatment enough that efforts are underway to secure federal funding for a drinking water conduit parallel to the River. There is substantial public interest in improved flexibility of water management.

Why, then, does something so apparently appealing seem to be in trouble? As Dean Joan Dusky has said, "the field of dreams doesn't work! Even if you build it, they won't come." It takes much more than a good theory, and a good institution; these are necessary but not sufficient.

THE INSTITUTIONAL DEMONSTRATION

The staffs of the Office of the State Engineer and the Attorney General worked hard to add the extra tasks called for by the legislation, including a series of public meetings and several additional appearances related to the water bank rule-making. The radical departure from Colorado's water law was opposed by many water leaders, and there was widespread expectation that the rules would be instantly litigated and perhaps never go into effect (interviews by author and informal conversations). Ditch companies in particular were often privately negative, but officially non-committal, which was in effect negative. Outreach and inquiry led to some reconsideration, but on the formal record, only one company endorsed more flexible water management; it subsequently made an innovative lease deal with an out-of-basin city, under later new legal authority. Some major objections were made on principle, and some by a group that perceived themselves as vulnerable to adverse impacts from mismanagement, judging by the public rule-making hearings. The major compromise reached was delay and use of a notification list for any transactions, and further delay if there is objection. The normal "spot market" idea was defeated, losing the use of the water bank for in-season re-allocations, and leaving the fastest transaction in 3 or more months, instead of the days involved in the Northern District and other working water bank operations, but this is still improvement over delays in years. The compromise averted litigation and accomplished rule-making on the legislature's timetable. Subsequently, the Southeastern Colorado Water Conservancy District agree to be the water bank operator, and a website for the electronic bulletin board was formally made operational January 2003 (www.coloradowaterbank.org).

Unfortunately, the legislature undercut a major potential use of the Water Bank in 2003, yielding to an arguably misinformed push against further out-of-basin transfers, though it also endorsed a shrunken concept by allowing it to be tried statewide (HB 03-1354). There is a fundamental contradiction between those who demand the right to sell their asset ("it's my 401k!") versus those who want agricultural water to stay in the areas of origin. The water bank, had it not been altered, should have demonstrated the potential for the kind of long-term deals with out-of-basin transferees that might well have provided the highest steady income, from long-lived interruptible supply contracts, while keeping the water rights on the farm and helping to capitalize modernization and intensification. Public sentiment against out-of- basin transfers was stalemated by the farmers' property rights claim of right to sell, and the cities' claims of right to buy, and the first compromise intended by the legislature was modified. Ironically, the legislature also expanded authority to make short-term (up to ten years duration) dry-year leases, thus helping cities get supply but again defeating long-term stability and markets in interruptible supply (HB03-1334). The new state-wide water-bank authority also retained the 2007 sunset provision, defeating long-term deals. And, the requirement to report to the legislature in 2005 is still in place.

So far, as of July 2004, there have been no transactions, while rentals are active in the Northern District (see http://www.ncwcd.org/hot_topic/rentalwater.asp). And, permanent sales of water rights out of agriculture are still unmitigated in impacts, and large ones threatening thousands of acres of "dry-up" impend.

THE EXPERIMENT AS AGRICULTURAL INNOVATION – THE MISSING PARTS OF THE PUZZLE

Important agricultural innovations in the U.S. have been made available by a combination of cooperative extension services and manufacturer sales communications for more than a century (Rasmussen 1989, Nowak 1992, Seevers et al. 1997, IPCC 2001, Rogers 2003). Traditional delivery has both involved potential users and provided localized demonstration of the benefits and applications of the innovation. Such innovations demand respect for the intended beneficiaries (Wiener 2002) in ways not necessarily obvious here, given the history of participatory demonstration. We blew it, in this case. Regarded as an agricultural innovation, none of the usual steps were taken to develop, communicate, and demonstrate the water bank innovation. Rogers (2003) provides the leading synthesis on diffusion of innovations. He has distilled five attributes of an innovation that affect adoption. On "relative advantage", the Water Bank should rank well, if it were understood. On "compatibility", however, it ranks low; uses are not well understood. "Complexity" is actually low, but limitation to internet makes it look worse than it is. "Trialability" is actually much higher than potential users often thought; misunderstanding was rife. And "observability" has been missing, since no one has tried it, and the first simple models showing operations are just now in progress. Bad program design!

Specific to agricultural innovation, there are critical contextual issues which affect interest, understanding, acceptance and adoption. Seevers et al. (1997) offer the comic mnemonic "SHEEEP", which can be briefly used to illustrate how poorly the ground was plowed in this case. Social factors include major events, demographics, and such. For example, "graying farmer" problems are relevant; one county commissioner said that "these guys don't use internet; they never will." There was no funding for the water bank, so no capacity to provide outreach service beyond the generosity of the District. Historical factors are very important: the big water transfers in the past were huge social injuries compounding earlier loss of the sugar beet business, begun in the West in the Arkansas Valley, and shrinkage of the melon market. The cities are widely and not unreasonably regarded as the enemy of the rural, and the persistent refusal to allow mitigation bills convinced many that the water bank was just another device to take the water. Outreach and explanation, let alone demonstration, were limited to only the initial public meetings for rule-making. Economic issues are important: the long decline in agriculture and related businesses has disheartened many, and the big water transfers have dried-up thousands of acres fields and little

towns, as others struggle to keep some businesses going. Long-term improvement or at least moderation of the changes is an important goal, but the source of the innovation was perceived to be the source of the problem, not the solution. Educational achievements are not a problem. Emotional issues are critical here, because the loss of water to out-of-basin transfers is literally the loss of the way of life for many, and the loss of the future for some places. The kinds of economic activity possible after irrigation are not the same, according to people in the Valley, and in the words of a very influential person, taking the water away is "just plain evil." The emotional power of the loss of farms and families is enormous. Ironically, that power is probably the single biggest force working against using the water bank. The irony is that yielding to this fear apparently caused the legislature to revoke authority for out-of-basin transfers, which made the most lucrative likely long-term support for farmers unavailable (in-basin cities are well-supplied). The second irony is that strident association of the water bank with "just another scam to steal the water" (e.g. dozens of newspaper editorials against water transfers) seems to have deflected attention away from possible in-basin transfers which could provide firmer water supply for higher-intensity farming and recapitalization help for the transferors. For instance, organics are growing 20% per year (Dimitri and Greene 2002), but moving water to organic-certifiable soils takes the high-cost slow process in water court, without a water bank to cover the first few years. Political issues are also critical, since the moving of water is a political act in conditions of severe imbalance between supply and demand; and it has profound political effects where the secondary impacts are so important. The rural-urban split in Colorado is based in this, and it is not alleviated by the failure to find, enact, and use better management. Future economies of any kind may depend on keeping enough water, as amenity for the region as well as for use as an input to production, even of hobby-based and tax-benefit-seeking small acreage "farms", which are a very fast-growing part of the rural landscape.

Given the enormous resentment of losing water, and the identification of new management with the old goals of just taking it away without any mitigation of impacts, it seems reasonable to expect that a substantial effort to illustrate the differences between old and new will be needed; so far, well-informed people have simply denied them. Given that this is an agricultural innovation, at base, why expect success without any of the traditional demonstrations and local applications? The social part of this process has only begun, and it is now very important that the report to the legislature may be done before any of the appropriate steps to try the experiment are undertaken. Early focus on the institutional and legal issues overlooked the human and social realities, to the frustration so far of an important improvement in flexibility in water management.

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