NATURAL RESOURCES JOURNAL

Volume 53
Issue 1 *Spring*

Spring 2013

Water Transfers for a Changing Climate

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Water Transfers for a Changing Climate[1]

ABSTRACT

The prior appropriation doctrine that dominates the water laws of the Western United States was perhaps the inevitable consequence of the need to manage water resources in a region where the demand for water often exceeds the supply. This doctrine has proved surprisingly clumsy at accommodating changing water needs during times of shortage. Economists have long viewed water markets as an attractive solution for reallocating water to meet the demands of an evolving community of water users. But most western states have been skeptical—sometimes even hostile—to proposed changes in historic water use patterns. This reluctance to encourage the transfer of existing water rights to serve critical new water needs too often leads to the development of new and expensive water projects with serious adverse environmental consequences. Still, many water transfers have gone forward and many involve moving water from agricultural to urban use. This is not surprising since most of the water used in the West goes to irrigated agriculture and most of the new demand is coming from the West's burgeoning urban centers. But for a variety of reasons, transfer activity has proved inadequate to accommodate these growing needs. Climate change now threatens to exacerbate this problem, by diminishing water supplies in some of the most arid regions of the West. New ways of thinking about reallocating water could go a long way to solving this problem. This article offers concrete recommendations for promoting robust water markets that can address water shortages that are otherwise likely to confront the West. The article concludes with a series of practical and creative ways for reforming western water law to help ensure that water gets to where it is needed most efficiently.

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1. Submitted pursuant to NOAA Award NA07OAR4310375, OAR Climate Program Office (CPO) (June 30, 2011). The author gratefully acknowledges the helpful comments provided by Justice Gregory Hobbs, Dr. Charles Howe, Peter Nichols, Dr. Robert Young, and the participants in the climate change workshop held at the University of Colorado Law School, in August, 2011. The author also acknowledges the assistance of several outstanding law students including Anshul Bagga, Laura Brown, Stephen Chesterton, Asher Kohn, Mystery Murphy, John Newman, Erica Steidl, Mohitindervir Sandhu, Lisa Smith and Veronique Van Gheem.

I. Introduction

For decades, resource economists and policy wonks have touted the value of water markets to solve water scarcity problems.[2] Water markets have special appeal in the western United States where the prior appropriation doctrine favors historic, low-value agricultural water rights over far more valuable domestic water rights.[3] Yet despite the allure of water markets to move water—especially from agricultural to urban use—the legal, political, and practical obstacles to the operation of such markets have proven far more intractable than market theory would predict.[4] Overcoming these obstacles is not just about promoting economic efficiency. It is also about protecting the environment and minimizing impacts on communities in remote water basins that have often become the target for seemingly insatiable demands of growing urban centers. These remote communities are most vulnerable when water markets fail.[5]

The need to reform current law as it relates to water transfers is especially urgent because of the anticipated impacts of climate change.

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2. *See* TERRY L. ANDERSON, WATER CRISIS: ENDING THE POLICY DROUGHT (1983); *see also* Harrison C. Dunning, *State Equitable Apportionment of Western Water Resources*, 66 NEB. L. REV. 76, 78 (1987) ("Discussion of 'water marketing' is much in the air, as are other means for promoting increased efficiency in the use of water."); Ronald C. Griffin & Fred O. Boadu, *Water Marketing in Texas: Opportunities for Reform*, 32 NAT. RESOURCES J. 265, 276 (1992) ("Overall, there are some compelling reasons to believe that surface water marketing is serving the state well.").

3. The consumptive municipal use of water in Denver, Colorado amounts to 234,000 acre-feet per year, which is equivalent to 2% of all of Colorado's state-wide consumptive use. *About Us, Denver Water's Water Use*, *available at* www.denverwater.org/AboutUs/KeyFacts/. Metropolitan Denver has a gross municipal product of $152.8 billion, which is approximately 66% of the Colorado State gross domestic product (GDP) of $231.6 billion. U.S. Dep't of Commerce, Bureau of Econ. Analysis, 2011, *available at* http://www.bea.gov/newsreleases/regional/gdp_metro/2011/pdf/gdp_metro0211.pdf. Irrigation in the state of Colorado accounted for 90% of the consumptive use within the state in 2005. ESTIMATED USE OF WATER IN THE UNITED STATES, U.S. Geological Survey, U.S. Dep't of the Interior (2005), *available at* http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf. Net farm income in Colorado accounted for $745 million or approximately 0.3% percent of the state gross domestic product in 2009. *State Fact Sheets: Colorado*, U.S.D.A. (July 11, 2011), *available at* http://www.ers.usda.gov/StateFacts/CO.HTM.

4. *See* A. DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 2:13 (1988).

5. Kenneth R. Weber, *Effects of Water Transfers on Rural Areas: A Response to Shupe, Weatherford, and Checchio*, 30 NAT. RESOURCES J. 13 (1990); Steven J. Shupe, et al., *Western Water Rights: The Era of Reallocation*, 29 NAT. RESOURCES J. 413, 428–30 (1989) ("Water right transfers threaten not only county tax bases, but also the overall economic health of rural areas . . . The overall quality and character of life can be undermined in areas where historic irrigation suddenly is terminated."); George A. Gould, *Transfer of Water Rights*, 29 NAT. RESOURCES J. 457, 473–75 (1989).

The example that perhaps best illustrates this point is the Colorado River Basin. The Colorado River plays an important role in the economic health and water supplies of seven western states,[6] as well as Mexico and various native tribes.[7] A complex web of laws, interstate compacts, and government policies have helped to shape water allocations among the parties, and despite some early, overly optimistic assumptions about the available water supply,[8] the parties have historically managed to satisfy most of their water needs.[9] Unfortunately, water use in the Basin has finally caught up with the supply,[10] and climate change is projected to reduce Colorado River flows by over nine percent by 2060.[11] Although 9 percent may seem like a modest reduction in overall flows, such a loss could seriously disrupt the precarious balance of rights that currently exists among the states.[12] Moreover, the impact of this loss of approximately 1.35 million acre-feet (MAF) of the average annual flows of 15 MAF[13] would likely be concentrated in the Upper Basin States.[14] Since

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6. The seven Colorado River Basin states are Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

7. David H. Getches, *Competing Demands for the Colorado River*, 56 U. COLO. L. REV. 413, 413–14 (1984–1985).

8. James S. Lochhead, *Upper Basin Perspective on California's Claims to Water from the Colorado River Part I: The Law of the River*, 4 U. DENV. WATER L. REV. 291, 317–19 (2000–2001) (discussing the mistaken water estimates of the 1922 compact); Stuart H. Burness & James P. Quirk, *Water Law, Water Transfers, and Economic Efficiency: The Colorado River*, 23 J.L. & ECON. 111, 114 (1980) (discussing that earlier estimates of river flow were biased upwards).

9. Getches, *supra* note 7, at 420.

10. *Interim Report No. 1: Colorado River Basin Water Supply and Demand Study*, Figure 1, SR-4; Figure 2, SR-7, U.S. Bureau of Reclamation, (June 2011), *available at* http://www.usbr.gov/lc/region/programs/crbstudy/Report1/StatusRpt.pdf.

11. *Id.* at B-76.

12. *Id.* at SR-6.

13. *Id.* at B-26.

14. The Upper Basin states are Arizona, Colorado, New Mexico, Utah, and Wyoming. Colorado River Compact Colorado River Compact, N.M. STAT. ANN. § 72-15-5, art. II(b) (1922); *See* § 72-15-5, art. III(a); *see also* Charles J. Meyers & Richard L. Noble, *The Colorado River: The Treaty with Mexico*, 19 STAN. L. REV. 367, 388-89 (1966–1967) (noting that the negotiators of the Colorado River Compact of 1922 assumed that the Upper and Lower Basins would each receive approximately 7.5 MAF annually with an additional 1.5 MAF going to Mexico).

Unfortunately, the assumption that at least 16.5 MAF of water would be available on average annually has proven wrong. Douglas Kenney, *Rethinking the Future of the Colorado River: Draft Interim Report of the Colorado River Governance Initiative* 70 (2010), *available at* http://www.waterpolicy.info/archives/docs/CRGI-Interim-Report.pdf. In fact, only about 15 MAF has been available and in the decade from 2001–2010, flows averaged only about 12 MAF. *Id.* at 17, 70; *see also Colorado River Basin Water Supply and Demand Study, Interim Report No.1*, Bureau of Reclamation (June 2011), *available at* http://www.usbr.gov/lc/region/programs/crbstudy/report1.html. The reason that the Upper Basin states are expected to bear the brunt of any reduced flows is because the Compact does not actually

well over 80 percent of the Upper Basin's water is consumed by agricultural crops[15]—much of it for lower-value feed crops[16]—transfers of water from agricultural to urban use appear to be an obvious solution to the water shortages that may ultimately face the Upper Basin.

This article offers concrete solutions to promote the development of robust water markets. It begins with a review of water transfers in the western United States and historical water use patterns that help illuminate the problem. It then considers several case studies designed to help illustrate the opportunities and obstacles to the efficient movement of water. I focus in particular on the Northern Colorado Water Conservancy District (NCWCD) and its innovative mechanism for transferring water from its Colorado-Big Thompson Project, and on a still evolving

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split the available flows between the Upper and Lower Basins, but instead requires the Upper Basin to "not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years." Art. III(d); Kenney, *supra* at 13, 43. In addition, the Upper Basin essentially shares with the Lower Basin the obligation to satisfy Mexico's treaty entitlement of 1.5 MAF. Art. III(c); Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande art. 10(a), U.S.-Mex., Feb. 3, 1944, T.S. No. 994; Thus, the Lower Basin states appear to have rights that are more or less fixed, although the Lower Basin's obligation to share deliveries to Mexico could conceivably reduce its share by 0.75 MAF/year annually. Kenney, *supra* at 37, 42–43. The Compact does allow the Upper Basin to retain priority rights over any water allocated before the 1922 Compact was signed (Art. VIII), but these appropriations are only about 2.2 MAF. *Id.* at 48.

15. In the Upper Basin states, irrigation accounted for 87% of total water use in 2005. ESTIMATED USE OF WATER IN THE UNITED STATES, *supra* note 3.

16. In 2007, there were 2,296,765 acres of irrigated harvested cropland in Colorado. *2007 Census Publications: Colorado*, United States Department of Agriculture: The Census of Agriculture, Table 10, *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Colorado/st08_1_009_010.pdf. Of those acres, 81% were used for hay and corn grown for grain, silage or greenchop. *Id.* at Table 33, *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Colorado/st08_1_033_033.pdf. 727,118 acres grew corn for grain, silage or greenchop and 1,139,480 acres grew hay. *Id.* Note that "[i]f two or more crops were harvested from the same land during the year (double cropping), the acres were counted for each crop. Therefore, the total acres of all crops harvested generally exceeded the acres of cropland harvested. An exception to this procedure was hay crops. When more than one cutting of hay was taken from the same acres, the acres were counted only once for the harvesting method but the quantity harvested includes all cuttings. Acreage cut and tons harvested for both dry hay and haylage, silage, or greenchop was reported for each crop. For inter-planted crops or ''skip-row'' crops, acres were reported according to the portion of the field occupied, whether by a crop or whether it was idle land. If a crop was inter-planted in an orchard or vineyard and harvested, then the entire orchard or vineyard acreage was reported under the appropriate fruit crop and the inter-planted estimated crop acreage was reported under the appropriate crop." *Id.* at Appendix B, B-4, *available at* http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Colorado/coappxb.pdf.

proposal—often described as the "Super Ditch,"—that seeks to move water from agricultural to urban use without requiring farmers to relinquish control over their water rights. The article then derives lessons from these and other examples, and concludes with a series of recommendations for reforming western water law in ways that will promote sensible water transfers.

II. The Law of Water Transfers

From its earliest incarnations, the prior appropriation doctrine that evolved in most western states allowed users to transfer perfected[17] water rights from their original use to some other beneficial use.[18] The interdependent nature of most prior appropriation water rights, however, persuaded these states to authorize such transfers only where they could be carried out without injury to existing users.[19] Such injuries may occur, for example, where transfers reduce the amount or timing of return flows.[20] Moreover, in order to avoid burdening existing users with

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17. As a general rule, states do not allow parties to transfer unperfected rights— that is rights that have not been applied to the beneficial use for which they were authorized— in part because of the fear that allowing such transfers would promote speculation. *See, e.g.*, Catherland Reclamation Dist. v. Lower Platte North Natural Resources Dist., 433 N.W. 2d 161, 165 (Neb. 1988); Green River Development Co. v. FMC Corp., 660 P.2d 339, 344 (Wyo. 1983).

18. At least one western state — Wyoming — initially prohibited transfers entirely. *See* WYO. STAT. ANN. § 41-3-101 (2011), which to this day provides in relevant part that "[w]ater rights for the direct use of the natural unstored flow of any stream cannot be detached from the lands, place or purpose for which they are acquired. . .." This prohibition has since been superseded by an express provision that allows transfers, but only under strict conditions. WYO. STAT. ANN. § 41-3-104 (2011). Other western states have taken a more liberal view of transfers, but generally subject to the "no injury" standard. For example, ARIZ. REV. STAT. ANN. § 45-172 (2011) allows water transfers with some limitations. "A water right may be severed from the land to which it is appurtenant or from the site of its use if for other than irrigation purposes and with the consent and approval of the owner of such right may be transferred. . .." *Id.*

19. ARIZ. REV. STAT. ANN. § 45-172(A)(2) (2011) states in relevant part that, "[v]ested or existing rights to the use of water shall not be affected, infringed upon nor interfered with, and in no event shall the water diverted or used after the transfer of such rights exceed the vested rights existing at the time of such severance and transfer. . .." CAL. WATER CODE § 1745.07 (2011) states in relevant part that "[n]o transfer of water pursuant to this article or any other provision of law shall cause a forfeiture, diminution, or impairment of any water rights."

20. *See e.g.*, Phoenix Water Co. v. Fletcher, 23 Cal. 481, 487 (Cal. 1863); Lawrence J. MacDonnell & Teresa A. Rice, *Moving Agricultural Water to Cities: The Search for Smarter Approaches*, 2 HASTINGS W.-NW. J. ENVTL L. & POL'Y 27, 29 (1994) ("The understanding reached in Colorado is that a proposed transfer should be considered in terms of its net depletive effects on the stream and on the manner in which it would change the timing of flows. A reduction in the historical availability of water to another appropriator, either

the need to prove injury, many states place the burden of showing "no injury" on the proponent of the transfer.[21] Some states restrict transfers even beyond these requirements. Wyoming, for example, limits transfers to those that will not increase the historic, consumptive, beneficial use of the water resource, or reduce historic return flows—even if injury to existing users cannot be shown.[22]

On its face, the "no injury" rule is simple and sensible. It helps ensure that the compact to honor priorities among water users on a given stream is not upset by changes to the system instigated by an existing user or her successor.[23] Unfortunately, as currently implemented, the no injury rule often imposes extraordinary transaction costs, primarily in the form of legal and expert fees. In particular, uncertainties about

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because of increased depletion by the new use or because the new use changes the timing with which the water is available to other appropriators, will be regarded as an injury to those appropriators and will not be permitted.").

21. *See, e.g.*, *Santa Fe Trail Ranches Property Owners Ass'n. v. Simpson*, 990 P.2d 46, 58 (Colo. 1999), which held in part that, "[i]n a change of use and augmentation case, applicant seeking change must demonstrate that the timing of diversions and the quantity of consumption for the changed use will not exceed those of the perfected appropriation, and that return flows of native waters from the decreed use at its place of use-upon which junior appropriators and prospective new appropriators often depend for their supply-will not be diminished."; *see also Farmer's High Line Canal & Reservoir Co. v. City of Golden*, 975 P.2d 189, 197 (Colo. 1999), which held in relevant part that, "[i]t is the water court's duty to hear testimony regarding the alleged injurious effects of the change of use of water and to aid the parties in crafting conditions of water rights decree to prevent such injury." Put differently, "[c]hanging the place of diversion of adjudicated water rights cannot enlarge or expand the water right at the expense of other appropriators or the state." *W.S. Ranch Co. v. Kaiser Steel Corp.*, 439 P.2d 714,718 (N.M. 1968).

22. WYO. STAT. ANN. § 41-3-104 (2011) ("The change in use, or change in place of use, may be allowed, provided that the quantity of water transferred by the granting of the petition shall not exceed the amount of water historically diverted under the existing use, nor exceed the historic rate of diversion under the existing use, nor increase the historic amount consumptively used under the existing use, nor decrease the historic amount of return flow, nor in any manner injure other lawful appropriators."). *See also* Basin Elec. Power Coop. v. State Bd. of Control, 578 P.2d 557, 567 (Wyo. 1978) ("[T]he Board of Control properly interpreted § 41-3-104, supra, as requiring separate consideration of and limitation to historical consumptive uses even though injury to other appropriators was not at issue."). In its original water statutes, drafted in large measure by Wyoming's first State Engineer, Elwood Mead, Wyoming prohibited water transfers altogether. Mark Squillace, *Water Marketing in Wyoming*, 31 ARIZ. L. REV. 865, 884 (1989). This legislation reflected Mead's concern that speculators would hoard the state's water resources in a manner detrimental to the public interest. *Id.* The prohibition of water transfers in Wyoming gradually gave way to the current law, which allows transfers, albeit subject to additional restrictions beyond the typical "no injury" rule. *Id.*

23. MacDonnell & Rice, *supra* note 20, at 30–31. ("At one level, such protection [the no injury rule] makes eminent good sense; transfers ought not to leave other water users in the same system worse off.").

the scope and extent of injuries from a proposed transfer encourage parties on both sides to hire experts to predict an outcome that favors the legal position of their clients.[24] In addition to the significant costs associated with proving or disproving injury, all of this also takes considerable time, which means that a transfer applicant may not know for several years whether her application will be approved, and if it is approved how much water will be authorized for transfer if it is approved.[25] Litigation, of course, can add substantially to the time, cost, and uncertainty surrounding any transfer proposal.[26]

Arguably, much of the cost and uncertainty associated with water transfers can be traced to the resistance of the agricultural community to any transfers that propose moving water out of agricultural use.[27] This resistance stems, in large part, from the threats that water transfers pose to the economic stability of rural communities.[28] Perhaps most obviously, moving water from farms to cities usually means a loss of the economic activity associated with that farm.[29]

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24. Injuries may result not only from the loss of water resources from a particular basin, but also the loss of late season flows that often result from the application of water to upstream agricultural lands. *See* Hall v. Kuiper, 510 P.2d 329 (Colo. 1973); *see also* John H. Davidson, *Reallocation, Transfer, and Change Elements*, in WATER AND WATER RIGHTS, §14.04(c) (Robert E. Beck ed. 1991).

25. *See e.g.*, Peter D. Nichols & Douglas S. Kenney, *Watering Growth in Colorado: Swept Along by the Current or Choosing a Better Line*, 6 U. DENV. WATER L. REV. 411, 420 (2003) ("Complex cases can stretch over years and attract dozens of opponents. For example, litigation over Union Park extended from 1984 through 2000, and included over twenty parties." Bd. of County Comm'rs of County of Arapahoe v. Crystal Creek Homeowners Ass'n, 14 P.3d 325, 329 (Colo. 2000)); *Id.* at 421. ("Although engineers can estimate the yield of a water right, adjudication is necessary to determine consumptive use. Thus, purchasers of existing rights for new municipal uses may not know in advance the actual yield of the rights they are purchasing for transfer. The junior protection rule [COLO. REV. STAT. § 37-902-305(3)] guarantees in many, perhaps most, situations that not all of a water right can be transferred, and it is not apparent at the time of filing a change case which junior appropriators will be injured and what will be necessary to keep them whole, even with extensive engineering."). *See also* Bonny Colby Saliba et al., *Do Water Market Prices Appropriately Measure Water Values*, 27 NAT. RESOURCES J. 617, 621 (1987) (explaining that when individuals are unable to ascertain the legal rights and restrictions of a water purchase, they are unlikely to purchase a water right).

26. *See, e.g.*, Nichols & Kenney, *supra* note 25, at 421–22 (2003).

27. *See, e.g.*, In re Application of Howard Sleeper, 760 P.2d 787, 788–89 (N.M. Ct. App. 1988) (responding to protestants challenge that a transfer of water rights to a ski resort harmed the public welfare); MacDonnell & Rice, *supra* note 20, at 28. ("Purchases of agricultural lands in the Owens Valley and the associated water rights by the City of Los Angeles earlier in this century, provoked so much controversy that it essentially ended water marketing as a way of meeting urban water demands in California until the last ten years.").

28. Shupe et al., *supra* note 5, at 428–29.

29. Studies from California, Colorado, and Oregon confirm "that water availability is a significant determinate of farmland value." *Economic Impacts of Climate Change on Agricul-*

Less obvious, but no less real, is the risk to the land itself. When cities buy irrigated farmland for the purpose of transferring the water resources, they have often engaged in what some have pejoratively called "buy and dry"[30] practices. "Buy and dry" refers to the situation where the buyer essentially abandons the land after the water rights are transferred without restoring the land to a stable and productive state.[31] Thus, instead of reverting to native grasses that might contribute to a bucolic setting attractive to tourists and new settlers, the land subject to "buy and dry" practices may become infested with unattractive, opportunistic, non-native weeds, that further diminish the prospects for a vibrant rural economy. It is no wonder then that many people in rural areas are hostile to water transfers and are often willing to work together to block transfers or legal reforms that make transfers easier.[32] Overcoming, or at least neutralizing, this hostility is critical to improving the prospects for a robust agricultural to urban transfer program.

To be sure, agricultural to urban water transfers still do occur,[33] but the costs, delays, uncertainties, and political and social challenges posed by water transfers combine to discourage many municipal water suppliers from viewing such transfers as a viable option for solving their water supply needs.[34] Instead, many cities continue to rely on engineering solutions, despite the enormous environmental and economic costs

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tural Water Use in California, 15 (2005), *available at* http://www.energy.ca.gov/2005publications/CEC-500-2005-054/CEC-500-2005-054.pdf, and http://are.berkeley.edu/~fisher/ClimateChange.pdf; Brian E. Gray, *The Shape of Transfers to Come: A Model Water Transfer Act for California*, 4 HASTINGS W.-NW. J. ENVTL L. & POL'Y 23, 40 (1996) (discussing loss of economic activity associated with transfer of water); Charles W. Howe & Christopher Goemans, *Economic Efficiency and Equity Considerations in Regional Water Transfers: A Comparative Analysis of Two Basins in Colorado* 13 (2003).

30. *See, e.g.*, 26th Annual Water Law Conference: *Twenty-First Century Water Supply, Use and Distribution: Do the Rules Still Apply?*, 11 U. DENV. WATER L. REV. 389, 405–06 (2008) ("'[B]uy and dry' [is] the permanent transfer [of water] from agricultural use to municipal use that can dry the land. . . . [T]he transfer is a one-time deal where municipalities buy shares in a ditch company, often far from the municipality, and the water is permanently removed from irrigation use by the ditch company. The irrigator and the region then can suffer from the limited or lost agricultural productivity resulting from the water transfer.").

31. *See Id.*

32. *See e.g.*, In re Application of Howard Sleeper, *supra* note 27. *See also* Weber, *supra* note 5 (discussing the adverse effects on rural communities when water rights are lost).

33. For example, the Fort-Collins-Loveland Water District, the city of Evans, and the town of Lyons acquired from irrigators a total of 67 Colorado-Big Thompson units in February 2009. 23 WATER STRATEGIST 2, Feb. 2009.

34. *See, e.g.*, Sarah Klahn, *The Blind Man and the Elephant: Describing Drought in Colorado*, 6 U. DENV. WATER L. REV. 519, 534 (2003). ("As in past droughts, the legislature has determined that one solution is to build more storage projects . . .. The legislature adopted Senate Bill 236, which requested voter approval to float $2 billion in bonds for reservoir construction as a part of a so-called 'drought-package.'").

of such proposals.[35] Notwithstanding these obstacles, transfers are often the most efficient way to address growing water demands.[36] Legal reforms then must meaningfully address the very real problems historically created by transfers, while at the same time finding ways to simplify and streamline the transfer process.

Of course, legal reforms carry risk. Some will argue that reforms that facilitate transfers do so at the expense of existing users and, if they go too far, might even result in an unconstitutional taking of existing water rights.[37] This issue is explored in greater detail below.[38] Moreover, for the reasons noted above, rural communities will undoubtedly perceive a streamlined water transfers process as a vehicle for undermining rural economies, and thus view reforms skeptically.

It is hard to deny that a simpler and less costly water transfer system will likely move more water out of rural communities and into urban areas since, as was previously noted, irrigated agriculture is far and away the dominant consumptive use of water resources in the West.[39] Thus, it seems inevitable that cities looking for new water supplies will cast their gaze toward agricultural communities. Agricultural water rights are also attractive because they tend to be the most senior rights.[40] Moreover, while agriculture is an important component of the

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35. *See, e.g.*, Mark Squillace, *Accounting for Water Rights in the Western United States*, in INTERNATIONAL WATER ACCOUNTING: EFFECTIVE MANAGEMENT OF A SCARCE RESOURCE (2012).

36. *See e.g.*, Douglas S. Kenney, *Relative Costs of New Water Supply Options for Front Range Cities*, Phase 1 Report 21 (July 2010) (unpublished draft), *available at* http://www.rlch.org/archive/wp-content/uploads/2010/07/10_RR_Kenneycostofwater1.pdf. ("[O]ur estimates of representative costs (in $/AF) are as follows: new projects, $16,200; water transfers, $14,000; and conservation, $5,200.").

37. If a transfer causes even a minor injury, the injured party could conceivably allege a partial, physical taking of a water right. *Cf.* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 426 (1982). Arguably though, a change in transfer laws that tolerate minor injuries to existing rights would be viewed as regulatory and thus subject to the more relaxed takings analysis of *Penn Central Transportation Co. v. New York City*, 438 U.S. 104, 124 (1978). Under this test, the regulation would be upheld so long as it did not interfere with the reasonable, investment-backed expectations of the allegedly injured party.

38. *See infra* Section III.

39. For example, an estimated 90% of the total water consumed in Colorado was used for irrigation in 2005. ESTIMATED USE OF WATER IN THE UNITED STATES, *supra* note 3. In Montana, 96% of the total water consumed was used for irrigation. *Id.* In California, irrigation accounted for 74% of total state water use. *Id.*

40. Moreover, much agricultural water is used to grow relatively low-value feed crops or surplus crops that receive other government subsidies. *See, e.g.*, Charles T. DuMars, *Public Policy Considerations in State Water Allocations and Management*, 42 ROCKY MTN. MIN. L. INST. 24-1, 24-4 (1996) ("While the demand for urban uses is increasing, most senior water rights remain in agricultural uses criticized by some as economically inefficient."); Adam Schempp, *Western Water in the 21st Century: Policies and Programs that Stretch Supplies in a*

economies of these rural areas, it is not a significant part of the overall economy in any western state.[41] Indeed, even with the disincentives embedded in the current system, agricultural to urban transfers seem to be increasing.[42]

Still, water transfers remain a fraught option for urban communities seeking additional water supplies.[43] As a result, proposals to develop new water supplies—often at enormous financial and environmental costs—abound.[44] If the political, legal, and practical problems associated with traditional transfers could be fixed, the demand for new engineering projects could very well disappear.[45] The good news is that water transfers can be optimized and made more attractive with relatively modest reforms to current law. If western states are going to adapt sensibly to climate change, then such reforms are vital.

A successful campaign to reform current transfer laws must plainly account for the concerns of rural communities and ensure that they will remain vibrant, even if they lose some water resources. If rural communities instead perceive changes to water transfer laws as promoting the "buy and dry" policies of the past, then such changes are not likely to garner much political support. Fortunately, legal reforms that address all of the legitimate concerns of rural areas are possible. While the politics of reforming transfer laws will undoubtedly prove daunting—even with proposals that are sensitive to rural impacts—legal obstacles to changing existing water transfer laws are relatively easy to surmount.

Studying successful water transfer systems is the best way to understand opportunities for efficiently moving agricultural water to urban use. To those who know water allocation law, it will come as no surprise

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Prior Appropriation World, 40 ENVTL. L. REP. (Envtl. Law Inst.) 10394, 10411 (2010) ("Water rights can remain with lower value uses, such as agriculture (commonly the most senior water rights)."); *see also* Dudley D. Johnson, *An Optimal State of Water Law: Fixed Water Rights and Flexible Market Prices*, 57 VA. L. REV. 345 (1971) (discussing water allocation deficiencies and possible solutions within existing allocation systems).

41. *See generally* ESTIMATED USE OF WATER IN THE UNITED STATES, *supra* note 3.

42. Charles W. Howe, Jeffrey K. Lazo & Kenneth R. Weber, *The Economic Impacts of Agriculture-to-Urban Water Transfers on the Area of Origin: A Case Study of the Arkansas River Valley in Colorado*, 72 AM. J. AGRIC. ECON. 1200, 1202 (1990) (Table 2 indicates that of all agricultural to urban transfers, 48,389 acres were transferred in major transactions from 1955–1985. 129,210 acres will be potentially transferred from 1990-2013); PETER D. NICHOLS, MEGAN K. MURPHY, & DOUGLAS S. KENNEY, WATER AND GROWTH IN COLORADO: A REVIEW OF LEGAL AND POLICY ISSUES, 113 fig. 13b (2001), *available at* http://cstpr.colorado.edu/wwa/products/Water_and_Growth_web_full_report.pdf.

43. *See, e.g.*, Nichols & Kenney, *supra* note 25, at 421–22.

44. *See supra* note 34, at 534–35.

45. *See infra* text accompanying notes 90–91.

that many of these systems have evolved in the context of special purpose water districts[46] and mutual ditch companies.[47] Such districts and companies often hold substantial water rights that are commonly available for a wide range of uses anywhere within the boundaries of what are sometimes rather large geographic areas.[48] Changing the use or place of use of such water—that is "transferring" the water—falls outside the scope of state transfer laws so long as the use is of a type and at a place authorized under the original grant.[49] Since special purpose districts and mutual ditch companies provide well over half the water to water users in the West,[50] focusing reform efforts on such agencies could be an efficient way to modernize water transfer law. At a minimum, and, as will be shown, the operation of these agencies can inform proposals to change water transfer laws generally by providing examples of the efficient reallocation of water.

III. Water Transfers and the Takings Clause

One of the great myths of western water law is that water rights are property rights that are essentially inviolable. To be sure, water rights are vested property rights, and unless users abandon or waste those rights the State cannot generally reclaim them without paying just

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46. It is difficult to simplify descriptions of these districts, other than to say that they are quasi-governmental agencies organized in accordance with detailed legislation adopted in the various states. John Leshy once aptly noted that the "practical impossibility of generalizing about modern special water districts. They are, in fact, rather like snowflakes, each with its own unique form. Many of these typically lengthy statutes apply to only one or a handful of districts, and only a few lawyers and district managers may be familiar with their provisions." JOHN D. LESHY, *Special Water Districts – The Historical Background*, in James Corbridge, Ed., SPECIAL WATER DISTRICTS: CHALLENGE FOR THE FUTURE, Natural Resources Law Center, Boulder, Colorado (1983).

47. *See* JOHN H. DAVIDSON, *Mutual Ditch or Water Corporations*, *in* WATERS AND WATER RIGHTS, §26.02 (Robert E. Beck ed., 1991) (explaining that mutual ditch companies are "usually in the form of a non-profit corporation organized for the exclusive benefit of the users in a particular area who became its stockholders," with the goal of "provid[ing] a vehicle for organizing the distribution of water so that the individual water users were relieved of the burden of managing the ditch.").

48. *See, e.g.*, *infra* text accompanying note 137, ("Perhaps the most unique feature of the CBT project—and most relevant to this study—is that CBT water rights are represented by 310,000 shares or units") Shupe et al., *supra* note 5, at 423–24.

49. *See, e.g.*, *infra* text accompanying note 168.

50. *See, e.g.*, Barton H. Thompson, Jr., *Institutional Perspectives on Water Policy and Markets*, 81 CAL. L. REV. 671, 688 tbl.2 (1993) (In 1978, public water districts supplied 56.8% of California's water, mutuals supplied 9.0%; public water districts supplied 7.1% of Colorado's water, mutuals supplied 69.9%; public water districts supplied 24.7% of Wyoming's water, mutuals supplied 30.7%.).

compensation.[51] However, the State cannot manage or restrict the uses of water rights in ways that go beyond the restrictions imposed in the original grants. Such post-acquisition restrictions are common to most forms of property and do not inevitably lead to a valid claim that the property rights have been unconstitutionally "taken."[52]

Moreover, for several reasons, water rights are among the most tenuous forms of property. As such, they have one of the least compelling claims to be free from government restrictions, even where such restrictions are imposed after the rights are perfected. First, the State owns all water resources in every American state with positive water law. A water right gives only a right to use the water, and while even use rights can be quite valuable, States historically gave them to water users for free.[53] While this largesse does not allow the State to withdraw these rights, States have always claimed the power to set rules to regulate, among other things, the allocation of water, abandonment and forfeiture of rights, transfers of water rights, and beneficial use of water resources. And as with forms of real property, States may sometimes add new rules or set new restrictions on existing water rights without compensating the owner. Those new rules are not likely to lead to a valid "takings" claims unless they interfere with the owner's "distinct investment-backed expectations."[54]

Furthermore, minor departures from the priority system are common in the prior appropriation system, and are tolerated even where they might harm vested water rights. For example, the fact that an inaccurate flume might injure another water user by effectively allowing the diversion of more than one's entitlement,[55] or the fact that an appropriator might change crops and thereby consume more water in a manner detrimental to an existing user, will not generally trigger a valid legal claim by an injured water users. Likewise, existing users may recapture,

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51. *See* Brian E. Gray, *The Property Right in Water*, 9 HASTINGS W-NW. J. ENVTL. L. & POL'Y 2 (2002). *Compare* Tulare Lake Basin Water Storage Dist. v. U.S., 49 Fed. Cl. 313 (2001), *with* Klamath Irrigation Dist. v. U.S., 67 Fed. Cl. 504 (2005).

52. *See* U.S. CONST. amend. V (". . .*nor shall private property be taken for a public use without just compensation*."); *see also* Euclid v. Ambler Realty, 272 U.S. 365 (1926) (upholding post acquisition restrictions and corresponding diminution of value against a takings challenge); *See also* Penn. Cent. Transp. Co. v. City of New York, 438 U.S. 104 (1978).

53. One notable exception is the State of Montana, which provides for leasing large water rights from the State. MONT. CODE ANN. § 85-2-407 (2011).

54. *See* Penn. Cent. Transp. Co. v. City of N. Y., 438 U.S. 104 (1978).

55. A flume is an artificial channel or trough constructed to divert and measure water flows through a stream or river. Inaccuracies may arise from the poor construction of a flume, resulting in a shift of the flume's foundation or submerging of the flume. Additionally trash and sediment can become trapped in a flume and lead to inaccurate measurement. *See* Squillace, *supra* note 35 at 271–72.

reuse and thereby consume more water than they historically consumed, to the detriment of other users, without giving rise to a valid cause of action.[56] Tolerating such vagaries in the priority system is probably sensible and perhaps even necessary to operating the system efficiently, but it also illustrates how a water right is not the inviolate form of property that some wish to claim for it.

To be sure, claims that a state or federal rule gives rise to an unconstitutional taking do sometimes arise, and can be successful.[57] One strategy, for example, is to argue that a restriction curtailing the amount of water available to a user amounts to a partial "physical taking" of the water. The Supreme Court has suggested that a physical taking constitutes a *per se* taking of property.[58] However, unless the state is physically appropriating the water for its own use, courts are more likely to subject the restrictions to the more forgiving test articulated by the Supreme Court in *Penn Central Transportation Co. v. New York City*.[59] There the Court held that a regulation restricting the use of property should be upheld unless it interfered with the owners "distinct investment backed expectations."[60]

Given the widespread tolerance for minor injuries to water rights that occur under the current prior appropriation system, it seems unlikely that injuries to existing users—resulting from modest changes in the current water transfers system—would interfere with the distinct, investment-backed expectations of the existing user.

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56. *See* City of Thornton v. Bijou Irrigation Co., 926 P.2d 1 (Colo. 1996); Binning v. Miller, 102 P.2d 54 (Wyo. 1940); Dep't. of Ecology v. United States Bureau of Reclamation, 827 P.2d 275 (Wash. 1992).

57. *See, e.g.*, Hage v. United States, 687 F.3d. 1281, 1290 (Fed. Cir. 2012). ("The government, for example, could not entirely fence off a water source, such as a lake, and prevent a water rights holder from accessing such water. Assuming the other criteria for a Fifth Amendment taking were met, such fencing could be a taking.").

58. *See* Loretto v. Teleprompter Manhattan CATV Corp., 458 U.S. 419, 426, 35–36 (1982). (Holding that a permanent physical occupation of private property, however minor, results in a per se taking, regardless of the public interest advanced by the occupation.); *see also Klamath Irrigation Dist. v. United States*, 635 F.3d 505 (Fed. Cir. 2011); Sacramento Grazing Ass'n, Inc. v. United States, 96 Fed. Cl. 175 (2010). As with any property, the physical taking of a water right requires physical occupation, such as a diversion, in order to implicate the Penn Central test.

59. 438 U.S. at 124.

60. *Id.* at 124. The Court also considered the "the character of the governmental action," referring specifically to the notion that a physical invasion is more likely to support a takings claim. *Id.*

IV. The Economics of Water Transfers

The story of water transfers in the western United States is largely a story of market failure.[61] Although water transfers occur on a fairly regular basis in most western states,[62] they do not occur as quickly or as easily as they would likely occur in a free market, even where water supplies are stressed.[63] Furthermore, the transaction costs associated with many proposed transfers often prove prohibitive.[64]

Understanding why water markets have historically failed to provide for efficient water reallocation requires a review of basic microeconomic theory. A competitive market typically exhibits the following characteristics: (1) a large number of buyers and sellers; (2) products that are fungible, or indistinguishable to consumers; (3) consumers and producers with perfect information about prices and quality; and (4) firms with equal knowledge of and access to relevant technology.[65] Markets lacking one or more of these characteristics may fail to allocate goods efficiently.

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61. *See, e.g.*, L.M. HARTMAN AND DON SEASTONE, WATER TRANSFERS: ECONOMIC EFFICIENCY AND ALTERNATIVE INSTITUTIONS 1 (1970); *see also* J.F. Booker et al., *Economics and the Modeling of Water Resources and Policies*, NAT. RES. MODEL, Feb 2012, at 173 ("[C]ompetitive markets for water are rare if not absent throughout the world.").

62. *See* Bonnie G. Colby, Mark A. McGinnis & Ken Rait, *Procedural Aspects of State Water Law: Transferring Water Rights in the Western States, Water Transfer Symposium*, 31 ARIZ. L. REV. 697, 697 (1989) (summarizing the procedural differences in the evaluation of water right change applications across eight western states); *see also* C.W. Howe, J.K. Lazo, & K.R. Weber, *supra* note 42, at 1200 (1990) ("A major U.S. Geological Survey-funded study (MacDonnell, *et al*.) has found frequent water transfers in several western states (Colorado, New Mexico, Utah) but infrequent transfers in other states (e.g., California and Wyoming), the frequency being strongly affected by the institutional structure for effecting transfers and the pressure on water supplies.").

63. In economic terms, supplies are likely to be stressed when the demand for water is high and the supply comparatively low.

64. *See, e.g.*, Nichols & Kenney, *supra* note 25, at 422. ("The minimal transaction costs of acquiring existing trans-basin diversions for municipal use are a sharp contrast to the extreme costs associated with newly proposed trans-basin diversions. For example, the American Water Development, Inc. ("AWDI") proposal to export water from the San Luis Valley to the Denver Metro area consumed nine years and several million dollars in attorneys' fees and engineering fees associated with expert testimony presented in court."; The Colorado Supreme Court ended AWDI's plans when it upheld the District Court's dismissal of AWDI's water rights application. Am. Water Dev., Inc. v. City of Alamosa, 874 P.2d 352, 357, 359, 368 (Colo. 1994); *see also* Charles W. Howe, Carolyn S. Boggs & Peter Butler, *Transaction Costs as Determinants of Water Transfers*, 61 U. COLO. L. REV. 393 (1990) [hereinafter *Transaction Costs as Determinants*].

65. DAVID BESANKO & RONALD R. BRAEUTIGAM, MICROECONOMICS 330 (4th ed. 2011). The authors suggest that water markets seem to fail primarily because water rights are not fungible and to a lesser extent because information about price and value is likely imperfect.

At first blush, water rights might seem to fit the bill reasonably well. Many people own water rights and many others are interested in buying those rights. Basic information about the sale price of water is reasonably well-known,[66] and interested parties have some sense about the value of water in individual water basins.[67]A closer look reveals some structural problems that will have to be overcome if the free market in water is ever going to thrive. In particular, under the current legal system, water rights often fail the fungibility test because they are not homogenous. Moreover, the limited number of transfers and the Colorado-Big Thompson (CBT) market's dominant influence in the transfer picture may skew information about the price and quality of water.[68]

In order to be fungible, a water right must be essentially the same anywhere it is available within a given geographic market.[69] Put another way, if water rights were fungible, a buyer interested in purchasing an acre-foot of water should be able to walk into a marketplace and purchase that acre-foot of water at a negotiated price, and then take that water to the desired point of end use. To be sure, the location and quality of that acre-foot of water may affect the price since it will have to be delivered to the point of use, and perhaps treated to bring it to the quality required for that use. But the value of property is commonly dependent on location and quality, and such differences by themselves should not deter water transactions. The real obstacle to the fungibility of water rights seems to be the uncertainty that the no injury rule brings to the transfer.[70] Uncertainty causes significant delays and denies the buyer the ability to know exactly how much water will be available for use after the transfer.[71] Thus, the buyer cannot accurately compare the cost of

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66. *See* David S. Brookshire et al., *Market Prices for Water in the Semiarid West of the United States*, 40 WATER RESOURCES RESEARCH 1 (2004).

67. Decisions to pursue engineering solutions, for example, are generally weighed against the relative cost of acquiring water through transfers. *See, e.g.*, U.S. ARMY CORPS OF ENGINEERS, OMAHA DIST., NORTHERN INTEGRATED SUPPLY PROJECT DEIS, ES- 7 (Apr. 2008), *available at* http://www.northernwater.org/docs/NISP/MapsDocuments/ExecSummNispDeisApr08.pdf.

68. *See infra*, text accompanying notes 88–90. The Colorado Big Thompson project is discussed in greater detail at part V.A. of the article. *See also* BESANKO & BRAEUTIGAM, *supra* note 65, at 330; Saliba et al., *supra* note 25 at 632.

69. *See* Saliba et al., *supra* note 25, at 648.

70. *Id.* at 617, 621 (explaining that when individuals are unable to ascertain the legal rights and restrictions of a water purchase, they are unlikely to purchase a water right).

71. *Id.* at 645 (1987) (noting that legal, hydrologic, and economic uncertainties are present in water markets and reduce market participation and distort market prices); *see also Transaction Costs as Determinants*, *supra* note 64, at 397 (noting that because water transfers must go through the review of the Water Court or State Engineer, and because the Water Court may impose conditions upon the transfer, the final transfer is likely to contain terms

water available for transfer with water that might be available from a water development project or some other source.[72] Moreover, this uncertainty greatly increases the transaction costs associated with transferring water, and overcoming this uncertainty is too often an expensive, complex, and time-consuming task.[73]

As previously described, the no injury rule allows any existing water user who might be affected by a proposed transfer to block that transfer even for minor injuries that might result from the proposed changes to the water system. Such injuries might include, for example, a change in the timing of return flows.[74] Consequently, a water right taken from one location on a stream is not fungible with a water right taken from another location on that same stream if existing users are in a position to complain about injuries, such as the loss of late season return flows.

Importantly, this problem does not manifest itself with storage water rights, which is why successful water markets are almost always associated with stored water.[75] Since stored water in the western United States is typically collected in the spring as snow melts in the mountains, the owner's priorities are satisfied at the time of storage. Once the water is stored, it is free from the "call of the river"[76] and it can be quickly and easily sold within the project area for the types of uses for which is was

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not found in the original application such as restrictions on total volume, flow rate, and timing).

72. *See* Saliba et al., *supra* note 25, at 651 (explaining that information regarding the amount and price of water as well as the restrictions that will be placed on the use of said water are essential in the valuation process of a proposed transfer of water).

73. Uncertainties in water transfers lead to buyers and sellers bearing the cost of risks that take the form of brokerage service fees, hydrology studies, and legal representation. *Transaction Costs as Determinants*, *supra* note 64, at 397. These transaction costs become prohibitively large for most prospective parties to a transfer as is evidenced by the proposed American Water Development, Inc. transfer that spent seven and a half years in court and several million dollars in attorneys' and engineering fees. *See* Am. Water Dev., Inc. v. City of Alamosa, 874 P.2d 352, 357, 359 (Colo. 1994); *see also* Nichols & Kenney, *supra* note 25, at 422; *see also* Howe, Lazo, & Weber *supra* note 42, at 1202 ("Water sales and subsequent transfers may be negotiated over several years. . .There is no such thing as a clean-cut water transfer.").

74. *See, e.g.*, COLO. REV. STAT. §37-92-304 (2011).

75. *See, e.g.*, Margaret Bushman LaBianca, *The Arizona Water Bank and the Law of the River*, 40 ARIZ. L. REV. 659, 676 (1998); Morris Israel & Jay R. Lund, *Recent California Water Transfers: Implications for Water Management*, 35 NAT. RESOURCES J. 1, 13 (1995); *see also* Booker et al., *supra* note 61, at 28 ("Economists have long suggested that market institutions such as water rights transfers and water banks have the potential to increase economic efficiency relative to traditional water allocation institutions. . .").

76. A call of the river allows senior water rights holders to require junior water rights holders upstream to curtail use if senior rights holders are not receiving their entitled portion due to low stream flow. Charles W. Howe, *Water Law and Economics: An Assessment of*

originally approved, without review by state officials, and without concern about injury. Most of the large storage projects are owned and managed by special purpose water districts and mutual ditch companies, which is one reason that these agencies have proved more capable of transferring water efficiently.[77]

As already noted, one of the chief obstacles to making water rights fungible is the inadequate definition of the property right. Western water law has traditionally defined water rights in terms of the amount of water that can be diverted out of a stream.[78] While this may be a necessary requirement for identifying a property right in water, it is hardly sufficient if the goal is to promote a robust water market. The system largely functions on the basis of the amount of water *consumed*, not the amount of water *diverted*.[79] More specifically, the diversion amount tells a prospective buyer very little about the amount of water that might be available for transfer. If water rights were defined both in terms of a diversion amount and a consumptive use amount, the prospects for a free market in water would brighten markedly.[80] In particular, one can easily imagine a thriving market of consumptive use amounts within a single water basin, and perhaps even among multiple basins.

Of course, even defining water rights in terms of consumptive use would not by itself make transfers any easier. As mentioned above, current law in most jurisdictions explicitly recognizes the right of existing water users to block transfers if they suffer injuries, even where the transfer amount is limited to consumptive use.[81] However, a relatively simple change to the law would require water rights to be defined in terms of their consumptive use and to presumptively allow that amount to be transferred. Indeed, such a change would be easy to accommodate under the current legal regime, would likely cause no greater injury than

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River Calls and the South Platte Well Shut-Down, 12 U. DENV. WATER L. REV. 181, 181–82 (2008).

77. *See supra* text accompanying footnotes 23–27 for a discussion of a robust water market and its accompanying storage facilities.

78. Santa Fe Trail Ranches Prop. Owners Ass'n v. Simpson, 990 P.2d 46, 57 (Colo. 1999).

79. *Id.* at 51–59.

80. *See* Lawrence J. MacDonnell, *Public Water-Private Water: Anti-Speculation, Water Reallocation and High Plains A&M, LLC v. Southeastern Colorado Water Cons District*, 10 U. DEN. WATER L. REV. 1, 3 (2006) (suggesting that consumptive use "effectively privatizes the water."); ANTONY FRANK AND DAVID CARLSON, COLORADO DEPARTMENT OF AGRICULTURE, COLORADO'S NET IRRIGATION REQUIREMENTS FOR AGRICULTURE, tbl.1 (1995), *available at* http://cospl.coalliance.org/fez/eserv/co:3072/ag92ir71999internet.pdf; Nichols & Kenney, *supra* note 25, at 421.

81. *See, e.g.*, COLO. REV. STAT. § 37-92-304 (2011); WYO. STAT. ANN. § 41-3-104(a) (2011).

is already tolerated under the law, and could potentially limit other forms of injury.

For example, in every western state, agricultural water users are free to grow any crop they can successfully cultivate. But the choice of crop greatly affects the amount of water consumed.[82] In Colorado, alfalfa typically consumes nearly two acre-feet of water per acre whereas sunflowers consume 1.34 acre-feet of water per acre.[83] Yet an agricultural user may freely switch from sunflowers to alfalfa, even if such a change causes a significant injury to existing users. Likewise, in most western states agricultural users are free to recapture and reuse water, so long as they recapture and reuse the water for the same purpose, and on the land for which the rights were appropriated.[84] Users are free to reuse the water even if such reuse increases the amount of water consumed.[85] Finally, measuring the amount of water diverted through a ditch is far from an exact science, and measurement errors are routinely tolerated, even if they might cause injury to existing users.[86] Defining water rights in terms of consumptive use would ensure that efforts to recapture and reuse, or to change crops would not result in the consumption of water resources in excess of legal allotment.

Tolerating such errors in the allocation of a scarce resource like water may be necessary and appropriate, but these examples highlight the inconsistent way that water transfers are treated under the law. The smallest injuries could result in the denial of a transfer application, but farmers do not need approval to change to crops that could cause far greater injuries to existing users. Allowing parties to transfer consumptive use amounts, without regard to the relatively minor injuries that such transfers might cause, would help address the definitional problem with water rights that exists under the current system, and could easily be accomplished in accordance with property rights principles. The courts have consistently recognized the power of government agencies to impose modest constraints on the use of property without having to

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82. SAVE THE POUDRE COAL., A REVIEW OF THE LIKELY AGRICULTURAL IMPACTS FROM THE NORTHERN INTEGRATED SUPPLY PROJECT, app. A, tbl.4 (2008), *available at* http://www.savethepoudre.org/docs/stp_ag_impacts_analysis.pdf.

83. ANTONY FRANK & DAVID CARLSON, COLORADO'S NET IRRIGATION REQUIREMENTS FOR AGRICULTURE, 1995, tbl.1 (1999), *available at* http://cospl.coalliance.org/fez/eserv/co:3072/ag92ir71999internet.pdf.

84. *See, e.g.*, Montana v. Wyoming, 131 S. Ct. 1765, 1774-76 (2011).

85. *Id.* at 1774.

86. *See* Squillace, *supra* note 35.

compensate the property owner for any possible loss of value.[87] That government agencies are able to impose such limits on the use of private water rights should be especially clear in the context of a resource where the property owner has only a use right and the State holds the corpus of the right in trust for the people.[88]

The difficulties inherent in transferring water in the West have the unfortunate effect of increasing the price of the limited supplies of water that are readily available for transfer. This can be seen from the ease with which users trade CBT units and the extraordinarily high price that these units command in the market place.[89] From 2007–2009 there were 353 permanent transfers in the western United States.[90] Of those transfers, 61 percent—or 216 transfers—involved CBT units in Colorado.[91] Put another way, more than 60 percent of all transfer activity involved a single project that represents a tiny fraction of total allocated water rights in the western states. Prices for CBT units purchased in Colorado from 2007–2009 were also among the highest recorded for permanent transfers in western states.[92] The relative paucity of these transfers calls into ques-

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87. *See* Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 397 (1926); Goldblatt v. Town of Hempstead, 369 U.S. 590, 592-93 (1962); Keystone Bituminous Coal Ass'n v. DeBenedictis, 480 U.S. 470, 488 (1987); Palazzolo v. Rhode Island, 533 U.S. 606, 630 (2001).

88. *See* COLO. CONST. art. XVI, § 5; IDAHO CONST. art. XV, § 1; CAL. CONST. art. X, § 5; WYO. CONST. art. I, § 31.

89. *See* Booker et al., *supra* note 61, at 208 ("Gardner and Miller (1983) . . .. found that while most CBT shares at that time were held by agricultural users, prices fully reflected expected values to future municipal and industrial buyers.").

90. There were 135 permanent transfers in the west in 2007, 87 of which were for CBT units. WATER STRATEGIST, 2007 ANNUAL TRANSACTION REVIEW 11–15 (2008). In 2008 there were 116 permanent transfers, 69 of which involved CBT units. WATER STRATEGIST, 2008 ANNUAL TRANSACTION REVIEW 8–12 (2009). In 2009 there were 102 permanent transfers in the western states, 60 of which involved CBT units. WATER STRATEGIST, 2009 ANNUAL TRANSACTION REVIEW 9–13 (2010).

91. WATER STRATEGIST, 2007 ANNUAL TRANSACTION REVIEW 11–15 (2008); WATER STRATEGIST, 2008 ANNUAL TRANSACTION REVIEW 8–12 (2009); WATER STRATEGIST, 2009 ANNUAL TRANSACTION REVIEW 9–13 (2010).

92. In 2007, CBT units were purchased from $9,215–$10,500/unit ($11,519–$13,125/AF) on average. WATER STRATEGIST, 2007 ANNUAL TRANSACTION REVIEW 18 (2008). These prices were significantly higher than recorded prices for permanent transfers in most western states. *Id.* at 11–15. Examples of prices in other western states include purchases of pumping rights to Edwards Aquifer in Texas for $5,000/AF and non-irrigation water rights in Arizona for $1,200–$2,000/AF. *Id.* In 2008, average CBT prices ranged from $9,215–$9,716/unit ($13,164–$13,880/AF), excluding certain November transactions because their price was negotiated in 2002. WATER STRATEGIST, 2008 ANNUAL TRANSACTION REVIEW 16 (2009). In Texas, pumping rights for the Edwards aquifer again sold for $5,000/AF and non-irrigation water rights in Arizona sold for $1,200–$2,000/AF. *Id.* Prices ranged from $1,800–$3,650/AF in California in the Mojave River Basin. *Id.* CBT units in 2009 sold for $7,133–$10,000/unit ($8,916–$12,500/AF) on average. WATER STRATEGIST, 2009 ANNUAL

tion the adequacy of the public's information about the true price of water.

If the only consequence of this market failure in water resources was that municipal residents were forced to pay a higher price for their water, this might be an acceptable outcome. Yet, the consequences are far more serious, especially in terms of environmental impacts. When a city decides that it needs to secure additional water resources it has several options. First, and perhaps most importantly, it can embark on a water conservation program to reduce per capita consumption.[93] Second, it can purchase senior water rights (or farmlands that include senior water rights) and begin the process of transferring that water to municipal use.[94] As previously noted, this can be a long and expensive process with an uncertain outcome. Third, it can look to developing new sources of water, either from groundwater or water storage projects.[95] Groundwater is not always available and may not be a secure, long-term resource.[96]

TRANSACTION REVIEW 16 (2010). In Texas, rights to the Edwards Aquifer sold for $5,400 – $6,500/AF. *Id.* Non-irrigation rights in Arizona sold for $1,000–$2,000/AF. *Id.* Prices in the Mojave River Basin of California ranged from $400–$3,841. *Id.* CBT units are converted to acre feet using a quota set each year by the NCWCD. The quota was 80% in 2007 and 2009, and 70% in 2008. *See generally News Releases*, Northern Colorado Water Conservancy District, http://www.northernwater.org/MediaAndNews/NewsReleases.aspx. *See infra* text accompanying notes 191–197 explaining the CBT quota system.

93. *See* KENNEY, MAZZONE & BEDINGFIELD, *supra* note 36 (comparing costs of conservation programs, water transfers and water development projects). Study finds that conservation is the cheapest option. *Id.* at 5.

94. *See supra* text accompanying notes 29–31. *See also* KENNEY, MAZZONE & BEDINGFIELD, *supra* note 36, at 2 (assessing the relative costs of water transfers to other water supply options).

95. Both groundwater and storage projects have found little success in the past 20 years. *See generally* Nichols & Kenney, *supra* note 25, at 427; *see, e.g.*, Am. Water Dev., Inc., v. City of Alamosa, 874 P.2d 352, 358-59 (Colo. 1994) (American Water Development, Inc., was defeated in its attempt to tap and export 200,000 acre-feet of groundwater from beneath land it owned in the San Luis Valley as it was determined to be tributary groundwater). Additionally, new development of water storage projects is considered by most commentators to be nearly impossible because of environmental and area-of-origin considerations. *See, e.g.*, Nichols & Kenney, *supra* note 25, at 447 (claiming that any new development will be small scale and "unconventional" reservoirs).

96. Although most groundwater aquifers do have a certain level of recharge or replenishment, the rate is markedly slow, and therefore, groundwater resources are usually considered non-renewable. *See, e.g.*, Stephen Foster et al., *Utilization of Non-Renewable Groundwater: A Socially-Sustainable Approach to Resource Management*, *in* SUSTAINABLE GROUNDWATER MANAGEMENT: CONCEPTS AND TOOLS, Briefing Note 11 (2002), *available at* cap-net.org/sites/cap-net.org/files/wtr_mngmnt_tls/38_GWMate11.pdf; *see also* PETER D. NICHOLS, MEGAN K. MURPHY & DOUGLAS S. KENNEY, WATER AND GROWTH IN COLORADO: A REVIEW OF LEGAL AND POLICY ISSUES 99, 103 (2001) (explaining that in Colorado, tributary groundwater is treated like surface waters under the prior appropriation system and that

Moreover, much groundwater is hydrologically connected to surface water and thus often leads to conflicts with senior surface water users.[97]

Water storage, often with water from remote water basins, has historically proved to be a reliable source for new water resources. However, stored water can also be very expensive. To justify construction of new projects, a city typically compares the cost of building and operating the project to other options, including the costs associated with buying, transferring, and delivering water from existing users.[98] If the cost of transferring water is inflated well beyond the true market price, water development looks far more reasonable.[99]

Suppose, for example, that a city decides it needs to secure an additional 10,000 acre-feet of water to satisfy its projected demands. If the price for water in a dysfunctional market is currently $10,000/acre-foot (including delivery costs) then, assuming that operation and maintenance costs are comparable, the city will likely opt to transfer water rights only if the cost of a project to produce that water is more than $100 million—the cost of purchasing and transferring 10,000 acre-feet of water rights. If the true market price for water, however, is $1,000 per acre-foot, then the city would be justified in pursuing the project only if the project could be built for less than $10 million.[100] Perhaps more importantly, if the city is not sure how much water it will get from the proposed transfer, or how long it will take to consummate the transfer, the city might

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non-tributary groundwater can only be permanent source of water supply if withdrawals are limited to the recharge rate).

97. *See, e.g.*, Am. Water Dev., Inc. v. City of Alamosa, 874 P.2d 352, 357, 359, 368 (Colo. 1994); *Kobobel v. State*, 249 P.3d 1127, 1136 (Colo. 2011); Three Bells Ranch Associates v. Cache La Poudre Water Users Ass'n, 758 P.2d 164, 169–70 (Colo. 1988).

98. *E.g.*, U.S. ARMY CORPS OF ENGINEERS, OMAHA DIST., *supra* note 67, at ES-3.

99. Nichols & Kenney, *supra* note 25, at 421–22. ("[M]unicipalities such as Colorado Springs, Pueblo, Pueblo West, and Aurora now own almost all of the water from the Twin Lakes project located south of Leadville, a trans-basin project originally designed to serve irrigation interests. Shares sell for $10,000 to $15,000, a price dramatically higher than the cost of native Arkansas River water. Yet, buying shares of trans-basin water for municipal use makes better economic sense than buying native water since it is generally possible to unilaterally change the use without the uncertainty or risk of water court. C-BT shares exhibit a similar trend. Municipal water providers concerned about water court costs to convert native water dramatically bid up the price of C-BT units. Weighted C-BT prices rose steadily from around $3,600 per acre-foot in June 1996 to nearly $26,000 per acre-foot in April 2000. In contrast, competing native irrigation water sells for $500 to $1,000 per acre-foot, depending on location.").

100. *See, e.g.*, U.S. ARMY CORPS OF ENGINEERS, OMAHA DIST., *supra* note 67, at ES-7. No action alternative which would involve acquiring the water from CBT would cost an estimated $830,500,000. This is significantly more than the other proposed alternatives, all of which involve major water development projects. *Id.*

reasonably opt to build the project even if it is projected to cost more due to the uncertainties surrounding the transfer.

While water transfers can have adverse environmental impacts,[101] limiting transfers to the existing consumptive use (i.e., the amount that has historically been consumed by the existing user), and restricting transfers to the basin of origin, would largely guarantee relatively modest environmental impacts. By contrast, water development projects—especially those that draw water from remote water basins—are far more likely to impose serious environmental damage.[102] The costs and benefits associated with the projects may justify these damages as compared to the alternatives. But when the water transfer alternative is based upon the significantly inflated costs of a dysfunctional market, environmentalists and economic conservatives alike can fairly question whether a more rational approach to water transfers should be fashioned. Suggestions for reforming current law and practices to overcome the problems identified in this section are set out in a later section of this article.[103] Suffice to say that relatively minor changes to existing law could correct some of the most troubling flaws in the current system and help to promote a truly free and flourishing water market.

One additional, but important, advantage of defining water rights in terms of consumptive use is the fundamental way that it changes incentives for farmers. Under current law, a farmer's incentive is to grow the most water consumptive crop possible, especially if that farmer is even remotely contemplating a possible future transfer of the water right. This is because the transfer amount will likely be limited to the amount of water historically consumed.[104] If however, a water right is defined in terms of its consumptive use, the farmer has the opposite incentive.

Consider, for example, a farmer who has historically grown alfalfa on 100 acres of land. That farmer would typically consume about 193 acre-feet of water in northeastern Colorado.[105] If the law defined that farmer's water right as the full 193 acre-feet of water consumed by the alfalfa crop, that farmer would have a powerful incentive to switch to a

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101. *E.g.,* Morris Israel & Jay R. Lund, *Recent California Water Transfers: Implications for Water Management*, 35 NAT. RESOURCES J. 1, 13 (1995)(explaining environmental impacts of California's water banks).

102. *See, e.g.*, U.S. ARMY CORPS OF ENGINEERS, OMAHA DIST., MOFFAT COLLECTION SYSTEM PROJECT (MOFFAT PROJECT) DRAFT ENVIRONMENTAL IMPACT STATEMENT (Oct. 2009); U.S. ARMY CORPS OF ENGINEERS, OMAHA DIST., *supra* note 67.

103. *See infra* Part VI.

104. *See, e.g.*, WYO. STAT. ANN. § 41-3-104(a) (current through July 15, 2012); *see also* Orr v. Arapahoe Water & Sanitation Dist., 753 P.2d 1217, 1223–24 (Colo. 1988).

105. SAVE THE POUDRE COAL., *supra* note 82. *See also* FRANK & CARLSON, *supra* note 83.

less water intensive crop so as to be able to sell the remaining right. Growing sunflowers, for example, in northeastern Colorado would consume about 134 acre-feet of water.[106] Thus, the farmer could continue to farm, albeit with a different crop, while at the same time realizing a significant profit from selling the water saved as a result of the crop switch.

V. Case Studies of Water Transfers

To better understand how water transfers happen, a review of projects that facilitate or are designed to facilitate transfers will be useful. These projects both inform the possibilities for water transfers and point to some of the obstacles that still remain. Two particular projects receive special attention here. The first looks at a single special purpose district—the Northern Colorado Water Conservancy District (NCWCD)—and its program for moving water simply and efficiently among the many prospective users in a large geographic area encompassing most of northeastern Colorado. This is not the first such study of this District,[107] and it will undoubtedly not be the last. This study is unique, however, in highlighting features of the NCWCD that promote the easy movement of water. It also examines some of the ways in which the operation of the District could further be improved to facilitate the movement of water. The second case study examines the "Super Ditch Company" proposal that would essentially combine several ditch companies in the Arkansas River valley for the purposes of promoting agricultural to urban water transfers in a way that keeps rural areas in control of the water rights and thus protects rural interests.

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106. *Id.*

107. *See, e.g.*, DANIEL TYLER, THE LAST WATER HOLE IN THE WEST: THE COLORADO-BIG THOMPSON PROJECT AND THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT (1992); David S. Brookshire et al., *Market Prices for Water in the Semiarid West of the United States*, 40 WATER RES., July 29, 2004, at 1; Janis M. Carey & David L. Sunding, *Emerging Markets in Water: A Comparative Institutional Analysis of the Central Valley and Colorado–Big Thompson Projects*, 41 NAT. RESOURCES J. 283 (2001); Raymond L. Anderson, *Windfall Gains from Transfer of Water Allotments within the Colorado-Big Thompson Project*, 43 LAND ECON. 265 (1967); Charles W. Howe, *Project Benefits and Costs from National and Regional Viewpoints: Methodological Issues and Case Study of the Colorado–Big Thompson Project*, 27 NAT. RESOURCES J. 5 (1987); Saliba et al., *supra* note 25, at 631; Charles W. Howe et al., *Innovations in Water Management: Lessons from the Colorado-Big Thompson Project and Northern Colorado Water Conservancy District*, *in* SCARCE WATER AND INSTITUTIONAL CHANGE, 171 (1986); Charles W. Howe et al., *Innovative Approaches to Water Allocation: The Potential for Water Markets*, 22 WATER RESOURCES RES., Apr. 1986, at 439; HARTMAN & SEASTONE, *supra* note 61, at 45.

A. The Colorado-Big Thompson Project

The story of the Colorado Big Thompson (CBT) project and its remarkable success in achieving a robust market for its water resources dates back to 1870, even before Colorado became a state. Two thousand settlers established the Union Colony at what is now Greeley,[108] irrigating 12,000 acres, and taking appropriated water directly from the South Platte River.[109] By 1900, Union Colony and other landowners in the region had already over-appropriated the water in the streams.[110] If agriculture in the region was to continue to grow, water would need to come from across the Great Divide.[111]

In the 1920s, as annual crop losses mounted due to inadequate native water supplies, individual farmers and mutual irrigation companies sought government support to secure more reliable sources of irrigation water.[112] In 1929, the Colorado State Engineer, the Platte Valley Water Conservation League, and the United States Army Corps of Engineers sponsored a study that found that the water resources in the South Platte Basin were insufficient to meet the current and future supply demands for Northeastern Colorado.[113] However, the study identified a potential surplus of water on the western side of the Continental Divide, within the headwaters of the Colorado River.[114] In 1935, the United States Bureau of Reclamation began surveying the Colorado River Basin to determine the feasibility of a west-to-east trans-mountain water diversion, as well as the potential impact that such a diversion might have on future development on the Western Slope.[115] In 1937 Congress approved construction of the trans-mountain water diversion and supply project, known as the Colorado-Big Thompson Project (CBT).[116]

The project's approval was contingent upon the formation of a public water district in Colorado to contract with the United States government for repayment of the project costs.[117] Later in 1937, the same

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108. ROBERT AUTOBEE, COLORADO–BIG THOMPSON PROJECT 3 (1996), *available at* http://www.usbr.gov/projects//ImageServer?imgName=Doc_1303159857902.pdf.

109. U.S. Bureau of Reclamation, *Colorado–Big Thompson Project*, Development, USBR.GOV, http://www.usbr.gov/projects/Project.jsp?proj_Name=Colorado-Big+Thompson+Project (last updated July 23, 2012).

110. *Id.*

111. *Id.*

112. *Id.*

113. *Id.*

114. *Id.*

115. *Id.*

116. Interior Department Appropriation Act, 1938, Pub. L. No. 75-249, 50 Stat. 564, 595 (1937).

117. AUTOBEE, *supra* note 108, at 11.

year that Congress authorized the CBT project, the Colorado Legislature enacted the Colorado Water Conservancy Act,[118] which authorizes a district court to organize a conservancy district upon petition of a stipulated number of property owners.[119] Landowners in Larimer, Boulder, Weld, Morgan, Washington, Logan, and Sedgwick counties subsequently created the Northern Colorado Water Conservancy District (NCWCD) and designated it as a public agency authorized to contract with the United States for the development and management of the CBT system and its water supply.[120]

According to the NCWCD *Water Conservation and Management Plan*, "[t]he District's primary purpose is to provide supplemental water for agricultural, municipal, domestic, and industrial uses in northeastern Colorado."[121] The NCWCD encompasses approximately 1.6 million acres in portions of eight counties, with boundaries encompassing the majority of irrigated land within the South Platte watershed downstream of Fort Lupton.[122] This area includes the principal tributary rivers of the Cache la Poudre, the Big and Little Thompson, the St. Vrain, and Boulder Creek.[123]

NCWCD serves a population of approximately 830,000 and delivers an average of 213,000 acre-feet per year to more than 100 ditch, reservoir, and irrigation companies, and thirty-two municipalities.[124] This

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118. COL. REV. STAT. § 37-45-101 (1937).

119. *Id.* at §§108–109.

120. *See* NORTHERN WATER, WATER CONSERVATION AND MANAGEMENT PLAN 8 (2011) [hereinafter NCWCD Management Plan], *available at* http://www.northernwater.org/docs/WaterConservation/WaterConservationMngtPlan.pdf.

121. *Id.* at 9. "Through the C-BT Project, Northern Water helps administer the delivery of an average of 215,000 acre-feet of Colorado River water annually to northeastern Colorado for municipal, agricultural and industrial uses. The C-BT Project provides these additional water supplies to the region as a supplemental supply, not the sole source of water, for water users." *Id.*; *see also* U.S. Bureau of Reclamation, *Colorado–Big Thompson Project*, Benefits, USBR.GOV, http://www.usbr.gov/projects/Project.jsp?proj_Name=Colorado-Big+Thompson+Project (last updated July 23, 2012) ("Eleven communities now receive full or supplemental [use from the project]."); *see also* AUTOBEE, *supra* note 108, at 12 ("[The project] provide[s] water to existing farmlands and was not designed to reclaim uncultivated land.").

122. Northern Water, *Water Projects*, NORTHERNWATER.ORG, http://www.northernwater.org/WaterProjects/WaterProjects.aspx (last visited Nov. 5, 2012).

123. Northern Water, *How the Colorado-Big Thompson Project Works*, NORTHERNWATER.ORG, http://www.northernwater.org/WaterProjects/HowtheC-BTWorks.aspx (last visited Nov. 5, 2012).

124. The most recent yearly data from the NCWCD shows an annual use of 213,000 acre-feet. NORTHERN WATER, 2010 WATER QUALITY REPORT: FLOWING SITES EXECUTIVE SUMMARY 4 (2010), *available at* http://www.northernwater.org/docs/WaterQuality/WQ_Reports/2010WqRepExecSumm.pdf. The NCWCD Management Plan found in 2011 that the project had delivered an annual average of 215,000 acre-feet per year to the service area. NCWCD Management Plan, *supra* note 120, at 9.

amounts to about 10 percent of the total water used within the NCWCD's service area annually.[125]

As noted previously, Congress mandated the establishment of the NCWCD essentially to manage the CBT project. The project consists of a collection and distribution system encompassing 12 reservoirs, 35 miles of tunnels, and 95 miles of canals.[126] Within the Colorado River Basin on Colorado's Western Slope, Willow Creek and Shadow Mountain Reservoirs, along with Grand Lake and Lake Granby collect and store water for the CBT system.[127] A series of pumps move water up from Lake Granby to Shadow Mountain Reservoir, which then flows into Grand Lake.[128] From there, the 13.1 miles long Alva B. Adams Tunnel carries Colorado River water under the Continental Divide to tunnels, canals, and pipelines that divert and disperse the water to users throughout northeastern Colorado.[129] A number of reservoirs store the CBT flows on the Eastern Slope, and the system forks to the north and south, tying distribution into South Platte River tributaries from the Cache la Poudre River to Boulder Creek.[130]

The significant hydroelectric power revenues that the CBT project generates contribute substantially to the economic feasibility of the water transfers system.[131] After it crosses the Continental Divide, CBT water generates hydroelectric power at five stations as it descends nearly one-half mile before meeting its first tributary, the Big Thompson River.[132] Seven hundred miles of transmission lines within the CBT system transport this generated power to various substations.[133] CBT generates an average of 760 million kilowatt-hours on an annual basis, with all power

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125. Between 1957–2003 the CBT Project annually provided 221,381 acre-feet of water to water users within
NCWCD's boundaries. *See* NCWCD Management Plan, *supra* note 120, Table 9, Appendix G. Therefore, CBT water only made up 10% of all the water used within the District boundaries (2,232,757 acre-feet annually). *Id.* Of the 2,232,757 acre-feet of water used within the District annually, 657,595 acre-feet are pumped from wells. *Id.*

126. *Northern Water C-BT,* NORTHERN Colorado Water Conservancy District, http://www.northernwater.org/WaterProjects/CBTProject.aspx (last visited Nov. 4, 2012).

127. *Id.*

128. *Id.*

129. *Id.*

130. *See* United States Bureau of Reclamation, *Project Details – Colorado-Big Thompson Project – Facility Descriptions* [hereinafter Project Details – CBT], USBR.GOV, http://www.usbr.gov/projects/Project.jsp?proj_Name=Colorado-Big+Thompson+Project (last visited Nov. 5, 2011).

131. *See* AUTOBEE, *supra* note 108, at 12, 28.

132. *See* Project Details – CBT, supra note 130.

133. *See* AUTOBEE, *supra* note 108, at 28.

revenues held by the United States through the Department of Energy's Western Area Power Administration and the Bureau of Reclamation.[134]

The CBT system has a total storage capacity of 925,456 acre-feet, with the majority of its Western Slope capacity held within Lake Granby (539,758 acre-feet), and the Front Range capacity primarily coming from Horsetooth Reservoir (156,735 acre-feet) and Carter Lake (112,230 acre-feet).[135] With 75,000 acre-feet of dead storage, Lake Granby can hold over two years of CBT water in active storage.[136] CBT water rights are owned by the Bureau of Reclamation and the water is sold to the District under the terms of the Repayment Contract (Contract).[137]

Perhaps the most unique feature of the CBT project—and most relevant to this study—is that CBT water rights are represented by 310,000 shares or units.[138] Each share was supposed to represent an acre-foot of water to account for the 310,000 acre-feet of West Slope water that the project was designed to deliver.[139] On average, however, the CBT project only provides about 220,000 acre-feet annually to its shareholders, thus yielding an average of 0.7 acre-feet for each CBT share each year.[140] What makes this project so important for the study of water transfers is that the 310,000 CBT shares are freely marketable over the entire District—a vast geographic area that includes all of the urban areas along the Front Range of Colorado from Broomfield to Fort Collins.[141]

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134. *Id.*; *see also* Contract between the U.S. and the Northern Colorado Water Conservancy District Providing for the Construction of the Colorado-Big Thompson Project, 5 Jul. 1938, ¶ 18, at 24–25 [hereinafter Repayment Contract].

135. Northern Colorado Water Conservation District, *Colorado-Big Thompson Interpretive Area Brochure*, *available at* http://www.northernwater.org/docs/WaterConservation/CBT_InterpretiveArea.pdf.

136. *See* United States Geological Survey, 09018500 *Lake Granby Near Granby, CO*, PUBS.USGS.GOV, http://pubs.usgs.gov/wdr/wdr-co-03-1/vol2/html/09018500.2003.sw.html (last visited Nov. 4, 2012); *see also* Interview with Don Carlson and Brian Werner, NCWCD, in Berthoud, Colo. (July 17, 2009) ("Dead Storage" is defined as water storage space below the level of the spillway). [hereinafter Interview with Carlson & Werner].

137. *See* RICHARD W. WAHL, MARKETS FOR FEDERAL WATER: SUBSIDIES, PROPERTY RIGHTS AND THE BUREAU OF RECLAMATION 135 (1989); *see also* Repayment Contract, *supra* note 134.

138. *See* D.M. Frick & J.D. Salas, *Evaluating Modelling [sic] Strategies for a Complex Water Resource*, *in* IAHS Pub. No. 201 (1991), *available at* http://iahs.info/redbooks/a201/iahs_201_0105.pdf.

139. *Repayment Contract*, *supra* note 134,¶ 4, at 8.

140. *E.g.*, CBT shares were originally set at 0.6 for 2009 but were raised to 0.8 in April of that year and remained at 0.8 through the end of the water year in October. *See* Press Release, Brian Werner, Northern Water Waternews (April 10, 2009), *available at* http://www.northernwater.org/docs/Previous_News_Releases/2009_4_10_quota_set.pdf.

141. For a description of the geographic area encompassed by the District, *see* NCWCD Management Plan, *supra* note 120, at 8.

The primary documents that guide management of the CBT system and its water are the Colorado Water Conservancy Act,[142] Senate Document 80,[143] and the Repayment Contract with the United States.[144] Colorado's Water Conservancy Act provides the underlying legal authority for establishing water conservancy districts within the state.[145] Among the powers granted under the Act is the power to fix an *ad valorem* tax of up to one mill on all property within the District.[146] As required by the terms of the Contract, the District levies the full one mill tax on all property within its boundaries,[147] and that tax generates a large portion of the District's annual revenue.[148]

Senate Document 80 contains a detailed proposal and cost estimate for the CBT project as presented to the United States Senate.[149] The document, dated June 11, 1937, describes the reservoirs, pipelines, power plants, dams, and other structures that were to be built and implemented as part of the CBT delivery system.[150] Senate Document 80 describes three purposes for the CBT project: (1) to preserve the vested and future water rights in irrigation; (2) to conserve and make use of these waters for irrigation, power, industrial development, and other purposes; and (3) to maintain conditions of river flow for the benefit of domestic and sanitary uses of this water.[151]

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142. COLO. REV. STAT. §37-45-101 to 153 (2010).

143. Senate Document 80 was the Bureau of Reclamation's final report on the development and cost estimate of the Colorado-Big Thompson Project. Senate Document 80 also included letters of support from the primary groups representing water interests on the east and west sides of the project. After its acceptance by the U.S. Senate, Senate Document 80 "became the governing authority for construction and maintenance of the CBT system." *See* TYLER, *supra* note 107, at 82.

144. NCWCD Management Plan, *supra* note 120, at 49.

145. COLO. REV. STAT. §37-45-102(1)(a) (2011); The Colorado Supreme Court has held that a water conservancy district is a *de facto* municipal corporation with the power to levy taxes, People ex rel. Dunbar v. South Platte Water Conservancy District, 364 P.2d 215, 217 (Colo. 1961).

146. COLO. REV. STAT. §37-45-122(1) (2011); The statute also allows for water districts to build and operate water works, exercise eminent domain, and many other powers enumerated in § 37-45-118.

147. One mill equals $.001. The District's practices were confirmed in an interview with Don Carlson and Brian Werner, NCWCD, in Berthoud, Colo. (July 17, 2009); *see also* Repayment Contract, *supra* note 134 ¶15, at 21.

148. Northern Colorado Water Conservancy District Fund, *2010 Estimated Budget D1*, *available at* http://www.northernwater.org/docs/About_Us/Budgets/NW_budgets_2009_2010.pdf, (last visited Nov. 5, 2012)(the tax accounts for around $14 million of approximately $28 million in total revenue, a larger portion than any other source).

149. *See* TYLER, *supra* note 107, at 82.

150. NCWCD Management Plan, *supra* note 120, at 17.

151. Northern Colorado Water Conservancy District, Water Conservation and Management Plan 3 (2004); *Id.*

The Contract set out the terms and conditions for CBT project construction, management of project works and water resources, and cost allocation between the United States and the District for CBT construction, operation, and maintenance.[152] According to the Contract, "[t]he terms and conditions of the Repayment Contract dictate the use of CBT project water."[153]

The Contract also included a detailed but tentative list of major project works, such as CBT reservoirs, dams and hydroelectric power plants, canals, pumping plants, transmission lines, and the trans-mountain diversion tunnel.[154] It estimated that the cost of construction for the CBT project would be $44 million, but provided that "the total obligation of the District under this contract for construction shall in no event exceed $25,000,000," or about 57 percent of the estimated cost.[155] The reported final CBT project construction cost ballooned to $163 million (including power station construction costs),[156] thus reducing the District's share, which remained at $25,000,000, to less than 15 percent, even without taking into account the substantial value of the long-term, interest-free loan.[157] In 2006, the United States Congress adopted a resolution recognizing that the District's responsibility for payment had been fulfilled, but allowing for continuation of all other terms of the Contract.[158]

The Contract allocates possession, operation, maintenance, and costs related to project works.[159] The United States is responsible for power plants and associated works, while the District manages the vari-

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152. Repayment Contract, *supra* note 134 ¶1, at 1. (providing management terms for the CBT system). *See also* Jean Marie Boyer & Christine Hawley, *Operational and Water Quality Summary Report for Grand Lake and Shadow Mountain Reservoir* 5-6 (2010) (suggesting five "primary" purposes for the CBT project, two of which concern the protection of Grand Lake and its resources), *available at*, http://www.northernwater.org/docs/WaterQuality/WQ_Reports/2010ClarityRepGrandLake.pdf (last visited Nov. 5, 2012).

153. *See id.*

154. *Id.* ¶4, at 2-7.

155. *Id.* ¶5, at 9.

156. Charles H. Howe, *Project Benefits and Costs from National and Regional Viewpoints: Methodological Issues and Case Study of the Colorado-Big Thompson Project*, 26 NAT. RESOURCES J. 77, 84 (1986).

157. The Repayment Contract makes clear that the District's share was to be paid out in forty consecutive annual installments with no interest. Repayment Contract, *supra* note 134 ¶6, at 10; *see also* Tyler, *supra* note 107. The District also paid Grand County "the sum of $100,000.00, to compensate such County for loss due to the construction of the project. . .." *Repayment Contract*, *supra* note 134 ¶7, at 12. Regarding subsidies generally available under the Reclamation Act, *see* RICHARD W. WAHL, MARKETS FOR FEDERAL WATER: SUBSIDIES, PROPERTY RIGHTS AND THE BUREAU OF RECLAMATION 27–28 (1989).

158. H.R. 3443,109th Cong. (2nd Sess. 2006).

159. Repayment Contract, *supra* note 134.

ous canals and pumping plants.[160] All revenues generated from the power plants within the CBT system (excluding revenue from water releases at Green Mountain Reservoir[161]) go to the United States.[162]

The Contract also specifies revenues to be collected by the District, including CBT water rental rates and property taxes.[163] In order to make its repayments to the United States, "the District shall exercise its full powers under the Water Conservancy District Act of Colorado to produce the funds necessary to meet in full its obligations under this contract."[164] Water rental prices are to be "approved by the Secretary, but in no event less than $1.50 per acre-foot per annum."[165] Based on the taxation power granted under the Water Conservancy Act,[166] the Contract requires that "the District shall levy not less than one-mill tax on property within the District" annually.[167] Property taxes currently comprise about one half of all District revenues.[168]

Article 16 of the Contract lays out the terms of the District's "perpetual rights to use all water . . . that becomes available through the construction and operation of this project, for irrigation, domestic, municipal, and industrial purposes. . .."[169] Use of the water by the District for any power-generating purposes is prohibited.[170] The Contract also al-

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160. H.R. 3443, *supra* note 158, ¶¶8–9, at 12–16.

161. *See* Repayment Contract, *supra* note 134 ¶22, at 28. These revenues shall be disposed of pursuant to Article 22, which states:

> Miscellaneous revenues arising out of use of project works facilities and other properties. . .shall be credited to the cost of construction of the project until such times as the final determination of construction costs has been made by the Secretary. . .and thereafter shall be credited equally to the District and the United States; provided, however, that all revenues derived from the carriage of other than project water through the Continental Divide Tunnel shall be the property of the District.

162. *See id.* ¶18, at 24–25.

163. *Id.* ¶15, at 22.

164. *Id.*

165. *See id. Northern Water C-BT*, Northern Colorado Water Conservancy District, http://www.northernwater.org/WaterProjects/CBTProject.aspx (last visited Nov. 4, 2012) ¶10, at 17.

166. *See* COLO. REV. STAT. §§ 37-45-121, 122(1) (2011).

167. Repayment Contract, *supra* note 134, ¶ 15 at 21.

168. Northern Colorado Water Conservancy District, Comprehensive Annual Financial Report 3 (2009), *available at* http://www.northernwater.org/docs/annual_reports_nw_FINANCIAL/cafr09.pdf.

169. Repayment Contract, *supra* note 134, ¶ 16, at 23. These rights exclude "water made available by the Green Mountain Reservoir, (reserved for West Slope use as compensation for Colorado River water diverted out of basin by the CBT project) and the water rights reserved in Article 24 (a maximum of "three second-feet") for use in Rocky Mountain National Park], and in Article 25 (up to 500 acre feet per year for Estes Park). *Id.* ¶¶ 16, 24–25.

170. *Id.* ¶ 16, at 23.

lows the United States to demand a minimum annual flow of 255,000 acre-feet through the Alva B. Adams Tunnel for hydroelectric power generation.[171]

CBT water is imported into the South Platte Basin from the Colorado Basin and is therefore foreign water.[172] Under Colorado law, ". . .a developer of foreign water has the right to use, reuse, successively use, and dispose of such water. . . *subject to contractual obligations*."[173] The Contract effectively took away this significant advantage for foreign water by prohibiting a shareholder's reuse of CBT water.[174] Specifically, the Contract requires the District to reallocate return flows as a supplemental supply for downstream irrigation users within the District, free of charge.[175] This is sometimes described as the "Return Flow Policy."[176] The District is currently in the process of quantifying CBT return flows

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171. *Id.* In addition, the contract requires that the distribution and use of water by the District comply with the Reclamation Act, and Section 13 of the Boulder Canyon Project Act, which control the use and sale of public land for irrigation purposes.

172. This water is considered "foreign water" because it is water that is imported into a new stream system. *See e.g.*, 32A COLO. PRAC., METHODS OF PRACTICE § 76.10 (5th ed.); *see also* PETER D. NICHOLS, MEGAN K. MURPHY & DOUGLAS S. KENNEY, WATER AND GROWTH IN COLORADO: A REVIEW OF LEGAL AND POLICY ISSUES 39 (2001).

173. Town of Estes Park v. Northern Colo. Water Conservancy Dist., 677 P.2d 320, 326 (Colo.1984) (emphasis added).

174. TYLER, *supra* note 107, at 462. Article 19 of the Repayment Contract, provides in relevant part as follows:

> There is also *claimed and reserved by the United States for the use of the District for domestic, irrigation and industrial uses, all of the increment, seepage and return flow water* which may result from the construction of the project and the importation thereby, from an extraneous source, to-wit, from the Colorado River watershed, of a new and added supply of water to average 320,000 acre feet, or more, annually, into the streams of the South Platte watershed from which the irrigable lands within the District derive their water supply; and the *right is reserved on behalf of the District to capture, recapture, use and reuse the said added supply* so often and as it may appear at the stream intake headgates of ditches and reservoirs serving lands within the District. *Said captured, recaptured and return flow water shall be, by the Board of Directors of the District, allocated only to the irrigable lands within the District already being partially supplied with water for irrigation*, using as a basis for such allocation the decreed priorities existing at the date of this contract, and *without other or additional consideration or payments by the owners of such lands* therefore; provided no such captured, recaptured or return flow water shall be taken and held as supplying any appropriation or decreed priority of any such ditch or reservoir.

Repayment Contract, *supra* note 134, ¶ 19, at 25–26 (emphasis added).

175. *See* Carey & Sunding, *supra* note 107, at 324.

176. Interview with Carlson & Werner, *supra* note 136.

through a modeling project, with the goal of gathering information to better manage this water supply.[177]

Given the value of CBT water (currently more than $8,500/acre-foot) the decision to allocate return flows to secondary users without charge seems surprising.[178] Perhaps it is, as the Colorado Supreme Court has suggested, that "return flow rights were critical to the organizational and operational scheme of the district."[179] Indeed, return flows are the only benefit to the landowners in the eastern portion of the District along the South Platte River, who pay the District's ad valorem tax.[180] The Return Flow Policy has also been defended on the grounds that it protects Denver Water and other native South Platte water users because CBT return flows help satisfy senior appropriators along the South Platte and in the eastern portion of the District.[181] Were it not for return flows, these seniors might otherwise call out more junior South Platte water rights.[182] While this rationale is no doubt true, it is far from clear why the NCWCD should operate its project to benefit users outside the District at the expense of its own CBT shareholders.

Others have argued that the primary reason for the District retaining return flow rights is to prevent any future federal interference in these state water supplies, while also reducing transaction costs of CBT water.[183] This latter benefit may result from attempts by the District to avoid complaints by downstream irrigators who could allege interference with their water rights if CBT shareholders were allowed to reuse their water or increase the consumption of the water they currently use.[184]

CBT water is distributed to participants based on the number of units or shares of water owned by each account holder.[185] Each shareholder has a delivery contract with the District, giving them a perpetual

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177. *Id.*

178. In 2010, CBT water sold for as much as $9,000/acre-foot, 24 WATER STRATEGIST 11, 5, Nov. 2010, but CBT water has sold for as much $15,000/acre-foot in the past, Northern Colorado Water Conservancy District. Water records, on file with author.

179. *See* Town of Estes Park v. Northern Colo. Water Conservancy Dist., 677 P.2d 320, 326 (Colo. 1984).

180. It is unlikely, however, that the taxes generated by these landowners are remotely equivalent to the value of these return flows, and from a purely economic perspective it would probably have made more sense to remove these lands from the District.

181. NICHOLS ET AL., *supra* note 172.

182. *Id.* (citing interview with Lee Rozaklis, Jul. 20, 1999).

183. Carey & Sunding, *supra* note 107, at 304–05, 323–24.

184. Megan Hennessy, *Colorado River Water Rights: Property Rights in Transition*, 71 U. CHI. L. REV. 1661, 1669 (2004).

185. N. COLO. WATER CONSERVANCY DIST., CBT PROJECT QUOTA, *available at* http://www.northernwater.org/AllotteeInformation/CBTQuota.aspx.

right to use of the water supply, subject to annual payments to the District.[186] The District charges a delivery fee for each unit delivered, which can be modified on an annual basis.[187] This fee is currently $10 per unit delivered to agricultural allottees and $24 per unit delivered to municipalities.[188] Municipalities hold approximately 65 percent of the current CBT shares but lease many of their units to agricultural users.[189] The municipal shareholders with the largest CBT allotments are among the most populous cities on the Front Range—Greeley, Boulder, and Fort Collins.[190]

As noted previously, CBT water is represented by 310,000 shares or units. The per-unit yield in any given year is determined by a quota system that is set annually by the District's Board of Directors.[191] In setting the initial quota each October, and resetting the following April, the Board takes into account water availability and need in the region.[192] Since CBT water is designed as a supplemental water supply, the Board looks at native water supplies and local storage during the quota setting process.[193] The goal of the process is to set a quota that leads to a stable average water supply from year to year.[194] Therefore, CBT quotas in wet years are typically lower than the quotas set in drier years because native supplies in wet years satisfy a greater percentage of water demand within the District.[195] The historic average quota is approximately 0.7 acre feet per unit, but this amount varies.[196] During the course of delivery of CBT water, seepage and evaporation (operational losses) historically account for losses of 4% on average.[197]

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186. Repayment Contract, *supra* note 134, ¶ 16, at 23.

187. *Assessments*, NORTHERN WATER, *available at* http://www.northernwater.org/AllotteeInformation/Assessments.aspx (last visited Nov. 25, 2012).

188. Interview with Carlson & Werner, *supra* note 136.

189. *Id.*

190. N. COLO. WATER CONSERVANCY DIST., COMPREHENSIVE ANN. FINANCIAL REP. 48 (2008), *available at* http://www.northernwater.org/docs/annual_reports_nw_FINANCIAL/cafr08.pdf [hereinafter ANN. FINANCIAL REP.].

191. *Water Market Indicators: Colorado-Big Thompson Units*, 23 WATER STRATEGIST 1, Jan. 2009.

192. *Id.*

193. NCWCD Management Plan, *supra* note 120, at 9, 18.

194. *Id.* at 18.

195. CLEAR WATER SOLUTIONS, INC., CITY OF EVANS: 2009 WATER CONSERVATION PLAN 9 (2009), *available at http://cwcbweblink.state.co.us/WebLink/ElectronicFile.aspx?docid=132543&&dbid=0.*

196. *See, e.g.*, Press Release, Northern Water Waternews, *supra* note 140.

197. Water Conservation and Management Plan 3, *supra* note 151, Appendix G, Table 2 (2004).

The Board also approves any transactions and transfers of CBT units, subject to the conditions set by District policies.[198] Transactions occur wholly within the NCWCD, so approval by the Colorado water court is not required.[199] CBT transfers are relatively straightforward, inexpensive, and require little time (two to three months) in comparison to typical water transfers.[200] When CBT water applications were first accepted in 1937–38, the original cost was $1.50/unit.[201] As late as 1988, the average sale price for CBT units was still well below $1,000/unit, but unit prices spiked to as much as $15,000/unit before settling back down to the $8,000–$10,000 range.[202]

While CBT water is expensive, it is relatively easy to acquire rights quickly.[203] But even accounting for this convenience, CBT unit prices are still significantly higher than water rights in most other states.[204] District officials attribute this premium to the limited supply of CBT units and the fact that storage costs are built into each CBT share.[205]

In the early years of CBT water distribution, agricultural usage dominated CBT water deliveries, topping out at 99.04 percent in 1958.[206] Municipal and industrial usage has gradually increased since 1958, and 66 percent of CBT units are now owned by municipal and industrial

198. NORTHERN COLORADO WATER CONSERVANCY DISTRICT, ALLOTMENT CONTRACT INFO, *available at* http://www.northernwater.org/AllotteeInformation/AllotmentContracts.aspx.

199. *Id.*

200. W.L. Nieuwoudt, *Water Market Institutions in Colorado with Possible Lessons for South Africa*, 26 WATER SA 27, 30 (2000).

201. Brookshire et al., *supra* note 66, at 3.

202. ANN. FINANCIAL REP., *supra* note 190, at 67. CBT shares sold for this price as recently as November 2010. 24 WATER STRATEGIST 10, Nov. 2010.

203. Interview with Carlson & Werner, *supra* note 136. In December 2008, CBT units sold at a price of $9,300/unit, when the quota set at that time yielded 0.6 acre feet per unit, *Transactions: Colorado*, 23 WATER STRATEGIST 1, Jan. 2009. From 2002 to 2008, CBT unit prices have fluctuated between approximately $9,300–10,600/unit, *Water Market Indicators: Colorado-Big Thompson Units*, 23 WATER STRATEGIST 11,12, Nov., Dec. 2009.

204. *See* 2009 ANNUAL TRANSACTION REVIEW, *supra* note 90. California has some of the highest prices per unit of water with shares of the San Antonio Water District selling at $48,000 per share as recently as December 2009. It should be noted that these shares provide 2.59 acre feet per share per year, which is nearly three times the amount of water in CBT shares. *See id.* California water rights typically sell for slightly less than CBT shares; the Metropolitan Water District of Southern California purchased water rights in December 2010 for $7,900 per acre foot; The Tejon Ranch Company bought water rights in the same month for $5,850 per acre foot, 24 WATER STRATEGIST 11, Dec. 2010; Arizona has seen comparable prices in non-water district shares over recent years, an unnamed golf course bought 98 acre feet of water at $1,500 per acre foot in February 2009, 23 WATER STRATEGIST 2, Feb. 2009.

205. Interview with Carlson & Werner, *supra* note 136.

206. Water Conservation and Management Plan 3, *supra* note 151, Appendix F (2004).

users.[207] However, approximately 60 percent of the actual deliveries still go to agriculture.[208] The municipalities have purchased CBT units in anticipation of future needs but currently do not have demand for the amount of water to which they have right.[209] This allows irrigators to lease water from municipal shareholders throughout the drier months.[210]

The hallmark of the CBT project is the ease with which shares are bought and sold and the range of uses for which they are approved. At least a part of its success is no doubt related to the district's geography, which allows easy delivery of project water to most of the cities along the northern Front Range of Colorado. Moreover, no two projects are the same. Still, it is difficult to understand why other districts have not adopted marketing mechanisms like the one established for the CBT. The prospects for such reforms are explored in greater detail in Section VI.

B. The "Super Ditch" Proposal[211]

The "Super Ditch" proposal, as it is often called, is neither a ditch nor any other kind of engineering project. Rather, it is essentially a "Super Ditch Company" that would work by pooling the water resources of seven ditch companies operating in the Arkansas River Basin of Colorado. The Company would arrange with individual shareholders of the seven ditch companies to lease water to municipal water suppliers primarily through a system of "rotational fallowing"[212] of agricultural land. The most salient feature of this Super Ditch proposal is its mechanism for allowing agricultural sellers to maintain control over water rights, even as the water is made available for municipal use.

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207. Telephone Interview with Sherri Rasmussen, Allotment Contract Specialist, N. Colo. Water Conservancy Dist. (July 6, 2012).

208. NCWCD Delivery Database, *CBT Project Deliveries* (June 16, 2009) (on file with author).

209. NCWCD Management Plan, *supra* note 120, at 54.

210. *See* NCWCD Carryover Capacity Transferability Program Rule 3 (August 13, 2004), *available at* http://www.northernwater.org/docs/AllotteeInfo/CarryovrCapacityTranferProg.pdf.

211. This section was adapted from a Report by Peter D. Nichols for the Colorado Water Conservation Board titled: *Development of Fallowing-Water Leasing in the Lower Arkansas Valley* (June 2011).

212. Rotational fallowing is a method of temporarily transferring water from agricultural to municipal users in which a farmer will fallow a portion of their land and lease the unused water to the municipality. The farmer will fallow a different portion of their land every year to avoid permanently drying up any portion of their land. COLO. WATER CONSERVATION BD., ALTERNATIVE AGRICULTURAL WATER TRANSFER METHODS GRANT PROGRAM STUDY, 5 (May 2, 2011), *available at* http://cwcb.state.co.us/water-management/water-supply-planning/Pages/main.aspx [hereinafter ALTERNATIVE AGRICULTURAL TRANSFER METHODS].

The Arkansas River is the longest tributary in the Mississippi-Missouri River System, flowing approximately 1,450 miles from its source near Leadville, Colorado to the Mississippi River.[213] Even though the Arkansas River watershed is the largest in Colorado—covering nearly one-third of the state's surface area[214]—its annual average yield of water is only about 6 percent of Colorado's annual water supply.[215]

During the 1870s most of the irrigation in the Valley occurred around the City of Pueblo and the majority of appropriations were relatively small. In 1874, large-scale irrigation began in the Arkansas Valley with the construction of the Rocky Ford Ditch by George Swink.[216] Swink successfully cultivated cantaloupe, watermelon, and sugar beets with the careful use of irrigation.[217] Sugar beet production, in particular, took hold and supported the construction of Rocky Ford's American Crystal Sugar Company factory in 1900.[218] Today, Rocky Ford's appropriation is the last in the Arkansas Valley to produce water reliably from the natural flow of the River during the summer irrigation season.[219]

Irrigation continued to develop throughout the 1880s with the establishment of the Arkansas River Land Town and Canal Company in 1884.[220] By 1893, T.C. Henry completed the Fort Lyon Canal from the site of the Sand Creek Massacre to its junction with Big Sandy creek, totaling 110 miles.[221] Private irrigation water supply companies became prominent shortly thereafter, with investors expecting to recoup their profits through shares of the company or lands made arable by the available water.[222] Often these private companies transformed into "mutual" companies which were owned cooperatively by appropriators holding water

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213. *Arkansas River Historical Timeline*, ARKANSAS RIVER HISTORICAL SOCIETY MUSEUM, http://www.aopoa.net/history/history1.htm (last visited Nov. 1, 2012).

214. COLO. WATER CONSERVATION BD., DEP'T OF NATURAL RES., COLORADO'S WATER SUPPLY FUTURE: STATEWIDE WATER SUPPLY INITIATIVE 2010 4-3 (JANUARY 2011) (this projection assumes a conservative amount of economic growth) [hereinafter SWSI 2010].

215. *See* David H. Getches, *Meeting Colorado's Water Requirements: An Overview of the Issues*, in TRADITION, INNOVATION, AND CONFLICT: PERSPECTIVES ON COLORADO WATER LAW 1, 4 tbl.1 (Lawrence J. MacDonnell ed., 1986).

216. David W. Robbins & Dennis M. Montgomery, *The Arkansas River Compact*, 5 U. DENV. WATER L. REV. 58, 62 (2001–2002).

217. LAWRENCE J. MacDONNELL, FROM RECLAMATION TO SUSTAINABILITY: WATER, AGRICULTURE, AND THE ENVIRONMENT IN THE AMERICAN WEST 24 (1999) [hereinafter THE AMERICAN WEST].

218. *Id.*

219. *Id.* at 26.

220. *Id.* at 27.

221. Id. at 29.

222. *Id.* at 27–31.

rights from the main ditch or canal.[223] Today, approximately 20 major ditch irrigation systems operate in the Colorado section of the Arkansas River Valley.[224] The largest, the Fort Lyon Canal, currently delivers water to more than 90,000 acres on the north side of the Arkansas from La Junta to Lamar.[225]

Extreme drought during 1889 and 1890 highlighted the need for water storage within the Arkansas River Basin.[226] Between 1890 and 1910 three reservoirs were constructed in the headwaters of the Basin and 11 more were constructed off-stream, adding 576,000 acre-feet of storage capacity to the system.[227]

Meanwhile, Sugar City grew around a factory built by the National Beet Sugar Company that depended on sugar beet production from the irrigation boom.[228] Other beet-sugar factories were built in Rocky Ford, Lamar, Holly, Swink, and Las Animas.[229] By 1911, Sugar City was the center of Colorado's sugar industry and the local economy was highly dependent on irrigation and water resources.[230]

Intense water development in the Colorado portion of the Arkansas River Basin led Kansas to sue Colorado in the U.S. Supreme Court in 1901, seeking an order to prohibit Colorado from additional water development there.[231] The Court held that although Colorado's development caused "perceptible injury" to Kansas, the injury was not sufficient to warrant the intervention of the Court.[232] However, the Court made clear that the time might come when "Kansas may justly say that there is no longer an equitable division of benefits, and may rightfully call for relief."[233]

In an effort to stabilize water supplies in the Arkansas Basin, Congress authorized construction of the John Martin Dam and Reservoir

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223. In 1897 shareholders in the Fort Lyon Canal organized a nonprofit mutual corporation that is still in operation today. *Id.* at 30.

224. Robbins & Montgomery, *supra* note 216 at 62.

225. *Id.* at 62–63.

226. *See supra* note 217, at 32.

227. *Id.*

228. *Id.* at 34

229. *Id.* at 34.

230. *See id.*

231. *See* Kansas v. Colorado, 206 U.S. 46 (1907). In its ruling, the Supreme Court developed the principle of "equitable apportionment" where "equality of right," not equality of amounts apportioned, should govern. *Id.* at 117. The Court explained that the states stand "on the same level," or "on an equal plane . . . in point of power and right, under our constitutional system." Thus, individual state laws do not bind the Court. *Id.*

232. *Id.*

233. *Id.*

project on the Arkansas River near Caddoa, Colorado in 1936.[234] Thirteen years later, Kansas and Colorado signed the Arkansas River Compact, which establishes operating criteria for the John Martin Reservoir.[235] In 1962, Congress authorized the Fryingpan-Arkansas Project which diverts water across the Continental Divide from the Roaring Fork River, a tributary of the Colorado River.[236]

Agricultural to urban water transfers from the Arkansas River Valley to the Front Range became relatively common in the last half of the 20th century as Colorado's cities began to grow.[237] The first transfer occurred in 1955 when the city of Pueblo purchased the Clear Creek Reservoir and its storage rights from the Otero Ditch Company.[238] Pueblo continued to obtain its water supply by trading diversion rights with the Rocky Ford Highline Ditch Company in 1971, purchasing the Booth Orchard Grove Ditch in 1972[239] and 26 percent of the Bessemer Ditch in 2009.[240]

Private investors such as the Crowley Land and Development Company (CLADCO) were also involved in agricultural to urban water transactions.[241] Shortly after the National Sugar Manufacturing Company

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234. The John Martin Dam and reservoir were completed in 1943 by the U.S. Army Corps of Engineers. *See The American West*, *supra* note 217 at 39.

235. The Arkansas River Compact, COLO. REV. STAT. §§ 37-69-101 to -106 (1990); KAN. STAT. ANN. § 82a-520 (1989) [hereinafter The Arkansas River Compact]. Under the terms of the Compact, Colorado may demand releases of water equivalent to the river flow, but not in excess of 100 cubic feet per second during the winter storage season (November 1 - March 31)(COLO. REV. STAT. § 37-69-101 art. V, § A). During the summer storage season (April 1 - October 31), Colorado may demand releases of water equivalent to the river flow up to 500 cubic feet per second. *Id.* art. V, § B. Kansas may demand releases of water equivalent to the portion of the river flow between 500 and 750 cubic feet per second. *Id.* During the summer storage season, water being held in storage may be released upon demand by both states concurrently or separately in amounts dependent upon the magnitude of the storage. With concurrent demand, Colorado is entitled to 60%, and Kansas 40% of the 1000 cubic feet per second release *Id.* art. V, § C.

236. *See Fryingpan-Arkansas Project*, USBR.GOV, http://www.usbr.gov/projects/Project.jsp?proj_Name=Fryingpan-Arkansas+Project. The Fryingpan-Arkansas annually diverts an average of 69,200 acre-feet. Congress authorized the project under 87 Stat. 590 (1962); *see also* http://www.secwcd.com/History and Description.htm.

237. *See* THE AMERICAN WEST, *supra* note 217, at 51.

238. *Id.*

239. *Id.*

240. 23 WATER STRATEGIST 10, 5 (November 2009). Additionally, Pueblo will have the option to buy more shares in the Bessemer ditch as they are offered for sale. *See also* Alan Hamel, *Smooth Selling on the Bessemer Ditch: Pueblo Water Board's Purchase Making Few Waves One Year Later*, PUEBLO CHIEFTAN, Sept. 8, 2010, *available at* http://chieftain.com/local/article_78ab4542-bb0d-11df-9ee3-001cc4c03286.html.

241. *See* THE AMERICAN WEST, *supra* note 217 at 51.

closed its Sugar City mill in 1967,[242] CLADCO bought the land and its associated water rights for $380 per acre (claiming that it intended to operate Christmas-tree farms and produce lettuce).[243] By 1970, CLADCO owned 23 percent of all Twin Lakes Reservoir and Canal Company stock; two years later it owned 55 percent.[244] After the acquisition, CLADCO negotiated the sale of its Twin Lakes shares to the cities of Aurora, Colorado Springs, and Pueblo for between $2,300 and $2,400 per acre-foot.[245] Many farmers who did not sell to CLADCO organized themselves and sold directly to the cities for $1,075 per share for their Twin Lakes interests.[246] By 1980, CLADCO went out of business and the three cities owned 94 percent of Twin Lakes' shares.[247]

In 1979 the last beet-sugar factory in the Valley closed.[248] It sold its land and 446.48 of 800 total shares in the Rocky Ford Ditch Company to Resource Investment Group, Ltd., making them the majority shareholder overnight.[249] Later, Resource Investment Group transferred these shares to the city of Aurora for $2,200 per acre-foot.[250] Aurora had an option on the other half of shares for $2,200 per acre-foot.[251] Aurora eventually settled on a transfer of 8,250 acre-feet of water per year from the Rocky Ford Ditch, drying up 4,000 acres of land.[252] By 1991, agricultural water right sales took 56,000 of the 320,000 irrigated acres between Pueblo and the Kansas state line out of production.[253] The net loss of water transferred from the Arkansas Basin between 1955 and 2002 totaled 148,602 acre-feet.[254] Pueblo and Aurora now hold the majority of these rights.[255] The transfers took 64,445 acres of land out of agricultural production.[256]

In November 2002, voters in the Arkansas Valley agreed to form the Lower Arkansas Valley Water Conservancy District (LAVWCD).[257]

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242. MACDONNELL, *supra* note 226 at 57.

243. *See* THE AMERICAN WEST, *supra* note 217 at 51–52.

244. *Id.* at 52.

245. NATIONAL RESEARCH COUNCIL, WATER TRANSFERS IN THE WEST: EFFICIENCY, EQUITY, AND THE ENVIRONMENT 150 (1992).

246. *See* THE AMERICAN WEST, *supra* note 217, at 53.

247. *Id.*

248. *Id.*

249. *Id.*

250. *Id.*

251. *Id.*

252. *Id.*

253. *Id.* at 70.

254. MACDONNELL, *supra* note 217 at 57.

255. *Id.*

256. *Id.*

257. *See* The Lower Arkansas Valley Water Conservation Dist., *About the LAVWCD*, http://www.lavwcd.com/about.html (last visited Oct. 30, 2012).

Although most conservancy districts form to develop water resources, LAVWCD's mission is to ensure the continued availability of water resources and the long-term economic viability of the Lower Arkansas Valley.[258] The District formed a steering committee with two representatives from each ditch company to determine the possibility of a cooperative water-leasing effort.[259] This ultimately led to the organization of the Super Ditch Company.[260]

In 2006, the LAVWCD hired an engineering firm to conduct a feasibility study on a water-leasing program in the Arkansas Basin.[261] The study made preliminary estimates of the quantity of water available for leasing and identified potential ditch companies to participate in the program.[262] The ditches that fit the qualities necessary for the program included Bessemer Ditch, Rocky Ford Highline Canal, Oxford Farmers Ditch, Otero Canal, Catlin Canal, Holbrook Canal, Fort Lyon Storage Canal and Fort Lyon Canal.[263]

The LAVWCD also began to engage local irrigators to educate them about water transfer alternatives.[264] Following a workshop in 2006,[265] the LAVWCD sponsored a trip to California for representatives of 7 ditch companies to learn about the rotational fallowing program between the Metropolitan Water District (MWD) and Palo Verde Irrigation District (PVID) in Southern California.[266] Under this program, growers fallow between 7 percent and 35 percent of their land annually.[267] All participants must make a long-term commitment to the program and are

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258. *See* The Lower Arkansas Valley Water Conservation Dist., *Our Mission*, http://www.lavwcd.com/mission.html (last visited Oct. 30, 2012). (The LAVWCD's Mission Statement declares that its purpose is "[t]o acquire, retain and conserve water resources within the Lower Arkansas River Valley. To encourage the use of such water for the socio-economic benefit of the District citizens. To participate in water-related projects that will embody thoughtful conservation, responsible growth, and beneficial water usage within the Lower Arkansas Valley, including the acceptance of conservation easements, with or without water.").

259. Jay Winner & Mary Lou Smith, *Colorado's "Super Ditch": Can Farmers Cooperate To Make Lemonade Out of Lemons?*, Report to the United States Committee on Irrigation and Drainage 157 (Mar. 30, 2008).

260. *Id.*

261. *Id.* at 155; *see also* HDR ENGINEERING, INC., LOWER ARKANSAS VALLEY WATER LEASING POTENTIAL PRELIMINARY FEASIBILITY INVESTIGATION, REPORT TO LOWER ARKANSAS VALLEY WATER CONSERVATION DISTRICT (2006) [hereinafter HDR ENGINEERING].

262. *Id.* The study analyzed natural stream flow data from 1956 through 2004.

263. *Id.* at 2.

264. Winner & Smith, *supra* note 259 at 156.

265. *Id.* at 157.

266. *Id.*

267. COLO. WATER CONSERVATION BD., DEP'T OF NATURAL RES., THE STATEWIDE WATER SUPPLY INITIATIVE: PHASE 2 (SWSI) 3–22 (2007) [hereinafter SWSI 2007].

paid per acre of land fallowed.[268] The program provides between 25,000 and 111,000 acre-feet of water to MWD each year and water providers are able to use existing infrastructure to facilitate the program.[269] The program was possible in part because MWD paid for all administrative costs and reimbursed PVID for all of its expenses.[270]

The success of MWD/PVID program stirred interest among several mutual ditch companies in the Lower Arkansas Basin.[271] However, one important difference between PVID and LAVWCD became evident immediately. The MWD/PVID agreement involves one ditch and one water right, providing water to one water supply entity.[272] By contrast, a rotational fallowing program in the Lower Arkansas Basin would involve seven ditch companies and a multitude of water rights, supplying water to as yet unknown municipalities.[273] This would allow the LAVWCD to create an open market whereby it could lease to anyone who needs water within the Basin, but it would also require the seller to aggregate multiple water rights, possibly with multiple buyers, thereby greatly increasing the complexity of the transfers and other terms of an agreement among the relevant parties.[274] This is of particular concern given the problem of high transaction costs that have long been associated with water transfers.[275]

In an effort to move the concept of a long-term leasing program forward, the LAVWCD established the Super Ditch Company to act as a facilitator for the collective leasing of water rights between municipalities in southeastern Colorado and individual shareholders of different ditch companies.[276] The Company will negotiate the terms and conditions of long-term water rights leases with cities, and water shareholders will provide the water from seven ditch companies within the Lower Arkansas Valley.[277] If participating shareholders agree to the terms of the

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268. *Id.*

269. *Id.*

270. *See id.* at 3–25.

271. Winner & Smith, *supra* note 259 at 157.

272. *Id.*; Telephone Interview with Jay Winner, Executive Director, Lower Arkansas Valley Water Conservation District, in Boulder, Colo. (Aug. 13, 2009).

273. *See* Winner & Smith, *supra* note 259 at 157.

274. HDR ENGINEERING, *supra* note 261 at 84–85.

275. For a discussion of transaction costs see the text accompanying footnotes 70–73.

276. *See* Peter D. Nichols, *Memorandum to Water Tables Regarding The Super Ditch: A Temporary Water Leasing Alternative to Historical Permanent 'Buy and Dry' or Irrigated Land in the Lower Arkansas Valley* ¶ B (July 7, 2008) [hereinafter *Memorandum to Water Tables*].

277. Thomas McMahon, *Memorandum to Colo. Water Conservation Bd. and the Lower Arkansas Valley Water Conservancy Dist., Regarding Antitrust Implications of Plan by Lower Arkansas Valley Super Ditch Co. to Collectively Lease Water Rights* 1 (July 15, 2008) [hereinafter *Memorandum on Antitrust Implications*].

individual cities, and pledge sufficient water rights to satisfy a city's needs, specific shareholders will enter into leases with the municipality.[278] If shareholders do not pledge a sufficient amount of water rights, the Super Ditch will re-open negotiations.[279] Throughout this process, ditch company shareholders remain free to seek out leases independently or sell water rights to other entities until their rights are committed.[280]

Ditch company shareholders that enter into a negotiated water lease will become shareholders in the Super Ditch Company.[281] Shareholders will be paid a small annual fee and receive additional money in years when portions of their water rights are used in the program to make up for the lack of production on their land.[282] The number of shares received will be based on the amount of water each shareholder provides under the lease and will be adjusted for the value of the water coming from her respective ditch as engineering studies determine.[283] Shareholders will then remain part of the Super Ditch Company as long as they provide water for leasing.[284]

Given the complicated nature of the Super Ditch proposal, it is unsurprising that the LAVWCD has encountered a variety of legal, logistical, and political difficulties in organizing the Super Ditch Company.[285] Among these was the challenge of persuading irrigators to participate before the basic details of the program were decided, such as the price per acre-foot of water and the length of leases.[286] For now, interested par-

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278. *Id.*

279. *Id.*

280. *Id.*

281. *See* Articles of Incorporation of the Lower Arkansas Super Ditch Company ¶ 3.2(a) (May 7, 2008) [hereinafter Articles of Incorporation].

282. *Memorandum to Water Tables*, *supra* note 276 at 1; *see also* Chris Woodka, *Lower Ark Takes Hard Look at "Super Ditch,"* THE PUEBLO CHIEFTAIN, Jan. 18, 2007.

283. *See* Articles of Incorporation, *supra* note 281 at ¶ 3.2(b).

284. *Memorandum to Water Tables*, *supra* note 276.

285. For example, historically, the ditch companies involved in the Super Ditch Company have had trouble working together. HDR ENGINEERING, *supra* note 259, at 109. There are logistical hurdles in determining how shares in the company will be distributed to irrigators because different ditches have different yields and quality of water. *See* Articles of Incorporation, *supra* note 281 at 3.2(b) (describing that the amount of shares disbursed will vary depending on the particular ditch and its historic yield and water quality). Additionally, some of the ditch companies' bylaws do not allow the ditch's water to be used on lands not served by the ditch. *See* Winner & Smith, *supra* note 259, at 158.

286. Chris Woodka, *Roundtable Supports Study of Super Ditch*, THE PUEBLO CHIEFTAIN, Sept. 13, 2007.

ties have simply been asked to pledge a willingness to participate, contingent upon the final terms of the program.[287]

The legal problems are potentially even more daunting. Most importantly, the Company will have to seek judicial approval for each of its leases prior to changing the point of diversion and new use of the water right. For purposes of transferring water rights, Colorado law historically does not differentiate between temporary or long-term transfers or between leases and permanent transfers.[288] The process for gaining water court approval will significantly increase transaction costs and could compromise the success of the Super Ditch proposal.

However, if these problems can be overcome, the Super Ditch Company will administer a rotational fallowing program that will make water available for leasing within the Arkansas River Basin.[289] Local irrigators will fallow a portion of their land and the corresponding water that would have been consumed by crops will be leased to municipalities.[290] Any water in excess of a crop's consumptive use will be returned to the river and used to satisfy other existing water rights.[291] Participation by irrigators will be entirely voluntary and all irrigators will be allowed to choose the extent to which they wish to commit their land to the program.[292] Participating irrigators will be responsible for monitoring weeds and controlling erosion on their fallowed land.[293]

LAVWCD hired a consulting firm to ascertain how much water might be available for lease through the proposed fallowing program.[294] The consultants concluded that the potential volumes of water would vary from year to year depending on whether the year was classified as wet, average, or dry.[295] During a dry year, the mean yield would likely be 14,020 acre-feet[296] with estimated annual revenues of approximately $9.8 million.[297] During average years, the mean yield would be 28,630 acre-

287. Winner & Smith, *supra* note 259, at 158. Additionally, LAVWCD had to address the practice among ditch companies of including in their bylaws clauses restricting the use of water to lands served directly by the ditch.

288. COLO. REV. STAT. § 37-92-304(3.5) (2012). *See also*, Fort Lyon Canal Co. v. Catlin Canal Co., 642 P.2d 501, 506 (Colo. 1982).

289. *See* Articles of Incorporation, *supra* note 281 at 2.1.

290. HDR ENGINEERING, *supra* note 261, at 3.

291. *Id.*

292. *Memorandum to Water Tables, supra* note 275 at ¶ C. Irrigators can agree to commit 0, 25, 50, or 100 percent of their lands.

293. *Id.*

294. *Id.* at 5.

295. *See* HDR ENGINEERING, *supra* note 261, at 17–18.

296. *Id.* at 73.

297. *Id.* at 77.

feet.[298] However, because 14,020 acre-feet of this total would be committed to the dry-year market, only 14,610 acre-feet would be available for leasing on the average-year market.[299] Since there would be a greater variability in yield compared to the dry market, average-year leases would be offered at a lower price to consumers and would be more attractive to customers who possess alternative water sources or raw water storage.[300] The average-year market should be able to make full deliveries for 16 out of 29 years with estimated annual revenues of approximately $7.3 million.[301] Approximately 45,400 acre-feet would be available to lease in the wet-year market.[302] However, 28,630 acre-feet of this yield would be committed to the dry- and average-year markets, making the remaining yield for the wet-year market 16,770 acre-feet.[303] Estimated annual revenues from wet-market leases could reach $2.5 million.[304]

Revenues aside, the loss of useable water resources will adversely affect the agricultural economy of the Lower Arkansas Valley.[305] The reductions in annual income from in-basin transfers are estimated at $1,424,200 and annual losses from out-of-basin transfers could be as high as $4,019,700.[306] Moreover, the region could see a loss of 550 agricultural-related jobs, and annual tax revenue losses of approximately $3,900,000.[307] In the case of in-basin transfers, however, agricultural losses would be partially offset by the economic activity surrounding the new water uses in the basin.[308]

C. Lessons Learned from the CBT Project and Super Ditch Proposal

The Northern Colorado Water Conservancy District operates what is arguably the most efficient water market in the country.[309] Its

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298. *Id.* at 74.

299. *Id.* (assuming that customers leasing on the dry-year market take delivery every year and the average-year market customers lease the remaining yield, then 14.610 acre-feet is a minimum yield for average years).

300. *Id.*

301. *Id.* at 75. (assuming partial deliveries would be available to customers in 27 of 29 years, with revenues corresponding to the amount of water delivered).

302. *Id.* at 75. (assuming again that the dry and average-year markets take delivery every year, and the wet-year market buys the remaining water).

303. *Id.*

304. *Id.*

305. CHUCK HOWE, ECONOMIC ANALYSIS OF EXPORTING WATER FROM THE LOWER ARKANSAS VALLEY §3.1 (Feb. 2009).

306. *Id.* at § 3.3.3.

307. *Id.*

308. *Id.* at § 3.3.1.

309. *See supra* text accompanying note 89 (showing that of the 353 permanent water transfers in the west from 2007-2009, 61% involved CBT units).

success is apparent from the high demand for CBT water and the high price that it commands.[310] Yet the high price of CBT shares also suggests a strain on the supply of other water resources available for sale in the region. The streamlined process for transferring CBT water highlights the obstacles to transferring other water, especially since CBT water represents only a small fraction of the water used in northeastern Colorado.[311] Moreover, NCWCD's policies unnecessarily constrain the market by limiting municipal purchases to 80 percent of CBT shares.[312] If other water resources within the CBT service area were more easily bought and sold, and if access to the NCWCD's distribution system was readily available at a fair price to other water buyers and sellers, one could imagine a far more robust market with the ability to trade water at much lower prices. Furthermore, a flourishing market for water could obviate the need for water projects that are currently proposed to bring more Western slope water to the Front Range. The environmental advantages to the West Slope, and perhaps even to the Front Range, that might be realized by abandoning these proposed projects are significant.

The lessons to be learned from the Northern Colorado Water Conservancy District are not limited to northeastern Colorado. First, water districts and mutual ditch companies throughout the West share many of the characteristics that make the NCWCD experience widely transferable to other regions. These characteristics include:

- Water rights that are available for a wide range of uses over a relatively large geographic area;
- Water rights that are sufficiently fungible that the location and type of use will not significantly impact other users;
- A delivery system that allows distribution of the water over a significant portion of the geographic area, including delivery to urban centers, perhaps with modest infrastructure improvements.

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310. *See 2007Annual Transaction Review*, *supra* note 90 (explaining that in 2007, on average CBT units were purchased at $9,215–$10,500/unit ($13,164–$15,000/AF)).

311. *See* U. S. Bureau of Reclamation, *Colorado-Big Thompson Project*, http://www.usbr.gov/projects/Project.jsp?proj_Name=Colorado-Big+Thompson+Project (reporting CBT water use accounts for approximately 260,000 acre feet annually); *also* Colo. Dep't of Natural Res., *Interim Water Supply and Needs Report for the South Platte Basin and Denver/South Metro Counties*, *available at* http://cwcb.state.co.us/water-management/basin-roundtables/Documents/SouthPlatte/MetroSPInterimBasinWaterSupplyNeedsReport.pdf (reporting groundwater use alone in northeastern Colorado is estimated at 880,000 acre feet annually).

312. Interview with Carlson & Werner, *supra* note 136.

A less obvious but additional lesson that can be gleaned from the NCWCD experience is the importance of allowing water buyers and sellers access to the elaborate distribution systems that typically characterize publicly-financed water projects. Because the NCWCD project was designed and is operated to provide supplemental water supplies, a substantial base of primary water rights owners could potentially benefit from fair access to the NCWCD distribution system. California requires water utilities to provide access to other water distributors when the utility has excess capacity,[313] and such legislation should be encouraged throughout the West.

The NCWCD case study also illustrates more generally the enormous value of a free and open market for water. If water rights can be defined not merely as an amount available for withdrawal, but also in terms of the amount of water consumed by the current use, that consumptive use can be converted to a presumptively marketable quantity of water. This offers the prospect for a truly open and robust water market that has the potential to reduce the price of water and make water shortages a thing of the past.

Expanding the scope of water rights that have the marketing advantages of CBT project water will require both political courage and modest legal reform. But with shortages looming in important water basins, like the Colorado and South Platte,[314] and with climate change threatening to exacerbate an already difficult problem it would be foolhardy not to make an effort to build on the CBT's success.

The Super Ditch proposal suggests some additional innovations, especially in the context of temporary water transfers or water-leasing programs. These programs hold promise both for moving water efficiently to urban communities, and for protecting rural areas that may otherwise face the prospect of losing water rights permanently. The rotational fallowing program that was pioneered by the Palo Verde Irrigation District (PVID) in its agreement with the Metropolitan Water District (MWD) offers a useful model for the proponents of the Super Ditch, but it also serves to highlight the complexity of the institutional arrangements that are contemplated by the Super Ditch proposal. The

313. CAL. WATER CODE §§ 1810–1814 (1986); *But see* Gray, *supra* note 29, at 33 (asserting that while these water wheeling statutes are helpful, they have been criticized recently for inadequately defining (1) what "unused capacity" means and how it is determined under the statute, (2) what "fair compensation" is, and (3) the rights of parties attempting to wheel water of a substantially different quality than the agency's water.

314. *See* SWSI 2010, *supra* note 214, § 5, at 5-28 tbl.5-12 (estimating that by 2050 the Colorado River Basin in Colorado is will experience a 22,000–48,000 acre foot per year shortage or gap and that the South Platte River Basin in Colorado will experience a 36,000–170,000 acre foot per year shortage or gap).

Super Ditch Company intends to engage farmers from multiple ditch companies to provide water for a number of southern Front Range cities that have yet to be specifically identified. The Super Ditch Company also seems to duplicate some of the goals of the Lower Arkansas Valley Water Conservancy District, but would operate distinctly from that entity.

Assuming these organizational complications can be addressed adequately, opportunities for rotational fallowing, as well as water banking and interruptible supply agreements or "dry-year options," do hold promise.[315] Rotational fallowing seems to be driving the Super Ditch proposal, perhaps because it is viewed as offering the greatest potential for amassing a substantial amount of water that could be made available on a relatively permanent basis. However, the opportunities for banking and dry-year options should not be overlooked.

Water banking, in particular, could hold promise given the substantial storage capacity in the Arkansas Basin.[316] One could imagine, for example, an arrangement comparable to that between Arizona and the Southern Nevada Water Authority (SNWA). In this example, SNWA sends surplus water to Arizona for storage and later use in Arizona, with the understanding that SNWA receives credits that will allow it to withdraw an equivalent amount of water from Lake Mead.[317] Similarly, a southern Front Range city could allow its surplus water supplies to pass by its diversion point for storage in an Arkansas Basin reservoir, where it could be made available for downstream users. The city would then have the opportunity to use that water in a dry year when it needs additional supplies.

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315. *See* Articles of Incorporation, *supra* note 281, § 2.1 (providing that Super Ditch irrigators can participate in water banking, interruptible supply agreements, and water banking).

316. COLO. DEP'T OF NATURAL RES, COLO. WATER CONSERVATION BD., STATEWIDE WATER SUPPLY INITIATIVE: FACT SHEET, ARKANSAS BASIN 1 (2006) (listing the major storage facilities or projects in the Arkansas River Basin as: John Martin Reservoir (618,600 acre-feet), Pueblo Reservoir (357,678 acre-feet), Great Plains Reservoir (265,552 acre-feet), Twin Lakes (141,000 acre-feet), Turquoise Reservoir (129,440 acre-feet), Trinidad Reservoir (119,887 acre-feet), Adobe Creek Reservoir (71,000 acre-feet), Cuchara Valley Reservoir (40,960 acre-feet), Lake Meredith (39,804 acre-feet), Horse Creek Reservoir (28,000 acre-feet), Mt. Elbert Forebay (11,530 acre-feet), Clear Creek Reservoir (11,500 acre-feet), Lake Henry (9,500 acre-feet), St. Charles Reservoir No. 3 (8,638 acre-feet), Dye Reservoir (5,640 acre-feet), Holbrook Reservoir (4,600 acre-feet), Brush Hollow Reservoir (3,933 acre-feet), Mt. Pisgah Reservoir (2,471 acre-feet), and Deweese-Dye Reservoir (1,772 acre-feet)).

317. *See* STORAGE AND INTERSTATE RELEASE AGREEMENT, Sec'y of Interior-Ariz. Water Banking Auth.–S. Nev. Water Auth.-Colo. River Comm'n of Nev., June 12, 2001, Contract No. 02-XX-30-W0406 [hereinafter *The Storage and Interstate Release Agreement*], *available at* http://www.usbr.gov/lc/region/g4000/SIRA/finagmt.pdf; *See also* Patricia Mulroy, *Beyond the Division: A Compact That Unites*, 28 J. LAND RESOURCES & ENVTL. L. 105, 109 (2008).

Dry-year options could also be constructed creatively to allow cities to take a fixed amount of agricultural water in dry years, either from a willing individual user or perhaps from an entire ditch company, that might be willing to forego a certain percentage of its supply in a dry year. The remaining water could be allocated proportionally among mutual shareholders or farmers could opt for more or less water with the payment of appropriate fees.

VI. Reforming Water Transfer Law in an Era of Climate Change

While it can be argued persuasively that the basic structure of prior appropriation law requires reform,[318] fundamental changes to that law are neither politically tenable nor necessary to address the most pressing problems facing water resources management in the West. But modest reform and new ways of thinking about western water law are necessary if the West is going to meet the challenges posed by growing demands for water in an era of climate change. Several recommendations are set forth below that could, if implemented, provide water resources to meet the needs of the West during an era when climate change promises to tax an already fragile water resources picture for the 21st century and beyond.

A. Define Water Rights by Consumptive Use and Allow Presumptive Transfers of the Consumptive Use Amount

Western water rights have historically been defined in terms of the amount of water diverted for a particular use on a particular tract of land. The amount of water consumed can vary so long as the location and type of use does not change. Under current state water law, however, consumptive use becomes relevant only when a water user decides to sell the water right. At that point, the amount available for transfer will generally be limited to the amount of water historically consumed.[319]

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318. CHARLES F. WILKINSON, CROSSING THE NEXT MERIDIAN: LAND, WATER, AND THE FUTURE OF THE WEST 21–22 (1992); Leila C. Behnampour, *Reforming a Western Water Institution: How Expanding the Productivity of Water Rights Could Lessen our Water Woes*, 41 ENVTL. L. 201, 204 (2011) (explaining that the prior appropriation doctrine hinders water conservation); Mark Honhart, *Carrots for Conservation: Oregon's Water Conservation Statute Offers Incentives to Invest in Efficiency*, 66 U. COLO. L. REV. 827, 828 (1995) (describing how the prior appropriation doctrine has become an obstacle to dealing with the problem of inefficient water use in the West); Charles F. Wilkinson, *Western Water Law in Transition*, 56 U. COLO. L. REV. 317, 344 (1985); Charles F. Wilkinson, *Prior Appropriation 1848–1991*, 21 ENVTL. L., at v (1991).

319. *See, e.g.*, CAL. WATER CODE § 1725 (1988); IDAHO CODE ANN. § 42-222 (1919); WYO. STAT. ANN. § 41-3-104(a)(1977).

State water law further prohibits the transfer of the consumptive amount if such a transfer would cause even the tiniest injury.[320] For opponents of a transfer, the no injury rule provides an opportunity to drag out the transfer process for many years at great expense to everyone involved. These high transaction costs stand as one of the biggest disincentives to water transfers.

As previously suggested, the absolute nature of the no injury rule as applied to water transfers is entirely at odds with the more flexible approach used in a raft of other areas of water law, such as measuring the accuracy of the diversion amount or allowing water users to change to crops that consume more water.[321] A similar flexibility should be embraced for water transfers since water transfers may very well hold the key to addressing the water scarcity issues that are expected to arise in the future.[322]

Defining water rights in terms of both the diversion amount and the consumptive use is relatively simple and would not disrupt the historic operation of state water law. It would, however, impose a modest administrative burden on the state, particularly during the time that the state is establishing consumptive use amounts for existing water rights. Once the state has defined all water rights within a basin in terms of both the diversion amount and consumptive use amount, the state would be in the position to presumptively allow the transfer of that consumptive use amount, at least within the same water basin, subject to minimal procedure. The processes for defining consumptive use rights and for allowing the transfer of these rights require elaboration.

First, defining all water rights in a state in terms of both the diversion amount and consumptive use will take time, but it can be accomplished deliberately over a period of years. This will allow states to gain experience carrying out the task fairly and efficiently. States might begin with a rulemaking process to help define terms, but should probably resist trying to do much with rules in favor of learning through case-by-case adjudication, at least until the process is reasonably well understood. In terms of actually adjudicating consumptive use amounts, there are a number of options. States could initially focus on the most water-

320. *See, e.g.*, COLO. REV. STAT. § 37-92-305(3)(2012); NEV. REV. STAT. § 533.370 (2011); UTAH CODE ANN. § 73-3-3 (West 2012); WYO. STAT. ANN. § 41-3-104 (1977).

321. *See* Squillace, *supra* note 35.

322. *See, e.g.*, ELWOOD MEAD, IRRIGATION INSTITUTIONS 264 (1903) (maintaining that the focus on precision in water transfers most likely reflects the suspicions of early legislators. By making it difficult to transfer water, the law minimized the concerns that early water applicants would just sell any excess water rights they acquired).

stressed basins and gradually work toward covering all basins.[323] Starting in the most water-stressed basins would facilitate water transfers in the basins that would benefit the most from them. Alternatively, a state might choose to begin with a small basin that is not facing any particular water shortage in order to obtain a better understanding of possible challenges it might face when tackling a more complex basin. A third, and perhaps the most practical option would be to begin with one or more water districts or mutual ditch companies in a given basin, since these entities generally hold large water rights that could be adjudicated more efficiently. Moreover, they might be in the best position to pool a significant amount of water for sale to a municipal supplier.[324]

The initial consumptive decisions should be made in draft form by the appropriate state official, such as the State Engineer, who could work in cooperation with a state agricultural school. Many of these schools have already done the pioneering work in determining water consumption by crops in different water basins.[325] This work focuses on different types of basins throughout western states.[326]

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323. Starting in the most water-stressed basins would facilitate water transfers in the basins that would benefit the most from them.

324. *See* discussion *infra* Part IV.C. (explaining that water supply organizations are probably in the best position to mimic the success of the CBT water market, and will be in a better position to do this if the law makes it easier to transfer consumptive use amounts).

325. *See, e.g.* José Luis Chávez, Dale Straw, Luis A Garcia, Thomas W Ley, Allan A Andales, Lane H Simmons, Michael E Bartolo & Christopher M.U Neale, *Remote Sensing ET of Alfalfa Using a Surface Aerodynamic Temperature Model*, 5th National Decennial Irrigation Conference Proceedings (Dec. 5-8, 2010); Bruce A. Lytle, Neil Hansen, Frank P. Jaeger & Jim Nikkel, *Urban & Rural Water Supplies*, THE WATER REPORT, no. 48, Feb. 2008, at 18, February, 2008, *available at* http://www.thewaterreport.com/Issues%2045%20to%2048.html. *See also* Save The Poudre Coalition, *A Review of the Likely Agricultural Impacts from the Northern Integrated Supply Project*, Appendix A (Sept. 7, 2008), *available at* http://www.savethepoudre.org/docs/stp_ag_impacts_analysis.pdf, citing the U.S. Department of Agriculture 2002 Census of Agriculture, *available at* http://www.agcensus.usda.gov/ *and* U.S. Department of Agriculture, National Agricultural Statistics Service, *available at* http://www.nass.usda.gov/. See also, Elisa Sims Albury, Jerry Keller, John W. Longworth, Molly L. Magnuson & Julie M. Valdez, New Mexico Water Use by Categories 2005, at 24 (incorporating New Mexico State University research on water use for alfalfa irrigation), available at http://www.ose.state.nm.us/PDF/Publications/Library/TechnicalReports/TechReport-052.pdf.

326. *See, e.g.*, Ahmed E. Al-Juaidi, Water Allocation for Agricultural Use Considering Treated Wastewater, Public Health Risk, and Economic Issues, at 33 (May 1, 2009) (Ph.d thesis, Utah State University) *available at* http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1250&context=etd&sei-redir=1#search=%22crops%20water%20consumption%22 (discussing Utah's Bear River Valley Basin); ALTERNATIVE AGRICULTURAL WATER TRANSFER METHODS, *supra* note 212, Table 1, at 8-9 (estimating seasonal water crop requirements for the South Platte, Republican, and Arkansas Basins); Timothy K. Gates, Luis A. Garcia, & John W. Labadie, *Toward Optimal Water Management in Colorado's Lower Arkansas River Valley*, COLORADO WATER RESOURCES RESEARCH INSTITUTE COMPLETION REPORT, No. 205 (June,

Unlike traditional water rights, which are often defined in terms of a flow right, consumptive use rights would always be defined in terms of volume of water, often acre-feet. The owner of the water right, and other interested members of the public, should be afforded an opportunity to comment on the draft consumptive use decisions. States could minimize the opportunities for objections by authorizing the state agency to treat crop and soil-types somewhat generically. This would allow states to cover large tracts of land fairly quickly, especially where scientific data is already available.

Challenges to these consumptive use determinations could be limited to: (1) whether the agency used the best scientific information in making its judgment; (2) whether a particular tract of land fits the soil profile used to make the decision; and (3) whether the crop chosen to estimate historic consumptive use accurately reflects that land's historical cropping pattern. Regarding this last point, the legislation might place the burden on the agricultural user of demonstrating to the appropriate state official the historic farming practices on the particular tract of land. The legislation might also clarify the meaning of historic practices, perhaps by setting out the historic period subject to review and the number of years necessary to show historic use for growing a particular crop. Alternatively, the appropriate state agency could adopt rules describing how it will determine historic practices and other issues that might be raised in the proceeding.

Once the consumptive use judgments are final, the owners of those rights would be free to sell all or any portion of the consumptive use amount. It might be wise, however, to build into the legislation a provision that subjects each transfer to a 10 percent reduction to protect stream flows and to help account for any errors in the system. The proposed transfer would still have to go through a notification and decision process, but objectors should not be allowed to complain about the original consumptive use judgment that was made during the basin review process.

While at first blush, farmers might be suspicious of a streamlined water transfer process, it potentially offers them a way to profit from their substantial agricultural water rights while continuing to farm. Suppose, for example, that a farmer in northeastern Colorado receives a con-

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2006), *available at* http://www.cwi.colostate.edu/publications/cr/205.pdf; Amber Kirkpatrick, Linzy Browning, James W. Bauder, Reagan Waskom, Matt Neibauer & Grant Cardon, *Irrigating with Limited Water Supplies: A Practical Guide to Choosing Crops Well-Suited to Limited Irrigation*, at 11 (2006), *available at* http://region8water.colostate.edu/PDFs/Irrigating%20with%20Limited%20Water%20Supplies.pdf (Estimating water consumptive use of select crops in Montana, Colorado, Utah, and Alberta).

sumptive use declaration of 193 acre-feet of water for 100 acres of land on which the farmer historically grew alfalfa.[327] If the farmer were willing to switch to a crop such as soybeans, which consumes only 122 acre-feet of water,[328] that farmer would be able to sell the remaining 71 acre-feet while continuing to farm. The state would have to verify the change in crop and ensure that the farmer does not revert to a more water consumptive crop in the future. Eventually, advances in satellite imaging technology should make it possible to monitor the type of crop being grown by farmers at a relatively low cost.[329] Even greater savings might be realized if the farmer were to limit an alfalfa crop to one, or perhaps two, cuttings each year rather than the more typical three cuttings. Indeed, with climate change, Colorado farmers may be in a position to take a fourth cutting, thereby consuming more water than they have historically consumed. While many agricultural rights are defined as "seasonal," the length of the season is often not specified in the water rights decree.[330]

A similar scenario could play out with a dry-year option. Our farmer could sell an option on 71 acre-feet for use by a city during dry years, grow alfalfa in high water years, and shift to a low water-consumption crop in dry years when the city would receive the optioned water.

Importantly, none of this is possible under the current legal regime. The farmer who shifts from alfalfa to soybeans receives no credit

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327. Antony Frank & David Carlson, Colorado's Net Irrigation Requirements for Agriculture 1995, Table 1: Normal Year Net Irrigation Requirements, (1999), (calculating off figures for Weld County), *available at* http://cospl.coalliance.org/fez/eserv/co:3072/ag92ir71999internet.pdf.

328. *Id.*

329. *See, e.g.*, *A Guide to the Practical Use of Aerial Color-infrared Photography in Agriculture Agricultural Applications of Color-infrared Film*, UNIVERSITY OF NEBRASKA LINCOLN http://www.casde.unl.edu/activities/cir-uses/applications/crop-inventory.php (last visited Nov. 5, 2012); Ping Zhang, Bruce Anderson, Bin Tan, Dong Huang & Ranga Myeni, *Potential Monitoring of Crop Production Using a Satellite-Based Climate-Variability Impact Index*, AGRIC. AND FOREST METEOROLOGY, no. 132 (Sept. 13, 2005), *available at http://cybele.bu.edu/download/manuscripts/zhping02.pdf* (detailing the potential agricultural capabilities of different types of imaging satellites and noting that historical data and visual inspection are currently necessary to supplement satellite data.); Stephan J. Maas & NITHYA RAJAN, *Estimating Ground Cover of Field Crops Using Medium-Resolution Multispectral Satellite Imagery*, 100 AGRONOMY JOURNAL, no. 2, Mar. 2008, at 320, 327. (observing that automation of satellite technology to monitor the vegetation canopy and bare soil line could be possible in the future, but currently has to be coupled with visual inspection).

330. *See* Douglas Kenney, et al., THE IMPACT OF EARLIER SPRING SNOWMELT ON WATER RIGHTS AND ADMINISTRATION: A PRELIMINARY OVERVIEW OF ISSUES AND CIRCUMSTANCES IN THE WESTERN STATES 4-6, (2008), *available at* http://sciencepolicy.colorado.edu/admin/publication_files/resource-2715-2008.24.pdf.

for the water saved, and pays no penalty for shifting from soybeans to alfalfa, even if soybeans had been grown on the site for 100 years. While the prospect of selling water sometime in the future may not be the driving force behind decisions that farmers make about the types of crops to grow, it is surely an important factor in any cropping decision. The incentives under the current system are all in favor of consuming more water. The proposed reforms would give farmers the incentive to consume less water, and in the process, potentially solve water scarcity issues for many years to come.

B. Demand Conservation and Reclamation Before Agricultural to Urban Transfers are Approved

Residents of rural areas are understandably unhappy about the prospect of watching water resources that have historically supported their local economies transferred to urban use. While a free market in water could accelerate this trend, states can and should provide rural communities with some assurance that water transfers will not be approved unless, and until, the buyer first demonstrates a clear need for additional water resources and takes responsibility for restoring the land from which the water will be transferred to an appropriate condition adequate to promote and sustain its value and future uses.[331]

Municipal suppliers might demonstrate need by using all reasonable conservation measures in the communities they serve. "Reasonable conservation measures" could be defined either by statute or regulation as measures that bring per capita water use below a certain threshold, or perhaps through more prescriptive standards such as requiring that cities employ aggressive block rate pricing policies,[332] or requiring that states recycle gray water.[333]

Restoration of the land might simply entail a commitment, backed by a bond, requiring the city to establish a healthy, self-regenerating community of native grasses on the dry lands. Alternatively, it might involve some long-term commitment to engage in dry land farming[334] or

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331. *See, e.g.*, COLO. REV. STAT. § 37-92-305 (4.5)(a) (2011) (providing specifically for such protection).

332. *See, e.g.*, Douglas S. Kenney, et al., *Residential Demand Management: Lessons from Aurora, Colorado*, 44 J. AM. WATER RESOURCES ASS'N 192 (2008).

333. *See, e.g.*, Yoram Cohen, *Gray Water: A Potential Source of Water*, SOUTHERN CALIFORNIA ENVIRONMENTAL REPORT CARD (Fall, 2009) http://www.environment.ucla.edu/reportcard/article.asp?parentid=4870.

334. *See generally*, Randy Creswell & Franklin W. Martin, *Dryland Farming: Crops and Techniques for Arid Regions*, EDUCATIONAL CONCERNS FOR HUNGER ORGANIZATION (1998), http://www.echonet.org/repositories/download/30/Dryland%20Farming.pdf (introducing appropriate techniques for dryland farming in arid regions).

some other use that will ensure that the land does not become a burden to the host community.

While rural areas may continue to harbor some antipathy toward cities for their ever increasing demands for water, farmers are far more likely to accept water transfers if they can see that the cities have made an aggressive commitment to conservation as a pre-condition to having agricultural water transfers approved. In addition, if rural communities are assured that lands that are dried up as a result of agricultural to urban water transfers are restored to some productive use, they may be more open to reform.

C. Encourage Private and Public Agencies with Substantial Storage Capacity and a Large Service Area to Mimic the Success of the CBT Project

The CBT project is unique. Not only does it have the benefit of substantial storage in the system, but it also holds water rights that are approved for a broad range of uses, operates an elaborate delivery system in the most populous areas of the northern Front Range, and covers a substantial portion of the northeastern part of Colorado.[335] Under these circumstances, it is not surprising that the limited supply of CBT shares attracts many buyers and sellers. While it may be unlikely that other water organizations will have all of the advantages of the CBT project, many water entities will likely share some transferable characteristics of the CBT project. For example, some water entities could conceivably establish marketable shares, similar to CBT shares, especially if states established a system to facilitate the transfer of consumptive use amounts, as suggested above.[336]

Most ditch companies hold legal title to the water rights used by their shareholders, but shares can be purchased by cities for urban use.[337] However, most ditch companies' water rights were granted strictly for agricultural use over a relatively small geographic area that may not include significant urban centers.[338] Under these circumstances, changing the use and the place of use will require the parties to go through the cumbersome statutory transfer process.

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335. *See* discussion *supra* Part V.A.

336. *See* discussion *supra* Part VI.A.

337. *See* discussion *supra*, Part V.B.; *see generally* Jacobucci v. Dist. Court In and For Jefferson Cnty., 189 Colo. 380, 386-91, 541 P.2d 667, 671–674 (1975) (discussing the unique organization of mutual ditch corporations under Colorado law and the relationship with their shareholders regarding ownership of the "right to make beneficial use of . . . water"); COLO. REV. STAT. §§ 7-42-101 to 118 (2011).

338. *See* NCWCD Management Plan, *supra* note 120, at Appendix C.

D. Promote Temporary Transfers

States should recognize the natural advantages that these organizations share with the NCWCD and the opportunities that would arise if they had more flexibility to transfer water rights outside the current transfer system. As previously argued, granting water organizations an easier path toward transfers would, at a minimum, require that their consumptive rights be clearly defined. Once that is done, states could use a streamlined transfer process to allow mutual ditch companies and water districts to transfer consumptive rights outside their districts and for new uses.[339] This would open up more robust marketing opportunities for these entities, and thereby resolve many of our current urban water needs.

In recent years, much attention has been paid to the potential for temporary transfers to solve long-term water needs. While such transfers could be short-term or long-term, they are all distinguished by the fact that the party holding the water right does not relinquish her ownership interest.

For farmers concerned about the long-term health of their rural communities, this is a very attractive feature. As previously described, successful real-world examples of temporary transfers already exist, including the Palo Verde Irrigation District's rotational fallowing program that provides water to the Metropolitan Water District,[340] and the Arizona Water Bank, which allows Las Vegas to bank groundwater in southern Arizona.[341] But widespread use of temporary transfers is unlikely to occur unless states adopt legislative reforms designed to promote their use.[342] The three primary temporary transfer mechanisms—rotational fallowing, dry-year options, and water banking—are described briefly below, along with policy reforms that could lead to their expanded use.

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339. *See generally*, ARIZ. REV. STAT. ANN. § 9-432 (2011); CAL. WATER CODE §§ 10505, 10505.5, 11460 (West 2011); COLO. REV. STAT. § 37-45-118(1)(b)(II) (2011); NEB. REV. STAT. ANN. § 46-290 (West 2011); NEV. REV. STAT. ANN. § 533.438(5) (West 2011); N.M. STAT. ANN. §72-5-22 (West 2011); OKLA. STAT. ANN. tit. 82, §§ 105.22, 1086.1 (West 2011); TEX. WATER CODE ANN. § 11.085 (West 2011); WYO. STAT. ANN. § 41-3-104 (West 2011).

340. As noted in the Super Ditch case study, PVID's fallowing program was instrumental in inspiring proponents of the Super Ditch concept. *See supra* text accompanying notes 271–274.

341. *See The Storage and Interstate Release Agreement*, *supra* note 317.

342. *See, e.g.*, ALTERNATIVE AGRICULTURAL TRANSFER METHODS, *supra* note 212, at 45–46 (explaining that legislative changes may be necessary to remove the barriers to water transfers in Colorado).

1. Rotational Fallowing

As a tool for moving more water from agricultural to urban use, rotational fallowing has much to recommend. Farmers who participate in the program agree to fallow a portion of their land, and can thus continue to farm on the remaining land, focusing their efforts on the most productive lands or rotating the fallowed land from year to year.[343] The unused water made available by fallowing is then leased to a municipality.[344] The MWD/PVID rotational fallowing program is usually cited as a model for such programs, and for good reason. Despite the fact that the program moves a substantial volume of water from agricultural to urban use, it is remarkably simple, with one large buyer and one large seller who both happen to have very senior water rights.[345] The Super Ditch proposal may suggest the more typical model, and it remains to be seen whether that proposal will ever come to fruition. Several legal reforms, however, could help make rotational fallowing programs like the Super Ditch more practical.

First and foremost, some progress must be made to streamline the normal water transfer process to accommodate temporary transfers. The effort needed to design a program like the Super Ditch Company, with its many potential sellers and multiple buyers, is substantial and expensive. Yet, the parties have no assurance that their efforts to transfer the relevant water rights will make it through the judicial process within a reasonable length of time. Moreover, it seems possible, perhaps even likely, that objections to the transfer will be filed and may succeed in thwarting the project entirely or at least limiting the amount of water available under the program, even if the transfer is ultimately approved.

Even if a state is not ready to embrace a wholesale shift to defining water rights in terms of consumptive use, it might consider doing so in the case of temporary transfers. For example, the state could authorize the prospective seller to apply to the appropriate agency official for a consumptive use determination. The seller might even be asked to bear the cost of the determination. Once the determination is made following a process such as that suggested above,[346] the state could authorize the temporary transfer of the consumptive right. Such temporary transfers might further be conditioned to reduce the transfer by 10 percent to protect stream flows and to account for potential calculation errors but they

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343. ALTERNATIVE AGRICULTURAL TRANSFERS, *supra* note 212, at 5.

344. *Id.*

345. *See supra* text accompanying note 272; *see also* TERESA A. RICE & LAWRENCE J. MACDONNELL, COLO. WATER RES. RESEARCH INST., AGRICULTURAL TO URBAN WATER TRANSFERS IN COLORADO: AN ASSESSMENT OF THE ISSUES AND OPTIONS 70–72 (1993).

346. *See supra* text accompanying notes 264–272.

would follow a minimal process, as proposed more generally for consumptive use transfers.[347] The law might also provide for minor adjustments to the consumptive use allocation to reflect actual experience once the program has been operating for several years.

In addition, state law must allow these rotational fallowing programs to operate over a long period of time consistent with the planning needs of municipal water suppliers. The law might build in some capacity for adjustments to be made as experience on the ground is gained but without some assurance that these programs will offer long-term water security (at least 30–40 years with provisions for renewal), cities are unlikely to find rotational fallowing an attractive option.[348]

2. Dry-Year Options

Dry-year options, or interruptible water supply agreements, operate much like an emergency water supply.[349] A city may contract with a farmer to take that farmer's water during dry years as defined in legislation, or preferably in the option contract. Dry year options allow cities to avoid acquiring a much more costly permanent water supply where the water resources might be needed only once every 10 years. As with rotational fallowing agreements, this strategy will be viable for municipal suppliers, only if the parties are willing and able to enter into long-term contracts of at least 30 to 40 years, with some assurance of an opportunity for renewal. If a city cannot secure a long-term commitment of access to water resources in dry years, it lacks an incentive to negotiate the option contract.

The Colorado interruptible water supply agreement statute[350] offers a useful example of how *not* to establish a dry-year option program. Under that law, a water owner may agree to forego her use of a water right during a dry year as provided under the terms of the agreement and the State Engineer may approve and administer such agreements without the need for the formal adjudication that would otherwise be required for a water transfer.[351] The State Engineer must, however, ensure that existing water rights would not be injured when the option is

347. *See id.*

348. *See* ALTERNATIVE AGRICULTURAL TRANSFERS, *supra* note 212, at 5 (explaining that if a rotational fallowing agreement were used to provide water for a growing municipal demand, the agreement would need to be ". . .long-term, renewable, or even perpetual. . .").

349. *See generally*, MICHAEL O'DONNELL & BONNIE COLBY, THE UNIV. OF ARIZ. DEP'T OF AGRIC. & RES. ECON., DRY-YEAR WATER SUPPLY RELIABILITY CONTRACTS: A TOOL FOR WATER MANAGERS (2009), *available at* http://ag.arizona.edu/arec/pubs/facultypubs/ewsr-dyo-Final-5-12-10.pdf.

350. COLO. REV. STAT. § 37-92-309 (2011).

351. *Id.*

exercised. Furthermore, the State Engineer must: (1) quantify the historical consumptive use of the water right, which then forms the basis for the option amount; (2) describe the land where the water is decreed for use; and (3) approve a plan for proper management of the land during the period when it is fallowed.[352] Although strict adherence to the no injury rule could prove problematic, for reasons already discussed, these are generally sensible requirements that could promote more streamlined decisions on these agreements.

Unfortunately, the statute goes on to limit the length of time for any agreement to 10 years, which can be renewed only once, and then only if the option has never been exercised.[353] For a city seeking a secure water supply, this limitation makes the Colorado interruptible water supply agreement statute unworkable.[354]

Fixing the Colorado statute would not be especially difficult and it suggests the contours of the law that might be adopted in other states. At a minimum, states should make clear that *de minimis* injuries that might result from exercising a dry year option are not actionable in court. Actionable injuries should specifically be defined to exclude a change in the timing of return flows. Even more explicitly, the statute could simply provide that where the state approves the transfer of the historic consumptive use of a water right, perhaps less 10 percent, no injury to existing users shall be found. Without some provision like this, the parties to any such agreement face the prospect of transaction costs that are essentially as high as those for regular water transfers.

States should also allow option agreements to last for at least 30 years, perhaps longer, with the possibility of renewal for additional 30 year terms. Municipal water suppliers cannot plan for future water needs unless they have some certainty about the availability of future supplies. A well-defined option right can provide that assurance. Guaranteeing the availability of an option right over a ten-year period—as authorized by the Colorado statute—is simply not adequate to incent municipal suppliers to negotiate an agreement.

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352. *Id.* at 309(3)(b).

353. *Id.* at 309(3)(c). The statute also provides that the option may not be exercised in more than three of the ten years of the agreement. While this could be a limiting factor in the utility of these agreements, it is understandable that the State would want to avoid having parties use this provision to accomplish something that looks more like a permanent transfer of the water.

354. Two minor applications were currently pending before the State Engineer, but at the time of this writing no interruptible supply agreements have yet been approved under this provision. Telephone Interview with Joanna Williams, Water Resource Engineer, Colo. Div. Water Res. (Jul. 6, 2012).

3. Water Banks

Water banks have been described broadly to encompass "an institutionalized process . . . to facilitate the transfer of developed water to new uses."[355] This definition, however, could be viewed as encompassing many other types of water transfers, including rotational fallowing and dry-year options. Moreover, the definition fails to convey the sense that water banks typically involve only temporary water transfers. A more nuanced definition that better reflects the term "water bank" might describe it as a program that establishes a repository or "bank" where parties can store water, together with a program for other parties to withdraw water from the bank.

Water banks have been around for many years, dating back to the early 1930s in Idaho.[356] The earliest legislation, also from Idaho, was enacted in 1979.[357] Since then, many other states have adopted some form of water banking.[358] Like other forms of temporary water transfers, water banks can help make water supplies available to meet critical needs, especially during dry years. They can also help promote conservation by providing water owners with a venue to market water supplies that they are able to conserve,[359] and by providing conservation groups and states a source for water needed to protect stream flows and fisheries.

Water banks can simply involve a paper transaction where, for example, water sellers answer a call from a buyer to forego the use of water to which the sellers are entitled.[360] This might happen where a party interested in protecting stream flows purchases natural flow rights from a seller for a period of one or more years. More commonly, water banks involve physical storage, either in a reservoir or underground. Water banking in this situation might typically involve a water district with excess storage capacity, willing to sell that capacity to parties with excess water rights. The district might then help facilitate a sale of the water to a third party, or perhaps issue credit to the original owner that

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355. Lawrence MacDonnell, *Water Banks: Untangling the Gordian Knot of Western Water*, 41 ROCKY MTN. MIN. L. INST. 22-1, 22-6 (1995).

356. *See* MACDONNELL, ET AL., UNIV. OF COLO. NATURAL RES. LAW CTR., USING WATER BANKS TO PROMOTE MORE FLEXIBLE WATER USE: FINAL REPORT 2-2 (1994).

357. IDAHO CODE ANN. §§ 42-1761 to -1766 (West 2011).

358. *See generally* PEGGY CLIFFORD, CLAY LANDRY, & ANDREA LARSEN-HAYDEN, WASH. DEP'T OF ECOLOGY, ANALYSIS OF WATER BANKS IN THE WESTERN STATES (2004) [hereinafter ANALYSIS OF WATER BANK], *available at* http://www.ecy.wa.gov/pubs/0411011.pdf. This excellent report offers a detailed discussion of the various approaches to water banking, along with a comprehensive survey of water banks in the Western United States.

359. *Id.* at 3.

360. *Id.* at 4. The Washington Department of Ecology describes this as "institutional banking."

allows that original owner to take the water at some later time, probably at some more convenient location on the stream. A good example of this latter arrangement is the Arizona Water Bank, discussed previously, which involves the State of Arizona and the Southern Nevada Water Authority (SNWA). Under this program, which operates through the Arizona Water Bank[361], SNWA pays the State of Arizona to store Colorado River water in its groundwater aquifer. When the SNWA needs the water, it takes its entitlement from its regular diversion point on Lake Mead, well above the storage aquifers.[362] Despite the apparent advantages of water banks there are few examples of successful banks,[363] and with limited exceptions, they do not currently seem to offer a reliable solution to municipal water shortage problems.

As with virtually every other recommendation set forth in this article, promoting water banks begins with better defining the water rights that are banked, so that they can be readily withdrawn by interested buyers, even if those buyers live outside the water district's service area. While the SNWA arrangement with Arizona is somewhat unusual, it illustrates the high potential for water banks to address municipal water needs. For example, the cities along the Front Range of Colorado are all near major streams that flow out of the mountains. Some of that water is used for municipal purposes; most is dedicated to downstream farmers on the plains who hold the most senior rights and who are often part of large water districts or mutual ditch companies with significant capacity to store water. If these cities could purchase some storage capacity in the existing reservoirs and solicit willing sellers in the service area of the reservoir to dedicate some their water rights for use by the city, the city could then be issued credits that would allow it to divert that same amount of water at an outtake near the city. Unfortunately, in Colorado this transaction would almost certainly have to be adjudicated in a state water court where it could be tied up for years. While the process might be somewhat less cumbersome in other states, the predominant no injury rule would still pose a significant obstacle to completing any such transaction. A streamlined transfer process for water bank transactions that would allow a simple transfer of the consumptive use amount less 10 percent could go a long way toward reinvigorating the water bank concept.

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361. *The Storage and Interstate Release Agreement*, *supra* note 317, at 1–2.

362. *Id.*

363. ANALYSIS OF WATER BANKS, *supra* note 358, at 16–18, Table 3. This report indicates that the only banks with high levels of activity are in California and Idaho. In the case of Idaho, the water values are so low ($3–$10.50/acre foot) as to suggest that they are not serving municipal needs.

D. Take Advantage of Existing Distribution Systems to Move Water

As described in the NCWCD case study,[364] that District has a huge advantage in moving water efficiently because of the elaborate distribution system it has built, much of it funded by taxpayers. Indeed, the District could not continue to operate without the one mill tax that it assesses every year on all property within the District's massive service area. The NCWCD and the many other publicly-supported water districts throughout the West most likely own and operate the very best water distribution systems in the country, and they are able to do so in large part because they are tax-payer supported. But it does not seem fair that they should enjoy a monopoly on the use of distribution systems with excess capacity, when third parties might be in a position to use that system to transfer water and thereby help address water supply needs for urban and other uses.

Making excess distribution capacity available to third parties would help promote efficient water transfers by affording at least some water sellers a simple way to move water from the location of its current use to the point of new use. It could also generate revenues for the water district, although a process for setting reasonable prices for wheeling water will have to be devised.

In 1986, the State of California enacted a "water wheeling statute" that essentially adopts the policy suggested here.[365] That law simply provides that "neither the state, nor any regional or local public agency may deny a bona fide transferor of water the use of a water conveyance facility which has unused capacity, for the period of time for which that capacity is available, if fair compensation is paid."[366] The law goes on to define such key terms as "fair compensation" and "unused capacity."[367] While evidence of the statute's use is anecdotal, the courts have thus far construed the statute broadly to encompass not only large systems such as aqueducts and canals, but also local distribution systems.[368]

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364. *See* text accompanying notes 185–190 (discussing the CBT distribution system).

365. CAL. WATER CODE §§ 1810–14 (West 2011).

366. *Id.* at § 1810.

367. *Id.* at § 1811.

368. *See* San Luis Coastal Unified Sch. Dist. v. City of Morro Bay, 81 Cal. App. 4th 1044, 97 Cal. Rptr. 2d 323 (2000); *see also Metro. Water Dist. of S. California v. Imperial Irr. Dist.*, 80 Cal. App. 4th 1403, 96 Cal. Rptr. 2d 314 (2000), where the Court of Appeal held that the wheeling statutes did not preclude the MWD from including system-wide costs in calculating its wheeling rate, and furthermore that the statute did not require MWD to set its wheeling rates on a case-by-case basis as transactions were proposed.

VII. Conclusion

Water markets have long been viewed as a promising option for addressing water shortages, and as a tool for meeting burgeoning urban water demand in the western United States. But the traditional water laws of western states make it difficult and in some cases even impossible to operate efficient water markets. As a result, water transfers and water marketing have thus far proved to be tools of limited utility for addressing the West's future water needs. As drought, climate change, and ever-increasing populations put more pressure on the West's limited water supplies, some additional movement of water from agricultural to urban use seems inevitable. But water marketing offers the possibility of much more. With modest reforms to current law, water marketing could be an efficient and effective solution for most of the West's future water resource challenges. Furthermore, water marketing could displace the need for destructive water development projects that continue to plague water resource management.

The reforms proposed here are politically challenging but relatively simple to describe and implement. Most fundamentally, water rights must be redefined in terms of their consumptive use amount and states must streamline the process for transferring the consumptive use amount without undue obeisance to the "no injury" rule. Such a change would no doubt be controversial, but it could be implemented strategically, either with pilot programs, or by adopting special legislation that would streamline transfers for particular projects that are proposing innovative approaches to moving water. Water marketing has long been a favorite topic of academics. The time for aggressively moving it into the field is long overdue.