Water Law Review

Volume 12 | Issue 1 Article 6

9-1-2008

Water Law and Economics: An Assessment of River Calls and the South Platte Well Shut-Down

Charles W. Howe

WATER LAW AND ECONOMICS: AN ASSESSMENT OF RIVER CALLS AND THE SOUTH PLATTE WELL SHUT-DOWN

CHARLES W. HOWE*

INTRODUCTION

Under the "priority doctrine" of water law embedded in the constitutions of many western states, each water right has a priority date attached to it.[1] In Colorado, the rights with earlier priority dates ("senior rights") have seniority in the allocation and usage of surface and groundwater.[2] State law considers water rights property that the right owner can lease or sell; further, the priority attaches to the right when it is traded.[3]

In the South Platte Basin of Colorado, many surface diversions allocated for irrigation use date back to the mid-19th century.[4] They are, thus, quite senior. If low stream flows prevent senior rights from diverting the water to which they are entitled, the seniors can put a "call"

---

* Professor Emeritus of Economics and Senior Scholar, Environment & Society Program, Institute of Behavioral Science, University of Colorado-Boulder. The author wishes to thank Lawrence (Larry) J. MacDonnell for many insights into water law and the nature of water rights.

1. *See, e.g.*, COLO. CONST. art. XVI, §5 (declaring all water in the streams of the state of Colorado as property of the state).

2. Coffin, et al v. Left Hand Ditch Co., 6 Colo. 443, 446 (1882) (recognizing prior appropriation system in Colorado instead of common law riparian system); COLO. REV. STAT. § 37-92-101, *et seq.* (incorporating groundwater withdrawals into prior appropriation system).

3. City and County of Denver v. Sheriff, 96 P.2d 836, 840 (Colo. 1939).

4. NEIL S. GRIGG, COLORADO'S WATER: SCIENCE AND MANAGEMENT, HISTORY AND POLITICS, 58 (2003).

on the river, requiring all upstream rights "junior" to the caller to stop diverting water until adequate streamflow is restored.[5]

Following World War II, well drilling exploded in the alluvial valleys of the West, based on improved pump technology, cheap energy and the absence of regulatory frameworks over wells.[6] In the South Platte River Basin of Colorado, irrigators tapped into the huge aquifer tributary to the South Platte River with thousands of wells that provided a reliable and handy source of water.[7] During the same period, developments in hydrologic science made clear the connections between river flows and tributary aquifers.[8] For example, hydrologists demonstrated that well pumping could deplete streamflows.[9]

With this new knowledge of river-aquifer linkage, Colorado's 1969 General Assembly decided the priority system should incorporate wells tapping the tributary aquifer, awarding priorities according to the date of first use.[10] This statute, the Water Right Determination and Administration Act of 1969, attached priority dates to the tributary wells, making the wells very junior in priority in their respective basins.[11] It thus appeared that the state would prohibit use of tributary wells during periods of low stream flow, for example during prolonged droughts, just when the huge store of groundwater would be most valuable.

To avoid this clearly uneconomic result, the 1969 Act allowed the State Engineer to approve temporary "substitute water supply plans," or augmentation plans, that would allow junior wells to continue pumping when there was a call on the river as long as the well owners could augment surface flows to make up for current shortages attributable to their current and past pumping - a calculation requiring detailed models.[12] The augmentation must make up for any potential injury to seniors.[13] The Act cited numerous ways to augment the injury that would be caused by their pumping, including "pooling...water resources or water exchange projects...."[14] Under these arrangements, Water Court Division One permanently approved 2,800 South Platte wells that continued to operate; Division One also permitted several

5. *See* Colorado Division of Water Resources, "Water Rights Terminology" *available at* http://water.state.co.us/wateradmin/terms.asp.

6. *See, e.g.* Colorado Division of Water Resources, Republican River Compact Administration Ground Water Model, *available at* http://water.state.co.us/wateradmin/republicanriver/rrca_model.pdf (noting the increase in groundwater pumping in the Republican River basin after World War II).

7. Lawrence J. MacDonnell, *Colorado's Law of Underground Water: A Look at the South Platte Basin and Beyond*, 59 U. COLO. L. REV. 579, 604 (1988).

8. *Id* at 581.

9. *Id.* at 582.

10. *Id.* at 588; *see also* C.R.S. § 37-92-101 (2008).

11. MacDonnell, *supra* note 7, at 588.

12. *Id.* at 589; COLO. REV. STAT. § 37-92-302 (2008).

13. MacDonnell, *supra* note 7, at 589.

14. COLO. REV. STAT. § 37-92-103(9) (2008).

hundred wells to operate temporarily while applications to the Water Court for permanent plans were pending.[15]

During the 1970's, 1980's and early 1990's, generous stream-flows meant that calls on the river were generally confined to July and August, requiring only limited well augmentation.[16] As the drought of the early 2000's became increasingly severe, surface water shortages led to increasingly frequent calls on the river, with almost continuous calls from 2002 to 2006.[17] This meant that the wells that had been operating under "substitute water supply plans" had to provide much larger volumes of augmentation water if they were to continue pumping and had to scramble for increasingly costly surface rights or leases.[18] Most were unsuccessful. The State Engineer shut down more than 400 major wells in the early summer of 2006 through 2007, drying up 30,000 acres of cropland with immediate, severe impacts on the farms and associated rural communities.[19] A second effect of the frequent calls on the river was that many water users in addition to the wells in question had to stop diverting water from the South Platte system.[20] A later section assesses those impacts.

I. DIRECT ECONOMIC IMPACTS OF THE WELL SHUT-DOWN

The 1969 Act provided for out-of-priority well pumping because of the value of groundwater during droughts.[21] The requirement for substitute water supply plans protected downstream water uses.[22] Therefore, it makes sense to compare the economic losses related to the shut-down with the consequential benefits to parties downstream of the wells. For this assessment, one needs to ask the following questions: (a) how much of the surface shortage that led to the calls was

15. *See* Hal Simpson, Address at the State Engineer's Office Forum, "History of Well Regulation, South Platte Basin" (Sept. 6, 2006), outline *available at* http://water.state.co.us/pubs/presentations.asp.

16. *Id.*

17. SOUTH PLATTE RIVER TASK FORCE BRIEFING DOCUMENT, WELL REGULATION IN THE SOUTH PLATTE RIVER BASIN OF COLORADO 5 (June 2007) *available at* http://www.colorado.gov (search "South Platte Briefing Document").

18. Simpson, *supra* note 15.

19. Press Release,·City of Boulder, City Responds to South Platte Well Shutdowns (May 19, 2006), *available at* http://www.ci.boulder.co.us/index.php?option=com_content&task=view&id=5179&Itemid=2526.

20. *Id.*

21. *See generally* Kathleen A. Miller, Lawrence J. McDonnell, Steven L. Rhodes, *Groundwater Rights in an Uncertain Environment: Theoretical Perspectives on the San Luis Valley*, 33 NAT. RESOURCES J. 727, 748 (1993) (explaining that valuable groundwater is pumped after droughts and that Colorado did not regulate such pumping until the passage of the 1969 Act).

22. *See generally* COLO. REV. STAT. § 37-92-308 (2008) (clarifying State Engineer's authority to approve substitute water supply plans).

actually attributable to the wells' current and past pumping and, thus, how much augmentation should the substitute water supply plans require?; (b) what would be the time profile of increased flows downstream resulting from the cessation of pumping?; (c) how does the *present value* of future income losses incurred by well owners and linked activities compare with the *present value* of future downstream benefits that would be gradually generated by the increased stream-flows?

Regarding the 2006 surface shortages that occasioned the continuing calls, some estimated that past pumping of the 445 wells caused out-of-priority depletions of 15,000 to 16,000 acre-feet.[23] However, other causes of the surface shortage were also at work including the lingering effects of drought, upstream cities increasing water reuse, and water users changing irrigation practices from flooding to sprinklers.[24] Thus, even had the wells been able to meet their augmentation requirements on a continuing basis, calls would still have occurred, but less frequently. In a similar situation on the East Snake Plain Aquifer in Idaho, the Idaho State Engineer commissioned a study that found that well pumping, drought and changes in irrigation techniques contributed equally to the surface shortages.[25]

When the wells were shut down, seasonal farm incomes were immediately lost because crops had been planted but had not matured.[26] Direct farm income losses were estimated to be $390 per acre, while total direct and indirect income losses were estimated at $690 per acre.[27] These losses will continue into the future until the state permits the wells to operate. In contrast, downstream benefits from the increased water supplies would occur only gradually over several years as the water table recovered and stream-flows increased.[28] In addition, downstream gains would be only marginal additions to farm income since downstream agriculture was not totally dependent on South

23. City of Boulder, *Issue Points on South Platte Wells* (Nov. 28, 2006), *available at* http://www.ci.boulder.co.us/files/Utilities/Projects/s_platte_factsheet.pdf.

24. SOUTH PLATTE RIVER TASK FORCE BRIEFING DOCUMENT, *supra* note 17, at 11.

25. DONALD L. SNYDER AND ROGER H. COUPAL, ASSESSMENT OF RELATIVE ECONOMIC CONSEQUENCES OF CURTAILMENT OF EASTERN SNAKE PLAIN AQUIFER GROUND WATER IRRIGATION RIGHTS at vii (February 2005), *available at* http://www.idwr.idaho.gov/Committee/ESPA%20Economic%20Study%20Feb%202005.pdf.

26. Jerd Smith, *'Tough News' Dooms Crops, Rejected Proposal Would Have Let Farmers Start Wells*, ROCKY MOUNTAIN NEWS, June 3, 2006, at 4A.

27. JENNIFER THORVALDSON AND JAMES PRITCHETT, COLORADO STATE UNIVERSITY, COLORADO WATER RESOURCES RESEARCH INSTITUTE, ECONOMIC IMPACT ANALYSIS OF REDUCED IRRIGATED ACREAGE IN FOUR RIVER BASINS IN COLORADO 34 (December 2006), *available at* http://www.cwi.colostate.edu/publications/cr/207.pdf.

28. *See, e.g.* SNYDER AND COUPAL, *supra* note 25, at xviii (noting gradual increase in downstream benefits on Eastern Snake River).

Platte flows.[29] The cropping patterns in the well areas and the benefiting downstream areas are roughly similar.[30]

For these reasons, the present value of losses of income due to the well shut-down logically must exceed the present value of direct downstream gains from eventual increases in flows. In the similar Idaho situation referenced above, the present value of losses to well owners called out by surface users was vastly greater than the present value of the gradual gains to the surface and spring water users, even though the latter included the largest trout farms in the United States.[31]

II. THE EFFECTS OF THE RIVER CALL

The calling rights on the South Platte were very senior and located far downstream on the Platte in the northeastern part of the State.[32] As a result, the 2006 call included many upstream juniors in addition to the wells, resulting in substantial additional losses to those water users.[33] The call included the cities of Greeley, Boulder, Englewood, Westminster and Highlands Ranch, along with several irrigation ditches and water districts.[34]

The City of Boulder (upstream of the wells) estimated the value of its foregone diversions in 2006 to be at least $100,000 depending on how Boulder would have used the water, either by leasing it to farmers at $25 per acre-foot if the water was in surplus or by having to pay for make-up water to be imported from the Colorado Basin at a cost of about $100 per acre-foot.[35] The losses of other towns involved would have similar values per acre-foot.[36] Therefore, the aggregate losses from the call were substantial.[37]

---

29. SOUTH PLATTE RIVER TASK FORCE BRIEFING DOCUMENT, *supra* note 17, at 10 (noting that only 1.4 million of the annual 4 million acre-feet surface water diversions come from the native flow of the South Platte river).

30. At least one study is underway to determine the validity of this assumption, at least in terms of changes in cropping patterns when irrigated land is fallowed. *See* JENNY THORVALDSON AND JAMES PRITCHETT, ECONOMIC IMPACTS OF REDUCED IRRIGATED AGRICULTURE IN EASTERN COLORADO: A SUMMARY OF THREE STUDIES 2, *available at* http://water.usgs.gov/wrri/05grants/progress.completion_reports/CO/2005CO115B.pdf.

31. SNYDER AND COUPAL, *supra* note 25, at 51-52.

32. *See* Dick Wolfe, Asst. State Engineer, Regulation of Well Pumping in the South Platte River (Oct. 7, 2005) *available at* http://water.state.co.us/pubs/presentations/dwolfe_100705_b.pdf (noting that rights in the northeastern part of the state have priority dates in the 1880s and 1890s).

33. Colorado Supreme Court, Notice of Appeal by Harmony Ditch et al, May 3, 2006

34. *Id.*

35. Carol Ellinghouse, Boulder Water Utility, personal email regarding the South Platte wells, Oct. 26, 2006.

36. *Id.*

37. *Id.*

The remaining question is, "How will the well shutdown affect the frequency and/or duration of future river calls?" Answering that question would require complicated hydrological and climatological analysis and the effects would spread over several years as the aquifer reached a higher level. The resultant reduction in the frequency and duration of calls would, to some degree, result in lower losses to the other junior water users – a benefit of the shut-down. However, because factors other than the wells reduce river flows, the shutdown will not avoid calls altogether – therefore, one must judge the net effect of the shutdown as a substantial economic loss.

III. ARE RIVER CALLS UNECONOMIC?

Calling parties are unlikely to take into account the losses to affected juniors. Indeed, it is difficult for a calling senior to identify the juniors the call will affect.[38] The famous "Coase Theorem" suggests that upstream losers could organize to pay the downstream calling party to "subordinate" their priority if upstream losses exceed those of the downstream caller.[39] Such organization seems unlikely at a large basin level.[40] Thus, there is a presumption that river calls will result in economic losses.

The underlying priority-efficiency conflict occurs because there is a low correlation between water right priorities and the values (net incomes) those rights generate.[41] Agriculture controlled most early uses of water, and many of the senior rights remain in agriculture in spite of a century of water market activity.[42] Senior right holders are still applying water to low marginal value uses in agriculture while urban, industrial and environmental rights typically have lower priorities because of their recent establishment.[43] However, if there were a stronger correla-

38. It is the responsibility of each right holder to monitor the status of the river with respect to river calls.

39. *See* R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 1-44 (1960) (describing how effective allocation of property rights can improve efficiency of transactions). In short, if the costs of bargaining and enforcement of agreements are low, resources will be efficiently allocated even in the absence of competitive markets and regardless of the initial distribution of rights or bargaining power. *See* PAUL MILGROM AND JOHN ROBERTS, ECONOMICS, ORGANIZATION AND MANAGEMENT 300-301 (1992).

40. *Id.* Coase's examples of his theorem depend on the effective interrelation of the economic actors involved. It is unlikely that the economic actors in a market as large as the South Platte River could achieve this level of organization through market forces alone.

41. *See* THORVALDSON AND PRITCHETT, *supra* note 27, at 14 (noting agricultural production represents 0.84% of the total economic activity in the South Platte basin).

42. Kristin Choo, Litigation Won't End the Battles Over Depleted Water Resources in Several Regions of the United States (2008), A.B.A. J., http://abajournal.com/magazine/gulp

43. *Id.*

tion between seniority and economic value ("seniority-value correlation"), then the high-value holders would make fewer calls, perhaps none at all.

The challenge is to find ways within existing water laws to increase the seniority-value correlation. This should be the mission of our water markets: to shift higher priorities towards higher value uses.

IV. IMPROVING WATER MARKETS TO MATCH PRIORITIES AND VALUES

Making the water transfer process less costly and time-consuming (i.e., reducing *transaction costs*[44]) would reduce the frequency of economically inefficient calls because there would be greater motivation to move lower-value-producing rights to higher-value-producing uses.[45] Sellers could get higher returns and buyers would have to pay less. The western states, especially Colorado, have had active water markets for over a century.[46] It should be the goal to make these markets as efficient as possible.

In Colorado, transfers of water rights and plans for augmentation go through water court review and approval in which the court certifies various dimensions of the right (e.g. historic consumptive use, timing of use) so that the water court can condition the transfer on no injury to other water users.[47] Court review frequently requires costly legal and engineering studies by buyer and seller.[48] In Idaho, Wyoming, and New Mexico, the Director of Water Resources, the Water Board, or the State Engineer carries out this review.[49] These agencies have the needed expertise in-house, thereby reducing the costs of legal representation and expert witnesses.[50] The Supreme Court of Idaho recently ruled that the Idaho State Engineer has broad authority to approve plans for well augmentation and can exercise flexibility in designing those arrangements in keeping with consideration of the general public welfare: "Somewhere between the absolute right to use a decreed water right and an obligation not to waste it and to protect the public's inter-

---

44. Charles W. Howe, Carolyn S. Boggs and Peter Butler, *Transaction Costs as Determinants of Water Transfers*, 61 U. Colo. L. Rev. 393 (1990).

45. Megan Hennessy, *Colorado River Water Rights: Property Rights in Transition*, 71 U. Chi. L. Rev. 1661, 1664 (2004).

46. Lawrence J. MacDonnell, *Changing Uses of Water in Colorado: Law and Policy*, 31 Ariz. L. Rev. 783 (1989)

47. COLO. REV. STAT. § 37-92-302 (2008).

48. LAWRENCE J. MACDONNELL, ET AL., WATER BANKS IN THE WEST, 4-2 (Natural Resources Law Center 1994).

49. IDAHO CODE ANN. § 42-1411 (2008); Peggy Sue Kirk, *Cowboys, Indians and Reserved Water Rights: May a State Court Limit How Indian Tribes Use Their Water?*, 28 Land & Water L. Rev. 467, 488 (1993); Howe, *supra* note 44, at 400.

50. *Id.*

est in this valuable commodity, lies an area for the exercise of discretion by the Director."[51]

In Idaho, a factor facilitating water transfers and augmentation plans is that the Department of Water Resources, in cooperation with the University of Idaho, has created a surface water-groundwater computer model that all stakeholders have broadly accepted for use in analyzing alternative plans and policies.[52] Broad authority for the State Engineer Office and broad acceptance of the standard model combine to reduce transaction costs and facilitate trades.

"Water banks" are arrangements through which buyers, sellers, and leasers can quickly execute short-term leases and permanent transfers.[53] Water banks have a long history in Idaho, California, Arizona and Colorado.[54] In Colorado, the General Assembly has authorized water banks for all major basins.[55] A pilot water bank Colorado authorized in 2002 for the Arkansas River failed to generate transactions partly because of long delays in the review process that ruled out useful short-term reallocations.[56] Quick agriculture-to-agriculture, agriculture-to-urban, and urban-to-agriculture leases can be highly beneficial. Again, Idaho utilizes a variety of types of water banks and rental pools that facilitate quick water transfers.[57]

There are other steps that would reduce transactions costs of transfers. More complete public records of ownership of rights and the prices at which transfers occur would help in increasing the efficiency of water markets.[58] Potential market participants have difficulty in identifying each other and in knowing what "the going price" should

51. *American Falls Reservoir District v. Idaho Dept. of Water Resources*, 154 P.3d 433, 451 (Idaho 2007).

52. Donna M. Cosgrove, & Gary S. Johnson, *Aquifer Management Zones Based on Simulated Surface Water Response Functions*, 131 J. of Water Resources Planning and Mgmt. 89, 99 (2005).

53. Kathleen A. Miller, *Managing Supply Variability: The Use of Water Banks in the Western United States, in* DROUGHT: A GLOBAL ASSESSMENT VOLUME III 70-86 (D.A. Wilhite ed., 2000), *available at* http://www.isse.ucar.edu/water_climate/banking.html.

54. Charles W. Howe, *Water Markets in Colorado: Past Performance and Needed Changes, in* MARKETS FOR WATER: POTENTIAL AND PERFORMANCE 65, 66 (K. William Easter, Mark W. Rosegrant and Ariel Dinar ed., 1998).

55. COLO. REV. STAT. § 37-80.5-104.5 (2008).

56. JOHN D . WIENER, ENVIRONMENT AND SOCIETY PROGRAM, INSTITUTE OF BEHAVIORAL SCIENCE, UNIVERSITY OF COLORADO-BOULDER, PROBLEMS WITH THE ARKANSAS RIVER BASIN WATER BANK PILOT PROGRAM, 1 (2008),
http://www.colorado.edu/ibs/eb/wiener/papers/One-pagersJuly08_5.pdf

57. Idaho Water Supply Bank,
http://www.idwr.idaho.gov/waterboard/water%20bank?waterbank.htm (last visited Oct. 10, 2008).

58. Hennessy, *supra* note 45, at 1664.

be in a particular area ("price discovery").[59] The Arkansas River water bank experience indicated that market participants had little idea of a reasonable price.[60] Various market forms are available to establish market-clearing prices, e.g. the sealed bid-double auction procedure that maximizes benefits from transfers, but even simple "bulletin board" markets have also proved effective.[61]

These ideas received recognition in the report of the South Platte Task Force ("SPTF"). The Colorado Governor appointed the SPTF in 2007 and charged them with finding efficient and equitable ways of resolving the South Platte conflicts.[62] Their recommendations recognized that streamlining water court procedures would facilitate transfers and plans of augmentation.[63] They further emphasized the potential for water banks, along with other transfer mechanisms that could substitute for traditional "buy and dry" permanent transfers.[64]

Eventually, the correlation between water right priorities and values generated will continue to increase through the functioning of our water markets, but the South Platte basin is losing large possible benefits–especially in drought years–by failing to facilitate both temporary and permanent transfers. Water transfer reform remains a priority issue.

59. Charles W. Howe, *Innovations in Water Management: lessons from the Colorado-Big Thompson Project and Northern Colorado Water Conservancy District, in* SCARCE WATER AND INSTITUTIONAL CHANGE 171, 191 (Kenneth D. Frederick ed., 1987).

60. Wiener, *supra* note 56.

61. MacDonnell, *supra* note 48, at 4-16; Howe, *supra* note 59, at 187, 191.

62. Letter from the Colorado Department of Natural Resources to Gov. Bill Ritter (Sept. 30, 2007). http://www.dnr.state.co.us/newsapp/press.asp?PressId=4567.

63. *Id.*

64. *Id.*