

Irrigation Institutions in the American West

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ABSTRACT

The history of irrigation organizations during the late nineteenth and early twentieth centuries in the arid and semi-arid American West reveals the important role of experimentation in determining the institutional forms that evolved. The legal framework was such that a wide variety of bottom-up organizations developed to deal with transaction cost problems. Contracting was complicated by asset specificity, potential spillovers between users, free-riding, and holdout problems. Asset specificity on the part of both farmers and irrigation infrastructure owners should have led to vertical integration with a single firm owning both the farmland and the infrastructure. However, the differing economies of scale between capturing and delivering irrigation water and farming meant that vertical integration would have resulted in costly operations. Instead of vertical integration or the separate ownership of farms and irrigation infrastructure, western farmers sought out intermediary institutions. In some cases, simple contracts among a few farmers were sufficient to divert water from streams and to carry it to crops. In other cases, a developer would form a commercial irrigation company, buy a large block of land, install irrigation infrastructure, and then sell off farms. However, the commercial irrigation company did not provide solutions to transaction cost issues; instead, it was fraught with transaction cost problems that undermined its use-

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fulness. Mutuals, both incorporated and unincorporated, allowed farmers to contract with other farmers to own and operate irrigation facilities. Irrigation districts, a form of localized government with coercive powers, were authorized in all of the western states. These districts became another significant form of irrigation organization.

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I.

INTRODUCTION

Aridity is a defining characteristic of the American West, and the application of water to land is a central theme in the history and development of the seventeen coterminous western states. "As late as 1875, W.B. Hazen, an army officer who served in the West, claimed that all the land between the hundredth meridian and the Sierra Nevada was uninhabitable and that 'emigration to these places known not to be arable, be emphatically discouraged.'"¹ Others were more optimistic about the settlement of

1. TERRY L. ANDERSON & PETER J. HILL, *THE NOT SO WILD, WILD WEST: PROPERTY RIGHTS ON THE FRONTIER* 178 (2004) (citing DONALD J. PISANI, *TO RECLAIM A DIVIDED WEST: WATER, LAW AND PUBLIC POLICY, 1848-1902*, 70 (2002)).

the West if the problem of irrigation could be solved. In 1896, the legal scholar William P. Aiken wrote:

The economic future of the far west is largely dependent on a practical solution to the problem of irrigation. Millions of acres lie there sterile and lifeless, yet with all the elements of fertility locked up in the soil, and with sunshine and a climate favorable to every kind of agricultural production. The nimble jugglery of the statistician does not enable one to grasp the situation. Square acres of maps and huge columns of figures convey but a dim impression of the urgency of the problem. Only the traveler who has passed over the vast solitudes and witnessed the transformation wrought here and there by some unknown Aaron of the wilderness can appreciate the enormous forces of nature waiting for a deliverer.²

As the three million acres of land that were under irrigation in the seventeen coterminous western states in 1890³ grew to over forty million acres by 1978,⁴ the “deliverer” of irrigation water that Aiken thought was necessary to develop the West had been found. As the decades immediately before and after the turn of the twentieth century revealed, the process of capturing and delivering water required a variety of institutional forms and legal arrangements. The legal structures available at the time allowed for different organizational experiments, some successful and others not, in the form of private and public, small scale, local institutions that captured and distributed water and managed the application of water to land. Private institutions included commercial irrigation companies, unincorporated mutual associations, and mutual irrigation (or ditch) companies. The primary public institution was the irrigation district.⁵

With these forms of organization, the settlers of the West applied new institutional solutions to underlying economic problems. Due to the lack of rain, farming in the West without

2. William P. Aiken, *The Irrigation Question in California*, 5 YALE L.J. 122, 122 (1896).

3. Bureau of the Census, U.S. Dep't of Commerce, 5 Thirteenth Census of the U.S. Taken in the Year 1910, Irrigation 845, tbl. 14 (1913) [hereinafter 1910 Census].

4. Bureau of the Census, U.S. Dep't of Commerce, 4 1978 Census of Agriculture: Census of Irrigation Organizations 192, tbl. 15 (1980) [hereinafter 1978 Census].

5. Although the Bureau of Reclamation is a type of public irrigation organization, it is not addressed separately as one in this article since it represented a very different form than early farmer-owned and farmer-financed irrigation organization. Although the Bureau of Reclamation was created by a congressional statute in 1902, it did not become a major supplier of water until later in the century. The influence of government subsidies via Bureau of Reclamation projects on the formation of local institutions is addressed later in the article.

irrigation has never been economically viable. In addition to the challenges created by geography, the vagaries of the weather, and the fluctuating markets for agricultural products, farmers also contended with fundamental economic problems in organizing production. These more fundamental problems arose because farms required a certain scale while irrigation facilities usually required a larger scale. The different economies of scale⁶ dictated different optimal sizes for organization and led to transaction costs⁷ that had to be overcome by farmers and the suppliers of irrigation water. These costs ranged from vertical integration costs⁸ associated with non-optimality⁹ of size to contractual costs created by hold-up problems and opportunistic behavior.¹⁰ Each of these problems represents a Coasean property rights problem in which transaction costs can prevent contractual solutions from addressing all the costs and benefits of a relationship.¹¹ The Coasean solution to a Coasean property rights problem is the firm,¹² and the settlers of the West turned to the firm, or, in the case of irrigation districts, firm-like structures, to reduce transaction costs associated with irrigation.

Commercial irrigation companies, mutual irrigation companies, and irrigation districts represented legal innovations that

6. Economies of scale describe the cost structure of the firm relative to its size. If there are economies of scale, the firm has a decreasing long run average total cost curve, meaning its per unit costs of production are falling. The optimal size of the firm is where the long run average total cost curve reaches its minimum, or where unit costs of production are the lowest. See JAMES GWARTNEY ET AL., *ECONOMICS: PRIVATE AND PUBLIC CHOICE* 457 (2006).

7. Transaction costs are the costs of defining, enforcing, and exchanging property rights. See TRAINN EGGERTSSON, *ECONOMIC BEHAVIOR AND INSTITUTIONS* 14 (1990).

8. Vertical integration occurs when a firm purchases control of either upstream or downstream cooperating factors of production, thus making them internal to the firm rather than buying the factors on a continuing basis in the market. See Ronald H. Coase, *The Nature of the Firm*, 4 *ECONOMICA* 386 (1937). For further implications developed in the voluminous literature that has followed Coase, see Benjamin Klein et al., *Vertical Integration, Appropriable Rents, and the Contracting Process*, 21 *J.L. & ECON.* 297 (1978); Oliver E. Williamson, *The Vertical Interaction of Production: Market Failure Considerations*, 61 *AM. ECON. REV.* 112 (1971).

9. Non-optimality occurs when a firm is operating at some point other than the minimum of its long run average total cost curve and therefore has higher than necessary unit costs of production. GWARTNEY ET AL., *supra* note 6.

10. Opportunistic behavior occurs when an owner of an asset that is crucial for a firm's production "holds-up" the firm by demanding a larger payment than agreed upon in the original contract. See OLIVER WILLIAMSON, *MARKETS AND HIERARCHIES; ANALYSIS AND ANTITRUST IMPLICATIONS* 26-30 (1975).

11. See Ronald H. Coase, *The Problem of Social Cost*, 3 *J.L. & ECON.* 1 (1960).

12. See Coase, *supra* note 8.

were adapted to the need for irrigation water to farm the West. By using private, corporate forms of organization in the late nineteenth and early twentieth centuries, the developers and farmers of the West took advantage of the contemporaneous revolution in corporation law that resulted in the modern business corporation.¹³ By forming irrigation districts, farmers also pioneered the use of local government special use entities that are prevalent today.¹⁴ Thus, the agricultural development of the West illustrates both an adaptation of farming techniques and technologies to an arid climate and geography and the adoption of new legal entities to solve the transaction costs of organizing the capture and delivery of water for agricultural purposes.

More recently, the institutions that farmers organized to overcome transaction costs in irrigation over a hundred years ago have been analyzed in the context of modern water transfers.¹⁵ Since these institutions were designed to deliver water effectively to groups of farmers within the organization, most of these institutions allowed for efficient intra-organization transfers of water to meet changing demands. However, when irrigation institutions were formed, few people believed that the highest valued use of water rights would ever be outside of agriculture or even the organization itself. Little thought was given to structuring the institutions so that water owners could easily respond to changing market conditions and move water to other uses, such as developing profit-sharing mechanisms among the members of the institution for water transfers by individual members.¹⁶ Thus, the historical development of irrigation institutions has resulted in high transaction costs for water transfers to municipalities and other users outside of the original organization.

Ultimately, an analysis of the influence of irrigation institutions in contemporary internal and external water transfers is enhanced by an understanding of the reasons why the institutional

13. See David Millon, *Frontiers of Legal Thought I: Theories of the Corporation*, 1990 DUKE L.J. 201; LAWRENCE FRIEDMAN, *A HISTORY OF AMERICAN LAW* 188-191 (2d ed. 1985).

14. See Lenni Beth Benson, *Desert Survival: The Evolving Western Irrigation District*, 1982 ARIZ. ST. L.J. 377; Tim De Young, *Governing Special Districts: The Conflict Between Voting Rights and Property Privileges*, 1982 ARIZ. ST. L.J. 419; John D Leshy, *Irrigation Districts in a Changing West – An Overview*, 1982 ARIZ. ST. L.J. 345.

15. See Barton H. Thompson, Jr., *Institutional Perspectives on Water Policy and Markets*, 81 CAL L. REV. 673 (1993); C. Carter Ruml, *The Coase Theorem and Western U.S. Appropriative Water Rights*, 45 NAT. RES. J. 169 (2005).

16. Thompson, *supra* note 15, at 731-33.

forms were created in the first place. This article analyzes the evolution of irrigation institutions in the American West in the late nineteenth and early twentieth centuries. Part II describes the transaction costs and property rights framework that led to the irrigation institution as the solution to the problem of organizing the capture, delivery, and management of water for agricultural purposes. One underlying assumption is that in situations with a high degree of residual claimancy¹⁷ on the part of decision makers, the institutional form, such as the size and nature of firms and contracts, will be one that maximizes the wealth of the participants, net of transaction costs.¹⁸ The result is viewing the rules of the game through "the lens of contract."¹⁹ Part III illustrates, through the example of commercial irrigation companies, how transaction costs made some organizational forms unworkable over time. Part IV describes the different types of irrigation institutions created by western farmers to solve transaction cost problems and discusses how different legal structures addressed these difficulties.

II.

THE TRANSACTION COSTS OF IRRIGATION

Transaction costs are part of the costs of defining and enforcing property rights. The firm is an organization created to reduce transaction costs.²⁰ Several types of transaction costs influenced the development of the type of organizations used by settlers in the American West to apply irrigation water to land: asset specificity²¹ and opportunism, holdout problems, and free-rider

17. Residual claimancy describes the member of a firm or social organization who has a claim on the residual after contractual payments are made to factors of production. Since the residual claimant receives the residual rewards from the firm's activity, he or she has an incentive to search for optimal organizational, monitoring, and production forms. See Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777 (1972).

18. DOUGLAS W. ALLEN & DEAN LUECK, *THE NATURE OF THE FARM: CONTRACTS, RISK AND ORGANIZATION IN AGRICULTURE* 4 (2002); see generally ANDERSON & HILL, *supra* note 1.

19. Oliver E. Williamson, *The Theory of the Firm as Government Structure: From Choice to Contract*, 16 J. ECON. PERSPECTIVES 171, 172 (2002).

20. See Coase, *supra* note 8.

21. Asset specificity occurs when, once the investment in the asset is complete, its highest and best use is specific to a particular firm or organization. This creates a bilateral exchange relationship for a considerable period and opportunistic behavior can result. See OLIVER WILLIAMSON, *FIRMS, MARKETS, AND POLICY CONTROL* 142-44 (1986).

problems.²² These transaction costs arose from the arid conditions that the settlers of the West encountered and the need to divert water for agricultural uses.²³

One institutional change that substantially reduced the transaction costs of irrigation was the replacement of riparian water rights by the prior appropriation doctrine.²⁴ Riparian rights, which had evolved under English common law, granted a stream bank owner a right to an undiminished quantity and quality of water. Since, however, water in the arid west was valuable outside of the stream, prior appropriation rights gradually replaced riparian rights. The prior appropriation doctrine allowed for diversion to nonriparian lands, granted the first appropriator an exclusive right to the water diverted, and conditioned other rights upon those prior rights. In order to limit the amount of water claims, a diverter had to put the water to beneficial use. Under this doctrine, water rights were transferable through voluntary exchange. The irrigation institutions developed in the American West arose in the context of the prior appropriation doctrine.²⁵

A high degree of asset specificity existed in irrigation for both the deliverers and the recipients of water. Land to be cultivated far from a surface water source required dams, reservoirs, diversions works, and a network of canals. However, once constructed these irrigation works were designed to deliver water to very specific locations. Farmers receiving water also faced a high degree of asset specificity because their land depended on particular networks for water delivery; competing sources of irrigation water were likely to be comparatively more expensive. This twin asset specificity problem created incentives for opportunism by both the organization delivering the water and the farmer receiving the water because the use of specialized assets in the produc-

22. Holdout problems and free-rider problems occur because of incomplete contracts. Holdouts represent the action of one potential member of an exchange withholding the consent to use his or her asset in order to capture a larger share of the gains from trade. Free-rider problems are the result of the high costs of excluding people who are potential beneficiaries of an action from those benefits even if they haven't paid for them. EGGERTSSON, *supra* note 7, at 64-67.

23. ANDERSON & HILL, *supra* note 1, at 179.

24. For a more complete discussion of water rights and their evolution, *see id* at 178-80.

25. This article assumes the operation of the prior appropriation doctrine and only discusses it when the nuances of water rights ownership affect transaction costs.

tion process created appropriable quasi rents.²⁶ A water delivery organization needed to attract farmers, but to do so it needed to convince farmers it would not raise the price of water once the land was developed.²⁷ However, a water delivery organization also risked becoming subject to the farmers' monopsony²⁸ power to capture more rents by organizing and obtaining prices high enough to cover the water delivery organization's costs but low enough to reduce or eliminate its profit.²⁹ In a situation where specialized assets created appropriable quasi rents, "the cost of contracting will generally increase more than the cost of vertical integration. Hence, *ceteris paribus*, we are more likely to observe vertical integration."³⁰ Although vertical integration between the water delivery organization and the farmer could eliminate the incentives for opportunism, vertical integration created its own costs that complicated the contracting nexus.

Economies of scale in constructing irrigation works meant that the optimal size of the water delivery organization was much larger than the optimal size of a western farm. In 1920, at the height of localized, bottom-up irrigation development,³¹ the average size of a farm in the seventeen coterminous western states was 263 acres and the number of irrigated acres per irrigated farm was 83 acres.³² Assuming that the farmers had overcome the initial transaction costs imposed by federal land laws and had reached close to an optimal size for farms by that date, these acreage figures contrast sharply with the size of irrigation organizations in 1920.³³ Mutual irrigation companies averaged 1,889

26. Appropriable quasi rents exist when, because of incomplete or unenforceable contracts, one party to an exchange has a credible opportunity to demand a portion of the rents (profits) created by a particular exchange. See Klein et al., *supra* note 8.

27. *Id.* at 181.

28. Monopsony occurs when there is a single purchaser of a service or good.

29. JOSEPH SAX, ET AL., *CONTROL OF WATER RESOURCES: CASES AND MATERIALS* 597 (3d ed. 2000).

30. Klein et al., *supra* note 8, at 298.

31. The irrigation organizations that existed in 1920 were largely the impetus of farmers who controlled their own assets and paid their own bills. However, after the Omnibus Adjustment Act of 1926, Pub. L. No. 69-284, 44 Stat. 636 (codified in scattered sections of 43 U.S.C.), the Bureau of Reclamation channeled all of its project water through irrigation districts. See, Leshy, *supra* note 14, at 360; see also Mark Wilson, *Reclamation Subsidies and Their Present-Day Impact*, 1982 ARIZ. ST. L.J. 497.

32. Bureau of the Census, U.S. Dep't of Commerce, 7 Fourteenth Census of the U.S. Taken in the Year 1920, Irrigation 41, tbl. 1 (1923).

33. Farm sizes in the West were initially fragmented by a statutory vision of small family farms. Federal land laws, such as the Homestead Act of 1862, 37 Cong. Ch. 75, 1, 2, 5, 6, 12 Stat. 392-93, and the Desert Lands Act of 1877, ch. 107, 1, 19 Stat.

acres and irrigation districts encompassed, on average, 9,510 acres.³⁴ Thus, there was enormous mismatch between the optimal size of an irrigation organization and the optimal size of a farm. If vertical integration was to occur, either the irrigation organizations would be too small to capture appropriate economies of scale or farms would be too large to be operating in a least cost manner.³⁵

Due to the problems of asset specificity and opportunism and the differing economies of scale between irrigation organizations and farms in the West, transaction cost theory would result in two different predictions about the appropriate contractual form for organizing irrigation. Asset specificity would normally lead to vertical integration in which the irrigation works and the farmland would be combined under single ownership to prevent the possibility of opportunistic behavior by either farmers or water delivery organizations. However, vertically integrating would be costly because of the non-optimal size of the resulting firm, which would therefore suggest a solution based on arms-length negotiations and contracts between farmers and water delivery organizations.

Potential contractual solutions contained their own problems. The normal issues of setting appropriate prices and agreeing to contract terms were exacerbated in the American West by the arid climate and the need to divert water for agriculture. These new production conditions made it difficult to predict the appropriate long-term price for water delivery. Opportunism and hold-up problems were also magnified by the farmers' need for timely water delivery that corresponded to the growing season, which meant that any contractual disputes not resolved quickly were costly to farmers. Contractual solutions to the problem of irrigation also faced holdout problems. Because irrigation works generally had to transect land owned by many different individuals, the potential existed for any single landowner to hold out for a larger share of rents from the project. An irrigation organization that wanted to build a canal across properties owned by disparate individuals could have its rents from the project threatened by a landowner who denied a right-of-way unless he

377, 377 (codified at 43 U.S.C. 321 (2004)), both placed limits on the initial size of farmers' land claims.

34. Bureau of the Census, U.S. Dept. of Commerce, Seventeenth Census of the U.S. Taken in the Year 1950, 3 Census of Agriculture 93, tbl. 60-17 (1952).

35. ALLEN & LUECK, *supra* note 18, at 182-83.

or she received a larger share of the rents from the project. The operation and maintenance of irrigation works was also subject to a free-rider problem because "upstream users had little incentive to worry about downstream delivery."³⁶ Farmers at the upper end of an irrigation system could reduce maintenance efforts and still obtain water, but the lack of upstream maintenance could reduce flows to downstream farmers. Other factors influenced the contractual form, particularly uncertainty over water supply availability due to exogenous shocks such as droughts in the arid West. Since contracts are of necessity incomplete on some margins, this uncertainty created an additional dimension that made contracting between parties costly and vertical integration more likely.

Thus, the transaction costs arising among farmers and between farmers and the owners of irrigation works did not lead to an unequivocally clear prediction about organizational form. Vertical integration involved significant costs in terms of non-optimality of size, but contracting between owners of irrigation works and farmers also held the potential for opportunistic behavior and hold-up problems with costly results.

However, vertically integrating into a single firm or contracting among separate economic entities were not the only options available. Another possibility was a producer-owned enterprise in which the producers maintained their appropriate scale of operation but contracted to form a jointly-owned firm or organization to provide certain inputs.³⁷ In agriculture, joint ownership is quite common, usually in the form of cooperatives for marketing products. In 1991, agricultural cooperatives marketed 28% of all farm products.³⁸ Farm cooperatives were important suppliers of farm inputs, representing, in 1990, 43% of fertilizer purchases by farmers, 38% of petroleum products, and 30% of farm chemicals.³⁹

The transaction costs of organizing irrigation in the western United States led to similar results. Farmers sought out alternative forms of organizing irrigation that represented neither vertical integration nor contracts between independent firms.

36. ANDERSON & HILL, *supra* note 1, at 181.

37. See HENRY HANSMANN, *THE OWNERSHIP OF ENTERPRISE*, 53-149 (1996).

38. *Id.* at 120.

39. *Id.* at 149.

TABLE 1
Irrigation Organizations (Acres Irrigated) 17 Western States, a 1910-1978

Census Year	Commercial	Individual and Unincorporated Mutuals ^b	Incorporated Mutuals	Irrigation Districts	Bureau of Reclamation	Other	Total acres irrigated
1890							3,631,381
1900							7,518,527
1910	1,451,806	6,257,387	4,643,539	528,642	395,646	461,465	13,738,485
Percentage	11.0%	46.0%	34.0%	4.0%	3.0%	1.0%	100.0%
1920	1,635,027	6,448,647	6,569,690	1,822,887	1,254,569	826,052	18,556,872
Percentage	8.8%	34.8%	35.4%	9.8%	6.8%	4.5%	100.0%
1930	999,778	6,038,839	6,271,334	3,452,275	1,485,028	697,513	18,944,767
Percentage	5.3%	31.9%	33.1%	18.2%	7.8%	3.7%	100.0%
1940	858,017	8,062,644	5,706,606	3,514,702	1,824,004	680,585	20,646,558
Percentage	4.2%	39.1%	27.6%	17.0%	8.8%	3.3%	100.0%
1950	705,087	13,930,697	5,635,630	4,962,413	682,413 ^d	614,703	26,530,943
Percentage	2.7%	52.5%	21.2%	18.7%	2.6%	2.3%	100.0%
1969	403,610	16,685,276	7,028,825	9,689,181	363,320 ^d	615,585	34,785,788
Percentage	0.1%	48.0%	20.2%	27.9%	1.0%	1.8%	100.0%
1978	219,836	24,315,596	6,937,119	10,769,762	250,840 ^d	864,694	43,357,847
Percentage	0.5%	56.1%	16.0%	24.8%	0.6%	2.0%	100.0%

Sources

- 1890 and 1900: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, 5 THIRTEENTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1910, ch. XI Irrigation 845, tbl. 14.
- 1910: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, 5 THIRTEENTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1910, ch. XI Irrigation 846, tbl. 15 (adjusted for Arkansas and Louisiana).
- 1920 and 1930: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, FIFTEENTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1930, 1 Irrigation and Drainage, pt. II, 50, tbl. 6 (1932) (adjusted for Arkansas and Louisiana).
- 1940: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, SIXTEENTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1940, Census of Agriculture, Irrigation, sec. C, 4, tbl. 5 (1942) (adjusted for Arkansas and Louisiana).
- 1950: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, SEVENTEENTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1950, 3 Census of Agriculture 58, tbl. 60-20.
- 1969: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, 4 1969 CENSUS OF AGRICULTURE 83, tbl. 18 (adjusted for Louisiana).
- 1978: BUREAU OF THE CENSUS, U.S. DEPT OF COMMERCE, 4 1978 CENSUS OF AGRICULTURE 192, tbl. 15.

Notes

- a. The western states are Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.
- b. Until 1950 single farm irrigation and partnerships, or unincorporated mutuals are listed together. After that date it is possible to separate the two, and for 1950, 1969, and 1978 the single-farm category is 85%, 98%, and 92% of the total "individual and unincorporated."
- c. "Other" includes Carey Act land (through 1930), Bureau of Indian Affairs, State, and City.
- d. After 1940 Bureau of Reclamation irrigation projects are assigned to the organization that is operating them, primarily irrigation districts. Thus the acres in this column for 1950, 1969, and 1978 are those directly under Bureau of Reclamation control, a small percentage of the total Bureau of Reclamation projects. For instance, in 1969 the Bureau of Reclamation was responsible for 5,865,035 acres of irrigation, but 5,501,713 of those acres are also listed under the organizations operating the projects, so they are not listed in this column to avoid double counting. By 1978 the Bureau of Reclamation had transferred 6,566,337 irrigated acres to irrigation organizations, leaving only 250,840 acres in the category "Bureau of Reclamation operated."

Table 1 provides an overview of the various irrigation institutions that developed in the late nineteenth and early twentieth centuries in the seventeen coterminous western states.⁴⁰ The primary forms of organization were commercial irrigation companies, unincorporated and incorporated mutual associations, and irrigation districts. Unincorporated mutual associations and mutual irrigation companies, along with commercial irrigation companies, relied on contract and corporation law for their formation and operation, while irrigation districts were local governmental units that used coercive power to overcome certain transaction cost problems.

III.

COMMERCIAL IRRIGATION COMPANIES AND THE PROBLEM OF TRANSACTION COSTS

One of the earliest corporate institutions used to amass capital for irrigation projects in the American West was the commercial irrigation company. By the 1880s, numerous commercial irrigation companies existed in the western states, although by the early twentieth century, the mutual ditch company and the irrigation district superseded the commercial irrigation company. In 1910, commercial irrigation companies represented 11% of total acres irrigated,⁴¹ but by 1978 they were less than 1% of total acres irrigated.⁴² Transaction costs arising from the asset specificity problem made it difficult for this type of organization to persist due to the fact that contracts between farmers and commercial irrigation companies were subject to numerous forms of opportunism.⁴³

The commercial irrigation company was a private venture established to construct and operate irrigation systems for a profit under three different forms.⁴⁴ The first type was a development company that aimed to profit from the sale of land, the value of which was enhanced by the availability of water for irrigation.⁴⁵ The development company purchased a large block of land, subdivided the land, constructed an irrigation system, sold land and

40. *See supra* note 31.

41. 1910 Census, *supra* note 3.

42. 1978 Census, *supra* note 4.

43. *See* Klein et al., *supra* note 8.

44. R. P. Teele, *The Organization of Irrigation Companies*, 12 J. POL. ECON. 161, 162 (1904); Wells Hutchins, *Commercial Irrigation Companies 1* (U.S. Dep't of Agric. Tech. Bull. No. 177, 1930) [hereinafter Tech. Bull. No. 177].

45. Tech. Bull. No. 177, *supra* note 44, at 5.

water rights, and then transferred control of the system to the landowners. The transfer was accomplished either through a direct assignment of the system to a mutual irrigation company established by the landowners, or by establishing a mutual irrigation company as a subsidiary to own the system and then transferring the shares to the landowners.⁴⁶ The second type of commercial irrigation company was a private water company that used an irrigation system to sell a right to perpetual water service through contracts with selected landowners.⁴⁷ The third type was a public utility that provided water service to anyone in its service area upon request.⁴⁸ In all three types, the commercial irrigation company usually held legal title to the appropriative water right.⁴⁹

Commercial irrigation companies were initially established as joint stock companies, or, once state general incorporation laws became widespread, as corporations via a simple filing with the state. They were governed by their articles of incorporation, by-laws, and state corporate law. The goal of a commercial irrigation company was to provide a return for its shareholders either in the short-term through the sale of irrigable land as a development company or over the long-term through the sale of water as a private water company.⁵⁰ The shareholders and bondholders tended to be investors from the financial centers on the East Coast and Europe who were speculating on the development of the American West.⁵¹ Control of a majority of the shares in commercial irrigation companies and thereby, the company, often vested in a small number of shareholders.⁵²

46. *Id.*

47. *Id.*

48. The role of public utilities in the distribution of irrigation water is beyond the scope of this article.

49. Wells Hutchins et al., *Irrigation-Enterprise Organizations* 50 (U.S. Dep't of Agric. Circ. No. 934, 1953) [hereinafter *Circ. No. 934*]; JAMES CORBRIDGE, JR. & TERESA A. RICE, *VRANESH'S COLORADO WATER LAW, REVISED EDITION* 292 (1999). The treatment of a commercial irrigation company's water rights varied under state law from that of appropriator to that of agent. *Circ. No. 934, supra*, at 50. For example, in Colorado, a literal application of the prior appropriation doctrine resulted in the water right held jointly by the company and the landowner since the company diverted the water and the landowner's application of the water created the required beneficial use. *Bd. Of Comm'rs of Jefferson Cty. v. Rocky Mtn. Water Co.*, 102 Colo. 351 (1938).

50. *Circ. No. 934, supra* note 49, at 14, 45-46.

51. *Id.* at 14, 36.

52. *Id.* at 35.

Unfortunately for their shareholders, commercial irrigation companies were often not good investments. A combination of boom and bust cycles in the markets for agricultural products, poor business judgments, and flawed business models, especially those formed in the boom years prior to the Panic of 1893, led to the failure of many commercial irrigation companies.⁵³ The business judgment issues, such as unrealistic predictions about land values, soil conditions, crop yields, commodity prices, water supplies, and the failure to factor the time and expense of litigation over appropriative water rights, were not unique to commercial irrigation companies.⁵⁴ However, transaction cost issues led to unsustainable business models and revealed why commercial irrigation companies were generally more successful in constructing irrigation systems than in operating those systems.

A commercial irrigation company used the initial capital raised by the sale of stock and bonds to investors to buy land and water rights and to construct the dams, main delivery canals, and lateral feeder ditches of the irrigation system. Initially, projects faced challenges of under-capitalization and over-capitalization. Under-capitalization resulting in insufficient funds to complete a project could lead to bankruptcy in the short term. Over-capitalization resulting in an irrigation system larger than either the available water rights could fill or the market for land could sustain could bankrupt a project in the long-term or prevent the company from recovering the cost of capital.

However, even a commercial irrigation company with sufficient capital to build an irrigation system of appropriate size and scale faced challenges arising from asset specificity and opportunism. Arid lands could not be farmed or homesteaded without irrigation, so the irrigation system needed to be built first. Building an irrigation system for profit based on expected revenues from the sale of land and water rights and then waiting for settlers to purchase serviceable lands meant relying on a company-generated market push strategy rather than on a farmer-generated market pull strategy. Unfortunately for investors in commercial irrigation companies, settlers did not always come in the time periods or numbers predicted; sometimes, annual service charges were set too low to attract settlers.⁵⁵ As a result, suffi-

53. Katherine Coman, *Some Unsettled Problems of Irrigation*, 1 AM. ECON. REV. 5 (1911).

54. Tech. Bull. No. 177, *supra* note 44, at 7.

55. *Id.* at 7-9.

cient revenues were not generated to maintain the irrigation system. As one contemporaneous writer noted in connection with these failed commercial projects, "Nothing goes to wreck more quickly than irrigation works where repairs are not maintained; the ditches fill with sand and silt, the flumes warp in the sun, and cement dams disintegrate under the alternate action of frost and heat."⁵⁶

Asset specificity and uncertainty created several types of issues for the commercial irrigation company. Farmers were concerned that commercial irrigation companies would use their monopoly power to charge excessive rates for the delivery of water.⁵⁷ Farmers could exercise their monopsony power and band together to refuse to contract for prices for water delivery.⁵⁸ Farmers were reluctant to enter into long term contracts since the contracts offered by commercial irrigation companies were often one-sided, requiring a farmer to make payments but not obligating the company to furnish water. A typical contract of a private water company contained the following paragraphs:

It is hereby distinctly understood and agreed that in case the canal shall be unable to carry and distribute a volume of water equal to its estimated capacity, either from casual or unforeseen or unavoidable accidents, or if the volume of water in the natural stream prove insufficient from drought, or the use thereof by those having prior rights thereto, to the said party of the first party [the company], or from any cause beyond the control of the party of the first part, then said party of the first part shall not be liable in any way for the shortage or deficiency of the supply occasioned by any of said causes.

And in case the second party [the landowner] shall fail to make the payments aforesaid, and each of them, punctually and upon the strict terms and times above limited, and likewise to perform and complete all and each of said agreements and stipulations aforesaid, strictly and literally, without any failure or default, then this contract, so far as it may bind the said first party, shall become utterly null and void, and all rights and interests hereby created or then existing in favor of the second party, or derived from the said second party, shall utterly cease and determine, and all equitable and legal interest in the water rights hereby contracted to be conveyed shall revert to and invest in said first party. . .⁵⁹

56. Coman, *supra* note 53, at 5.

57. SAX ET AL., *supra* note 29, at 597.

58. *Id.*

59. Teele, *supra* note 44, at 163.

As noted by an early twentieth century legal scholar, "Rights are sold on the basis of the estimated capacity of the works . . . But there is no guarantee that the capacity will not be overestimated; in fact, the capacity of most canals is overestimated."⁶⁰ Commercial irrigation companies apparently took advantage of this opportunity. According to Commander Booth-Tucker of the Salvation Army:

I know the power of irrigation, but I also know its dangers. An irrigation company can destroy a farmer in two or three days, if it chooses. It can sell him the land, give him plenty of water for two or three years, till he gets well improved. Then at the critical moment it can withhold the water for a few days, destroy his crops for that season, and ruin him. He is unable to meet his payments. The company takes his land, rendered more valuable by the improvements he has put on it, sells it over again, and makes money by the transaction. I am sorry to say that is being done all the time.⁶¹

Such opportunistic behavior was a double-edged sword for the company. The company's primary legal remedies for failure of the landowner to make payments were either a refusal to deliver water or the execution of a lien on the land. However, the widespread refusal to deliver water could result in smaller diversions for the company and a loss of appropriative water rights to abandonment. Too many liens on the land created the stigma of failure, hurting promotional efforts.⁶² Either remedy would also prevent the land from producing crops and generating income to pay the mortgage. In addition, opportunistic behavior by commercial irrigation companies produced a political backlash. A number of states passed laws prohibiting or regulating the sale of water rights by commercial irrigation companies.⁶³

As a result of all these issues, revenues from the sale of land and water rights by commercial irrigation companies were not adequate to pay dividends to shareholders or repay the interest and principals on bonds. Defaults on the bonds of commercial irrigation companies were heavy, and a history of failure scared away new capital and destroyed the market for bonds in these companies after 1913.⁶⁴ Thus, the legacy of commercial irrigation

60. *Id.* at 164.

61. *Id.* at 165.

62. Tech. Bull. No. 177, *supra* note 44, at 21.

63. Teele, *supra* note 44, at 166; CORBRIDGE & RICE, *supra* note 49, at 292; *see, e.g.*, Colo. Rev. Stat. §§ 37-85-101-111 (2005) (originally enacted in 1887), and ID Code Ann. § 42-913 (2006) (originally enacted in 1899).

64. Circ. No. 934, *supra* note 49, at 36-37.

companies in the American West is primarily one of constructing irrigation systems rather than operating irrigation systems.⁶⁵

IV.

TRANSACTION COSTS OVERCOME—MUTUALS AND IRRIGATION DISTRICTS

The question of whether firms could overcome the high transaction costs associated with capturing and delivering water to farmers in the American West was answered affirmatively by several small-scale, local institutions. Unincorporated mutual irrigation associations and mutual irrigation (or ditch) companies, also known as "mutuals," provided one answer while irrigation districts represented another answer. This part will review the legal structures and relationships created by each of these institutional solutions and will show how they addressed or failed to address the transaction costs faced by western farmers in their efforts to obtain water.

A. *Unincorporated Mutual Associations*

The simplest form of organization among farmers was a joint venture or similar unincorporated mutual association. Two or more individuals voluntarily agreed, either verbally or in writing, to jointly construct and maintain a ditch to transport water to agricultural lands. Since the joint venture was a creature of contract, the agreement between the parties governed the right to use the joint ditch, and the relationship was based on the laws of contract, real property, agency, and partnership.⁶⁶ In using this organizational form, farmers, consciously or unconsciously, relied on a mix of trust, common sense, and well-established common law principles.

Several legal implications arose from this tenancy in common. First, each party held an equal (or unequal) undivided interest in the joint ditch, but retained their individual water rights and associated priorities since the water rights could usually only be held as tenants in common when the water was used on land co-owned by the parties.⁶⁷ The difference in treatment between the

65. Tech. Bull. No. 177, *supra* note 44, at 2-3.

66. CORBRIDGE & RICE, *supra* note 49, at 278; Wells Hutchins, Mutual Irrigation Companies 11 (U.S. Dep't of Agric. Tech. Bull. No. 82, 1929) [hereinafter Tech. Bull. No. 82].

67. CORBRIDGE & RICE, *supra* note 49, at 278-79 (citing *City of Telluride v. Davis*, 33 Colo. 355 (1905)).

joint ditch and the water rights occurred because “the unity of possession necessary for a tenancy in common [was] destroyed once the water . . . [was] diverted to each individual’s use.”⁶⁸ Second, each party could transfer his or her interest in the joint ditch without the consent of the other co-tenants since, by definition, each tenant owned, with most of the attributes of private property, a physically undivided portion of the joint ditch.⁶⁹ Third, by definition, a tenancy in common did not provide the other tenants with a right of survivorship upon death, so each party’s interest in the joint ditch passed to his or her heirs upon death via the law of wills and estates.

State law often had provisions facilitating the creation and operation of joint ditches. For example, under the Colorado Constitution, both persons and corporations had the right to condemn private and public land to provide a right-of-way for ditches for various beneficial uses, including “the irrigation of agricultural lands” with the payment of compensation.⁷⁰ In addition, the statutes in a number of western states allowed an individual who incurred costs in operating and maintaining a joint ditch to seek recovery from the other joint venturers.⁷¹

For a relatively straightforward private irrigation project involving a small group of farmers, such as the construction and operation of a single joint ditch that depended on regular stream flow rather than storage works, the unincorporated association was a simple solution to the problem of moving water from a surface stream to agricultural lands. Transaction costs were low and limited to creating either an informal or formal contractual arrangement supplemented in the event of a dispute by state common law. Holdouts could be excluded from the project or, if necessary to prevent a holdout from blocking the project, private eminent domain rights granted by state statute could be used to create a right-of-way to gain access to a water source across the property of a balking landowner. The free-rider problem arising from the upstream water user’s ability to obtain water without maintaining the ditch for the benefit of downstream water users

68. *Id.*

69. Tech. Bull. No. 82, *supra* note 66, at 11; see generally Thomas F. Bergin & Paul G. Haskell, Preface to *Estates in Land and Future Interests* (2d ed. 1984).

70. Art. XVI, § 7.

71. Tech. Bull. No. 82, *supra* note 66, at 11; see, e.g., Colo. Rev. Stat. . § 38-23-101 (2005) (originally enacted in 1893).

was mitigated in many states by a statutory right of contribution, although at the expense of litigation.

As indicated by Table 1, a substantial portion of western irrigation was carried out by individuals and unincorporated mutuels. Individual irrigation occurred either by wells or when a farmer had property adjacent to a stream and diversion required no cooperation with other farmers. Not until the 1950 Census was the category of individuals and partnerships broken into separate categories. As of 1950, unincorporated mutuels made up 15% of that category and 8% of the total irrigated acres. The number of acres irrigated by either individuals or small, unincorporated groups was substantial in 1910, but evidently most of the opportunities for this type of irrigation were exploited early since the acreage stayed almost constant through 1930 and only increased slightly in 1940. The dramatic increase in individual irrigation after 1940 is explained by a technological change that did not require farmers to organize in order to irrigate. After 1940, the advent of better pumping technology meant that groundwater became a more important source of irrigation and individual farmers could rely upon their own wells rather than depending upon an irrigation organization.

B. *Mutual Irrigation Companies*

Larger irrigation projects involved scale economies and the need to amass capital. Landowners in the West employed corporate organizational forms, in addition to joint ventures and other unincorporated associations, to respond to this need to marshal higher levels of resources. This section focuses on the mutual irrigation company used by farmers. The mutual irrigation company represented a more localized use of a corporate institution to amass and structure capital to construct and operate irrigation systems in the West. Unlike a commercial irrigation company, the shareholders of an incorporated mutual irrigation company were landowners and water users, and the corporation's purpose was to provide water at cost to its shareholders rather than for a profit.⁷² Both its existence as a producer-owned institution and its nonprofit nature allowed the mutual irrigation company to succeed in reducing or eliminating transaction costs in areas where the commercial irrigation company had failed.

72. Tech. Bull. No. 82, *supra* note 66, at 4.

1. The Nineteenth Century Revolution in Corporate Law

In using a corporate form, the farmers who developed the American West participated in the nineteenth century revolution in corporate law. This revolution transformed the corporation from an institution that was an unwieldy creature of the state, to a flexible institution that promoted and reflected the initiative and agreement of private individuals.⁷³

Prior to the nineteenth century, corporations were uncommon in the United States, and even through the mid-nineteenth century, it was unusual to incorporate for primarily business objectives.⁷⁴ The formation of a corporation required the granting of a charter by a special, individual act of the state legislature. The charter defined the rights and responsibilities of the corporation, including its duration, scope, and liability.⁷⁵ A typical chartered corporation had a limited duration between five and thirty years and was only authorized to pursue a single and often quasi-public function, such as building and operating a turnpike or canal, in exchange for concessions from the state, such as the grant of a monopoly and tax exemptions.⁷⁶ Although some charters imposed personal liability on the shareholders for the corporation's debts, and other charters granted limited liability to shareholders, many charters did not address the issue of shareholder liability.⁷⁷

The intermediary business solution to the problem of obtaining a corporate charter from a state legislature was to form a joint stock company, which was a partnership (i.e., an unincorporated business association) that provided its owners with the benefits of freely transferable shares.⁷⁸ Unlike a general partnership, which had to be dissolved and reformed if one of the partners wanted to leave the partnership, the interest represented by shares in a joint stock company could be transferred to a new owner without affecting the company's existence. The transferability of shares allowed the long-term risks associated with a company's projects to be transformed into a short-term risk by

73. Millon, *supra* note 13, at 211.

74. FRIEDMAN, *supra* note 13, at 188; Millon, *supra* note 13, at 207.

75. FRANKLIN A. GEVUREZ, CORPORATION LAW 20 (2000).

76. FRIEDMAN, *supra* note 13, at 189-90.

77. GEVUREZ, *supra* note 75, at 26.

78. *Id.* at 20. For a brief history of the development of freely transferable shares see JOHN MICKLETHWAT & ADRIAN WOOLRIDGE, THE COMPANY: A SHORT HISTORY OF A REVOLUTIONARY IDEA (2003).

raising a large amount of capital in small amounts from individual investors via transferable shares.⁷⁹ With marketable shares, the owner was not tied to the completion of any individual business project and could determine when to realize gains or losses.⁸⁰ However, the joint stock company did not provide its owners with the benefits of limited liability without further legal machinations, such as the use of insurance contracts and trusts.⁸¹

By the mid-nineteenth century, the populism and suspicion of special privileges associated with Jacksonian democracy combined with the growth of the economy during the Industrial Revolution made chartering corporations via special legislative acts unpopular and unwieldy.⁸² Beginning with Connecticut in 1837, state legislatures began enacting general incorporation statutes which codified many of the business principles used by entrepreneurs in the joint stock company.⁸³ These general incorporation statutes provided for incorporation as a matter of right if certain statutory filing requirements were met rather than as a matter of privilege and politics. Furthermore, they also provided perpetual duration, multiple (and ultimately) unlimited business purposes, and limited liability for shareholders. Western states were at the forefront of this revolution in corporate law. In Berle & Means' chronological list of modern general incorporation laws, California's 1863 institution of a corporate code is third and Arizona's 1866 territorial legislation on corporations appears fourth.⁸⁴

These general incorporation statutes met the institutional needs of western farmers in the late nineteenth and early twentieth centuries in several ways. First, the corporation allowed farmers to amass capital for irrigation projects based on private initiative and contract and then to pass that capital on to succes-

79. NATHAN ROSENBERG & L. E. BIRDZELL, *HOW THE WEST GREW RICH: THE ECONOMIC TRANSFORMATION OF THE INDUSTRIAL WORLD* 229 (1985).

80. *Id.*

81. GEVURTZ, *supra* note 75, at 26.

82. *Id.* at 21; ROBERT HESSEN, *IN DEFENSE OF THE CORPORATION* 29 (1979).

83. HESSEN, *supra* note 82, at 30.

84. ADOLPH BERLE, JR. & GARDINER C. MEANS, *THE MODERN CORPORATION AND PRIVATE PROPERTY* 136 (1933). However, until 1931, California eschewed limited liability and imposed pro-rata liability on shareholders for the unpaid debts of the corporation. GEVURTZ, *supra* note 75, at 28. California's holdout role in the "race to the bottom" among states during the late nineteenth and early twentieth century in liberalizing their corporate codes to attract corporations could conceivably have been a factor in the early use of public irrigation districts in California under the 1887 Wright Act.

sive generations or sell it to third parties via freely transferable shares. Second, the corporation's more freely transferable shares permitted water rights to be transferred without the cumbersome procedures and filings required by real property law. Third, the corporate form gave shareholders the benefits of limited liability, affording farmers the opportunity to invest in irrigation works while protecting separate investments in developed land and appropriative water rights. Finally, the corporation provided a governing structure that gave farmers as shareholders the flexibility to divide power and control in different ways based on a variety of landholding sizes and water rights priorities.

The direct forerunners to the mutual irrigation company, at least in spirit, and sometimes in fact, were cooperative community associations among water users. The Hispanic acequias in New Mexico retained their identities and customary practices as unincorporated community ditch associations under special state law rather than adopting the newer corporate forms of organization.⁸⁵ However, others, such as the community irrigation systems constructed and operated under the auspices of the Mormon Church in Utah, were ultimately incorporated as mutual irrigation companies.⁸⁶ Often, farmer-owned mutual irrigation companies succeeded developer-owned commercial irrigation companies.⁸⁷ Sometimes this occurred by design as part of a development company's business strategy to transfer the irrigation system to the landowners once the land and water rights were sold. Other times, local landowners established a mutual irrigation company to purchase the irrigation works of a failed development or private water company. A study in the late 1940s involving seventeen mutual irrigation companies across sixteen western states evidenced this trend when it revealed that 65% of them began life as commercial irrigation companies.⁸⁸

2. The Institutional Form of Mutual Irrigation Companies

As indicated in Table 1, mutuals were responsible for about one third of the acres irrigated through 1930. According to the

85. Tech Bull. No. 82, *supra* note 66, at 32-33.

86. Mark H. Anderson, *The Efficient Use of Utah's Irrigation Water: Increased Transferability of Water Rights*, 1975 UTAH L. REV. 158, 159; Tech. Bull. No. 82, *supra* note 66, at 34.

87. Circ. No. 934, *supra* note 49, at 20.

88. *Id.* at 12.

Irrigation Census of 1940, approximately 61% of institutions classified as mutual or cooperative irrigation companies were incorporated and most were formed under general state corporation laws as non-profit corporations rather than under specialized state laws governing the organization of cooperative agricultural associations.⁸⁹ Some western states supplemented their general corporation laws with statutes containing special provisions for mutual irrigation companies.⁹⁰ With the advent of general incorporation statutes in the late nineteenth and early twentieth centuries and the adoption of the idea of incorporation as a right, the procedural requirements for incorporation were simple and involved filing certain documents and paying the necessary fees.

The corporate governance of a mutual irrigation company consisted of shareholders electing a board of directors and the board of directors managing the business affairs of the company, either directly or via appointed officers and managers. Because the capital owned by or available to western farmers tended to be limited, mutual irrigation companies through the early twentieth century tended to be small⁹¹ and followed a pattern of corporate governance typical among closely-held corporations in which the shareholders, directors, and any officers were the same people.

When a mutual irrigation company was organized, shares of stock were distributed to each shareholder in accordance with the articles of incorporation and bylaws, as in all corporations. However, the nature of the rights provided by each share of stock made the mutual irrigation company a unique corporate institution. As in other corporations, stock represented an ownership interest in the mutual irrigation company. Along with the right to vote in matters requiring shareholder approval, such as the election of directors, each share of stock in a mutual irrigation company represented a residual claim on the assets of the corporation after the obligations to secured and unsecured creditors were satisfied. However, unlike commercial irrigation companies, the stock of a mutual irrigation company did not usually entitle the shareholder to dividends since most mutual irrigation companies were non-profit corporations.⁹² Because the purpose of a mutual irrigation company was to deliver water to its share-

89. *Id.* at 9.

90. Tech. Bull. No. 82, *supra* note 66, at 10; *see, e.g.*, Colo Rev. Stat. . §§ 7-42-101-118 (2005) (originally enacted in 1877).

91. Tech. Bull. No. 82, *supra* note 66, at 3, 8.

92. *Id.* at 4.

holders, each share of stock also represented the right to water service and the delivery of a definite quantity of water.⁹³ The nineteenth century revolution in corporate law made incorporation primarily a matter of private contract, and due to the fact that mutual irrigation companies formed under many different circumstances, the relationship between stock, water rights, and land varied in different ways from state to state and company to company.

At the most fundamental level, a share of stock represented either a proportional interest in the appropriative water rights owned by the mutual irrigation company or the right to delivery by the mutual irrigation company of water corresponding to appropriative water rights owned by the shareholder. A mutual irrigation company might own the appropriative water right under several scenarios. First, the company could have been spun off from a development company that owned the water right. Second, the company might have been formed by local landowners to acquire the assets of an insolvent private water company, including its water rights. Third, local landowners forming a mutual irrigation company could have transferred their water rights to the new company in return for shares of stock or formed the company and contributed capital to allow the company to acquire a new water right. If the mutual irrigation company owned the appropriative water right, then the stock was "commonly apportioned among the shareholders on the basis of the number of acres of land to be irrigated. One share of stock represent[ed] a constant number of acres and [gave] its holder a proportion of the water available in the ditch equal to the proportion of land represented by one share."⁹⁴ If the shareholder owned the appropriative water right rather than the mutual irrigation company, then a share could embody a right to a specific quantity of water and shares might be issued in different classes to segregate water rights with different priorities.⁹⁵ In many western states, these distinctions in ownership were without meaning. Although the mutual irrigation company held formal title to an appropriative water right, ownership of the water right, either legal or beneficial or both, vested in the shareholder/landowner, especially if either the water rights or the shares were appurtenant to the

93. *Id.* at 13.

94. CORBRIDGE & RICE, *supra* note 49, at 284-85.

95. Tech. Bull. No. 82, *supra* note 66, at 13-14.

land.⁹⁶ Thus, landowners who transferred water rights to a mutual irrigation company in exchange for stock surrendered to the corporation their right of control or regulation in the use of water but did not impair their respective water rights or sever it from the land to which it was appurtenant.⁹⁷

The issues of transfers and appurtenance associated with the shares of a mutual irrigation company reveal the tensions arising from including an appropriative water right in a separate, contractual arrangement. Since title to water ultimately vests in the state under most western state constitutions,⁹⁸ an appropriative water right is only an usufructory right. However, this right of use is generally characterized as a real property interest.⁹⁹ Although an appropriative water right can be sold independent of the land, for purposes of conveyance, water rights must be conveyed in the same manner as real property.¹⁰⁰ However, stock in a mutual irrigation company is considered personal property, and, in the nineteenth and early twentieth centuries, ordinarily transferred freely via indorsement and delivery of the stock certificate. A legal solution to the tensions inherent in considering appropriative water rights as an interest in real property and stock in a mutual irrigation company as both representing that interest and existing separately as personal property was to create a statutory exemption from the legal formalities of real property conveyance when the ownership of the water right was embodied in the stock of a mutual irrigation company.¹⁰¹ Thus, the transfer of water rights associated with a mutual irrigation company became as much a matter of abiding by contractual provisions among individual landowners in the company's articles of

96. WELLS HUTCHINS, *WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES* 563-66 (1971). "Water rights are pooled in a mutual company for the convenience of operation and more efficient distribution, and perhaps for more convenient transfer,' and the stock certificate in such company 'is really a certificate showing an undivided part ownership in a certain water supply.' *Genola v. Santaquin*, 96 Utah 88, 101-02. 80 P.2d 930 (1938). A mutual irrigation company 'seems to be clearly that of a holding company, trustee, or agent for the real owners of the water who are putting it to beneficial use upon their lands.' *Eldredge v. Mill Ditch Co.*, 90 Ore. 590, 596-97, 177 P. 939 (1919). See also accompanying similar citations to cases in Arizona, California, and Idaho." *Id.* at 564.

97. *Id.* at 565 (citing California case law).

98. See, e.g. Wyo. Const. art. 8, § 1; Colo. Const. art. XVI, § 5.

99. CORBRIDGE & RICE, *supra* note 49, at 30; Anderson, *supra* note 86, at 161 n.26.

100. CORBRIDGE & RICE, *supra* note 49, at 31-32.

101. *Id.* at 285 n.54, citing Colo. Rev. Stat. § 38-30-102 (1999) (originally enacted in 1893).

incorporation and bylaws as it did observing public, statutory requirements.

A mutual irrigation company's articles of incorporation and bylaws often made shares freely transferable, which allowed a third party to purchase shares and transfer the accompanying water right to new uses.¹⁰² However, a mutual irrigation company, like any corporation, could place reasonable restrictions on the transferability of its stock. A common restriction on transferability involved the concept of appurtenance. Shares of stock in a mutual irrigation company could either be appurtenant or "attached" to the land or "float" separately from the land.¹⁰³ In most western states, the shares of stock in a nonprofit mutual irrigation company were considered appurtenant to the land on which the water was used.¹⁰⁴ Even where appurtenance was not a given or where appurtenance was assumed, the shares could be made appurtenant to the land by attaching the stock to specific tracts through an agreement between the company and its shareholders or by making the water right appurtenant to specific tracts.¹⁰⁵ In addition, the articles of incorporation or bylaws could create an inseverable appurtenance.¹⁰⁶ Without appurtenance, the stock, as personal property, could be transferred independent of the land. However, with appurtenance, the stock and its associated water rights could not be transferred separately from the land, and vice versa.

Another restriction on transfers involved requiring the approval of the board of directors to ensure that the transfer would not injure other shareholders or require service beyond the scope and scale of the irrigation system.¹⁰⁷ These restrictions were in addition to the statutory transfer procedures to ensure that junior and downstream appropriators were not injured due to a change in point of diversion, use or place of use.

Although "floating" or freely transferable shares allowed water to be allocated to uses with higher economic values and thus had greater market value, restrictions on the transfer of shares by mutual irrigation companies made sense given the nature of the institution. The mutual irrigation company was origi-

102. Thompson, *supra* note 15, at 724.

103. Circ. No. 934, *supra* note 49, at 29.

104. See Anderson, *supra* note 86, at 161-62, noting that Utah is an exception.

105. *Id.*

106. CORBRIDGE & RICE, *supra* note 49, at 286.

107. Tech. Bull. No. 82, *supra* note 66, at 20.

nally a local, cooperative venture among farmers who knew each other as neighbors and members of the same agricultural community. Appurtenance and similar restrictions prevented shares and their associated water rights from transferring out of the local community into the hands of other communities or to strangers.¹⁰⁸ In addition, these restrictions also facilitated smooth operation of the irrigation system, as the different components were designed to carry a certain capacity and to service specific lands, and uncontrolled transfers of water rights could overtax or underutilize that capacity.¹⁰⁹

Historically, bonds did not play a prominent role in mutual irrigation company financing, as the market for bonds in small, non-profit corporations with limited assets to offer as security was generally restricted to local markets.¹¹⁰ Instead, after the initial capitalization associated with the issuance of stock, a mutual irrigation company generated needed cash from assessments charged against shares and water charges based on actual usage.¹¹¹ Because many mutual irrigation companies were non-profit corporations, assessments and charges were calculated to cover the costs of operations, and remaining balances at season's end tended to be carried over to the next year.¹¹² State corporate law or the mutual irrigation company's articles of incorporation or bylaws granted the power to assess against shares.¹¹³ A decision to levy an assessment and its amount and terms were submitted to the shareholders for approval at an annual or special meeting.¹¹⁴ When levied, the assessments became a lien on the shares and could even be a lien on the land via an agreement between the shareholders and the company.¹¹⁵ If the lien was not paid, shares could be sold at public auction.¹¹⁶ Depending on the ownership interest in water rights represented by the stock, a sale of stock for delinquent assessments might not separate the water from the land, but it could deprive the landowner of the use of the company's irrigation system, resulting in forfeiture of

108. *Id.* at 19.

109. *Id.* at 20.

110. *Id.* at 3, 8, 22, 24.

111. *Id.* at 29.

112. *Id.*

113. Circ. No. 934, *supra* note 49, at 42; *see, e.g.*, Colo. Rev. Stat. § 7-42-104 (2005) (originally enacted 1877).

114. CORBRIDGE & RICE, *supra* note 49, at 287.

115. Circ. No. 934, *supra* note 49, at 42-43.

116. *Id.* at 43.

the appropriate water right due to the lack of alternative ditches and abandonment.¹¹⁷ Given the communal, cooperative nature of a small, non-profit mutual irrigation company, selling shares at public auction for delinquent stock assessments was a drastic measure of last resort, and refusing to provide water service was a more common threat.¹¹⁸

3. Mutual Irrigation Companies and Transaction Costs

As with commercial irrigation companies, mutual irrigation companies allowed landowners in the American West to amass capital and take advantage of the economies of scale needed to construct and operate irrigation systems. However, mutual irrigation companies captured this benefit with lower transaction costs than commercial irrigation companies.

The asset specificity problem that existed in commercial irrigation companies was not present in mutual irrigation companies. The separation of the water provider from the water user in the commercial irrigation company combined with the profit motive created opportunities for opportunism on both sides of the transaction. In a typical incorporated, non-profit mutual irrigation company, the water provider and the water user were combined in a small, cooperative, communal venture. The size and governing structure of a mutual irrigation company also meant that within this arrangement ownership and control were not separated, as they would become in large, publicly traded corporations. The landowners who held the shares of the company also participated in the management of the company through membership on the board of directors, thereby aligning the interests of the water provider and the water user.

Mutual irrigation companies also allowed farmers to overcome the free rider problem associated with the operation and maintenance of irrigation facilities. As Elwood Mead, the territorial and state engineer for Wyoming in the late nineteenth century and the head of the Bureau of Reclamation in the early twentieth century,¹¹⁹ noted:

Enthusiasm or the press of need would suffice to build partnership ditches, but friction would disrupt their subsequent operation. Human selfishness would then assert itself. The man whose land

117. Tech. Bull. No. 82, *supra* note 66, at 22.

118. *Id.* at 28.

119. See generally JAMES KLUGER, TURNING ON WATER WITH A SHOVEL: THE CAREER OF ELWOOD MEAD (1992).

was near the ditch did not need to keep it in repair; so long as water for others had run past his lateral, the people below him would have to attend to this or do without. The irrigator having this fortunate location showed equal ingenuity in manipulating his head gates so as to take more than his share of the water, while the unfortunate irrigator at the lower end of the ditch found himself doing more work and getting less for it than the other members of the partnership. Until farmers learned that they must place the control of the ditch in the hands of one individual, there was either murder or suicide in the heart of every member of the partnership.¹²⁰

While the lack of unanimity could destroy a partnership, state corporation laws combined with individual articles of incorporation and bylaws created a governing structure that placed decision making power in the hands of a single corporate officer or a majority of the board of directors as fiduciaries of the larger group of shareholders. In addition, state laws and corporate charter documents typically provided a procedure for levying and foreclosing on assessments against stock that was quicker than initiating a lawsuit for breach of contract against a member of an unincorporated mutual association.¹²¹ Thus, mutuals allowed for both optimal size farms and for the development of irrigation infrastructure with the appropriate loci of control for each.

C. *Irrigation Districts*

In the late nineteenth century, water was appropriated and delivered for irrigation in the American West primarily through the efforts of individual farmers and private institutions, such as commercial and mutual irrigation companies. However, in the early twentieth century, a new, public institution, the irrigation district, became the preferred vehicle for constructing and operating irrigation systems. The irrigation district was a political subdivision of state government, organized pursuant to state law, to provide water for irrigating land within its boundaries.¹²² This section describes the legal structures and relationships within irrigation districts created by state enabling statutes, and demon-

120. ELWOOD MEAD, *IRRIGATION INSTITUTIONS* 52-53 (1907).

121. Circ. No. 934, *supra* note 49, at 82.

122. Wells A. Hutchins, *Summary of Irrigation-District Statutes of Western States* 2 (U.S. Dep't of Agric. Misc. Pub. No. 103, 1931) [hereinafter *Misc. Pub. No. 103*]; John D. Leshy, *Special Water Districts – The Historical Background* 12 (Proceedings of the Workshop on Special Water Districts, 1983).

strates how irrigation districts overcame transaction cost problems.

One reason for the irrigation district's popularity as an institutional form was that it proved to be even more effective than mutual irrigation companies at solving the transaction cost problems for farmers seeking irrigation water. Beginning with the passage of the Wright Act¹²³ in California in 1887 and accelerating through the early 1900s with the passage of similar legislation in other western states,¹²⁴ state governments gave local landowners a new set of tools to finance and manage irrigation works through the irrigation district. These tools included the power of eminent domain, the power to include involuntarily land within a district to overcome holdout problems, and the power to issue bonds backed by assessments against land in the district to solve the free-rider problem and the problem of amassing sufficient capital. The ability to use public authority and power to finance the private goal of irrigating agricultural land through internal financing sources via assessments and external financing sources via bonds gave irrigation districts distinct advantages over purely private institutions.¹²⁵ Thus, in California, while "[t]he 1870 to 1910 period witnessed a phenomenal increase in irrigated acreage under private enterprise. . . [a]fter 1910, private investment in large-scale irrigation projects plummeted, and, in sharp contrast, public district spending on irrigation works experienced a substantial increase."¹²⁶

123. Ch. 34, 1887 Cal. Stat. 29 (repealed by the Wright-Bridgford Act, ch. 189, § 110, 1897 Cal. Stat. 254; current version entitled Irrigation District Law at Cal. Wat. Code §§ 20500-29978 (2007)).

124. In chronological order, the following western states enacted legislation enabling the formation of irrigation districts: California (1887), Washington (1890), Kansas (1891), Nevada (1891), Oregon (1895), Idaho (1895), Nebraska (1895), Colorado (1901), Texas (1905), Wyoming (1907), Montana (1907), New Mexico (1909), Utah (1909), Arizona (1912), Oklahoma (1915), South Dakota (1917), and North Dakota (1917). Misc. Pub. No. 103, *supra* note 122, at 2.

125. These tools attracted the interest of the Bureau of Reclamation, and laws enacted by Congress between 1911 and 1926 largely substituted irrigation districts for individual landowners and mutual irrigation companies as the contact point and contracting entity with the federal government for reclamation project water. Leshy, *supra* note 122, at 19.

126. Edward P. McDevitt, *The Evolution of Irrigation Institutions in California: The Rise of the Irrigation District, 1910-1930*, 56 J. ECON. HIST. 469, 470 (1996).

TABLE 2
Irrigation Districts Formed in 17 Western States to December 31, 1928, by Years

Year	CA	WA	KS	NV	OR	ID	NE	CO	TX	WY	MT	NM	UT	AZ	OK	SD	ND	Total
1887	(a) 4																	4
1888	7																	7
1889	6																	6
1890	11	(a) 4																15
1891	13	2	(a)	(a)														15
1892	3	1																4
1893	4																	4
1895	1				(a)	(a)	(a) 9											10
1896							3											3
1897							2											2
1898							4											4
1900						1												1
1901						1	1	(a) 1										3
1902						2		1										3
1903								3										3
1904					1	3	1	4										9
1905					2	1	1	2	(a)									6
1906					1	2	2	3										8
1907						1		3		(a)	(a) 2							6
1908						1		5		1								7
1909	2					4	1	19		2	6	(a) 1	(a) 6					41
1910					2	3		18		1	2	1	2					29

Table 2 indicates the increased use of irrigation districts in each of the seventeen coterminous western states from the passage of the Wright Act in 1887 through 1928.

1. The Formation of Irrigation Districts

Established as public institutions, irrigation districts were formed to benefit specific groups of private landowners. This fact gave irrigation districts a chameleon-like quality through their ability to “affect public colors when advantageous, but resort to private camouflage when needed.”¹²⁷ Reinforcing this public-private partnership was the tendency of irrigation districts to take over and complete or extend irrigation systems formerly owned by private institutions. In a study of twenty-nine irrigation districts across sixteen western states in the late 1940s, only 31% began as districts. The remaining 69% began institutional life as mutual irrigation companies or, to a lesser degree, as commercial irrigation companies.¹²⁸

The legal structure of irrigation districts reflected this combination of public authorization and private benefits. Irrigation districts held public prerogatives, such as eminent domain, the power of taxation, the power to issue bonds, and exemptions from state and federal income taxes, but retained many attributes of a private corporation, such as limiting voting to the private beneficiaries of the institution and allocating costs and benefits in proportion to the private beneficiaries' investment.¹²⁹ As private entities with a public character for a limited and basically financial purpose, irrigation districts could exercise monopoly or near monopoly power over the development and distribution of water within their boundaries without the regulation from state agencies that would normally be given to a public utility or business enterprise with similar monopoly power.¹³⁰

127. A. DAN TARLOCK ET AL., *WATER RESOURCE MANAGEMENT: A CASEBOOK IN LAW AND PUBLIC POLICY* 775 (2002). This chameleon like quality enabled the Wright Act to pass muster when the constitutionality of the Wright Act was attacked as a taking of private property for a private use in violation of the Fifth and Fourteenth Amendments of the United States Constitution. The Supreme Court held that the Wright Act was constitutional since the irrigation of arid land was a public purpose and the process for establishing a district met procedural due process requirements. *Fallbrook Irrigation Dist. v. Bradley*, 164 U.S. 112 (1896).

128. Circ. No. 934, *supra* note 49, at 12.

129. Tim De Young, *Discretion Versus Accountability: The Case of Special Water Districts*, 42 (Proceedings of the Workshop on Special Water Districts, 1983).

130. Leshy, *supra* note 14, at 355-56.

The subsidy inherent in the tax-free status of district bonds influenced the formation of irrigation districts. At the time most states passed their enabling statutes for irrigation districts, the tax-free status of bonds was not important since the income tax did not exist. However, with the advent of the federal income tax in 1913 with the passage of the Sixteenth Amendment and with rising tax rates in states, "it seems fair to conclude that the basic rationale behind the governmental status accorded these districts . . . almost silently shifted from an internal institutional need for enforced participation and cooperation by affected landowners to a desire for the financial benefits of tax-exempt status."¹³¹

Another influence on the formation and enlargement of irrigation districts was the opportunity to receive water from the Bureau of Reclamation.¹³² In 1922 Congress authorized the Bureau of Reclamation to contract directly with irrigation districts for repayment of project costs, and in 1926 Congress mandated that irrigation districts would be the only form of irrigation organization that could contract with the federal government for cost repayment.¹³³ As a result, the acres under irrigation by irrigation districts almost doubled between 1920 and 1930, as illustrated in Table 1, and continued to increase at a rapid rate throughout the rest of the twentieth century.

131. *Id.* at 355.

132. The Bureau of Reclamation was supposedly created with financing from land sales within the states. However, no interest was charged on the initial cost of the project which meant a subsidy of 48% to 95% of initial cost. RICHARD A. WAHL, *MARKETS FOR FEDERAL WATER: SUBSIDIES, PROPERTY RIGHTS AND THE BUREAU OF RECLAMATION* 30, Table 2.1 (1989). The subsidy also was increased by the repeated extension of the payback period and the deferment of payments. *See generally*, ANDERSON & HILL, *supra* note 1, at 197-99.

133. Leshy, *supra* note 14, at 359-60.

TABLE 3

Comparison of Bonds Sold and Bonds Outstanding by Irrigation Districts on December 31, 1928 with Indebtedness of Irrigation Districts to Bureau of Reclamation on June 30, 1929

	1	2	3	4
	Bonds sold	Bonds outstanding	Indebtedness of Irrigation districts to Bur. of Rec.	3/1
California	109,348,711	97,174,087	1,600,000	.015
Colorado	26,153,200	8,047,339	999,768	.038
Idaho	13,707,580	11,736,300	33,393,565	2.44
Montana	5,923,985	5,437,485	19,508,373	3.29
Nebraska	5,284,850	3,431,750	16,692,124	3.16
Nevada	846,500	846,500	3,248,743	3.84
New Mexico	1,234,300	1,073,000	7,470,000	6.05
North Dakota	0	0	1,435,835	
Oregon	11,833,900	11,234,300	19,843,391	1.68
South Dakota	0	0	5,432,258	
Texas	22,054,500	20,459,000	6,030,000	.27
Washington	11,159,471	10,046,395	14,657,986	1.31
Wyoming	<u>1,260,000</u>	<u>750,303</u>	<u>8,956,627</u>	7.11
Total	208,807,000	170,236,500	139,268,700	.6

3/2 = .82

Source: Calculated from WELLS A. HUTCHINS, IRRIGATION DISTRICTS, THEIR ORGANIZATION, OPERATION AND FINANCING 36, 46, tbls. 7, 9 (U.S. Dep't of Agric. Tech. Bull. No. 254, 1931).

Table 3 shows the extent of bond capitalization of irrigation districts and also shows the rapid pace of the Bureau of Reclamation in providing financing for water projects in certain states. By June 30, 1929, Bureau of Reclamation projects had committed funds equal to 67% of the bonds sold by irrigation districts and 82% of the bonds still outstanding. Thus, by that date the Bureau of Reclamation had become almost as large as the internally-financed irrigation districts. After 1926, the opportunity to use general, federal tax revenues via the Bureau of Reclamation meant that irrigation districts were no longer simply an organizational innovation to overcome transaction costs. Rent seeking became possible due to the government's involvement in capturing and distributing irrigation water and its coercive powers to tax and subsidize. Access to the federal treasury meant that the

formation of irrigation districts was influenced by rent seeking and the opportunity to capture subsidies.¹³⁴ However, the early pre-Bureau use of irrigation districts among farmers did not represent a substantial form of rent seeking,¹³⁵ and it was only with the advent of Bureau of Reclamation projects that rent seeking became a serious problem in the provision of irrigation water.¹³⁶

Enabling state laws set forth the procedures for forming an irrigation district. Although there were variations from state to state, the formation procedures were more alike than different, as many state statutes were modeled on California's 1887 Wright Act or the 1897 Wright-Bridgeford Act, which substantially amended the Wright Act.¹³⁷

The procedure began with a petition by local landowners to the county commissioners.¹³⁸ Most states required the petition be signed by a majority of resident landowners within the boundaries of the proposed district, although some states allowed the petitioners to include long term lease holders.¹³⁹ Some states, such as Montana, required a supermajority and the written consent of mortgagees or other lien holders, while other states, such as Idaho and Oregon, required either a majority or minimum number of landowners.¹⁴⁰ California was unique in allowing either a majority of landowners or a group of 500 voters that included landowners representing 20% of the value of lands to petition.¹⁴¹ Some states required landowners to own a minimum number of acres, set at one acre in Oregon, five in Nevada, and

134. See generally Rodney T. Smith, *The Economic Determinants and Consequences of Private and Public Ownership of Local Irrigation Facilities*, in *Water Rights: Scarce Resource Allocation, Bureaucracy, and the Environment* (Terry L. Anderson ed., 1983).

135. Rent seeking is generally defined as efforts to secure financial favors and privileges from government. See generally TOWARD A THEORY OF THE RENT-SEEKING SOCIETY (James M. Buchanan et al., eds., 1980).

136. *Contra id.* Accord Edward P. McDevitt, *The Evolution of Irrigation Institutions in California: The Rise of the Irrigation District* (1994) (unpublished Ph.D. dissertation, University of California-Los Angeles) (on file with author) (arguing that irrigation districts prior to receiving Bureau of Reclamation water did not represent significant rent-seeking based on three findings: a) the predicted yes vote from Smith's rent-seeking model was 38.5%, while the actual yes vote exceeded 90%; b) the possibility of exclusion meant that rent-seeking was much more difficult; and c) empirical testing does not confirm Smith's hypothesis that irrigation districts would price water below marginal cost).

137. See *supra* note 123.

138. Circ. No. 934, *supra* note 49, at 15.

139. Misc. Pub. No. 103, *supra* note 122, at 6-8.

140. *Id.*

141. *Id.*

ten in Nebraska, North Dakota, Oklahoma, and South Dakota.¹⁴²

Before the county commissioners reviewed a petition, some states required a preliminary report by the state engineer on the sufficiency of the water supply and the feasibility of the development plan.¹⁴³ In most states, the report was advisory, or, if negative, could be overridden by a supermajority vote of the landowners in the proposed district.¹⁴⁴ With the petition and state engineer's report in hand, the county commissioners held a hearing to determine if the statutory conditions had been met—namely whether the proposed district boundaries only included land susceptible to irrigation from the proposed common source and excluded land that would not benefit from the irrigation district.¹⁴⁵ If the requirements of state law were met, then the county commissioners called an election.¹⁴⁶

A formation election generally required approval by a majority of landowners, although some states, such as Idaho, New Mexico, Oregon, and Washington, required approval by a supermajority.¹⁴⁷ California, Idaho, and Kansas did not have a landownership limitation and allowed all voters qualified under the general election laws to vote.¹⁴⁸ States limiting voting to landowners sometimes further limited the eligible voters to individuals owning a minimum number of acres, and, where those requirements existed, they usually paralleled the minimum acreage requirements for the formation petition.¹⁴⁹ Voting could either take the form of one-person, one-vote or could be weighted: Colorado allowed one vote per acre, Montana permitted one vote per forty acres, New Mexico allotted one vote per acre with a 100 vote cap, and Utah distributed one vote per acre-foot of

142. *Id.*

143. *Id.* at 9-10.

144. *Id.* In Utah and Wyoming, the state engineer had a greater role. The latter is not surprising given Wyoming's role in central planning for water. See Andrew P. Morriss, *Lessons from the Development of Western Water Law for Emerging Water Markets: Common Law vs. Central Planning*, 80 OR. L. REV. 861, 905-40 (2001).

145. Misc. Pub. No. 103, *supra* note 122, at 8. See, e.g., Cal. Water Code § 20845 (2006) (originally enacted in 1897).

146. Misc. Pub. No. 103, *supra* note 122, at 8. In Montana and Wyoming, the petition was presented to a district court which entered an order approving or denying the petition after a hearing. *Id.*

147. *Id.* at 10.

148. *Id.* at 14-15.

149. *Id.*

water allotted by the state engineer.¹⁵⁰ These voting requirements carried over from formation elections to other elections for the district's directors and the issuance of bonds.¹⁵¹

Irrigation districts where all resident registered voters were eligible to vote on a one-person, one-vote basis represented a highly democratic form of government, while irrigation districts where voting was restricted and weighted reflected the tensions inherent in the hybrid public/private nature of irrigation districts. Irrigation was and continues to be a proprietary activity that principally benefits property, and landowners preferred controlling the irrigation system's governing structure, especially because they paid to exercise control through assessments.¹⁵² Weighted voting among landowners corresponded to the landowners' different investments.¹⁵³ In the late nineteenth and early twentieth centuries in small, rural, homogenous irrigation districts, the undemocratic costs of restricted and weighted voting were low. However, the rationale for this type of voting began falling apart when later twentieth century irrigation districts encompassed both rural areas and heterogeneous urban areas and their purpose evolved from only supplying irrigation water to supplying domestic water and electric power.¹⁵⁴

A formation election also included the election of the initial directors, as a typical irrigation district was governed by a board of directors.¹⁵⁵ The boards tended to be small, with statutory limitations ranging from three to nine directors.¹⁵⁶ Directors were elected either at-large by the whole district or each director was chosen by smaller subdistricts of equal area or voting strength.¹⁵⁷ Directors themselves had to be qualified voters,

150. *Id.* at 15-16. The constitutionality of restricted and weighted voting systems in irrigation districts was upheld by the United States Supreme Court under the rationale that one-person, one-vote requirements do not apply to special purpose districts acting as a business enterprise and benefiting a specific group of landowners. *Ball v. James*, 451 U.S. 355 (1981).

151. Idaho and Kansas, which allowed all qualified voters under the general election laws to vote, limited bond elections to landowners. Misc. Pub. No. 103, *supra* note 122, at 14.

152. De Young, *supra* note 14, at 425-26.

153. *Id.*

154. De Young, *supra* note 14, at 428-29; *contra* Merrill R. Goodall & John D. Sullivan, *Water System Entities in California: Social and Environmental Effects* 71-78 (Proceedings of the Workshop on Special Water Districts, 1983) (negative political and social effects of property-weighted voting even in rural irrigation districts).

155. Circ. No. 934, *supra* note 49, at 56.

156. Misc. Pub. No. 103, *supra* note 122, at 17.

157. *Id.* at 16.

which meant in most irrigation districts that directors were landowners who at least resided in the county or state, if not the district or subdistrict¹⁵⁸ The board managed the district's finances (often through a county treasurer who acted as an *ex officio* member of the board), acquired property through the district's power of eminent domain, entered into contracts, oversaw the operation and maintenance of the irrigation system, established rules and regulations concerning the delivery of water, and evaluated and approved intradistrict and interdistrict water transfers.¹⁵⁹

Allowing the formation of an irrigation district by a majority or even a supermajority of voters meant including the lands of objecting landowners, as long as those lands benefited from inclusion in the district's irrigation system.¹⁶⁰ The principal objective of the early irrigation laws was to establish a mechanism requiring all landowners in an area supplied by a common water source to participate in developing and delivering that water.¹⁶¹ Forced inclusion made the irrigation project feasible by assembling a critical mass of land to tax in the form of assessments.¹⁶² Assessments were made to pay for bonds, and bonds were issued to raise money to construct, complete, and extend irrigation systems. The power to compel inclusion created an internal financing mechanism that supported the external financing mechanism.¹⁶³ However, this power to compel also initially provoked resistance and lawsuits among holders of senior water rights, including an unsuccessful challenge to the constitutionality of the Wright Act.¹⁶⁴ Later irrigation district statutes in many states, such as Arizona, Colorado, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, and Utah, excluded existing irrigation works and irrigated lands from the district by default,¹⁶⁵ although the procedure for otherwise

158. *Id.* at 22-23.

159. *Id.* at 26.

160. Irrigation district enabling statutes generally allowed the county commissioners at the formation hearings to exclude lands which, in their judgment, would not benefit from the irrigation project. See, e.g., Cal. Wat. Code § 20845 (2006) (originally enacted in 1897).

161. Leshy, *supra* note 14, at 353.

162. Circ. No. 934, *supra* note 49, at 76.

163. Leshy, *supra* note 14, at 353.

164. See *supra* note 127.

165. Misc. Pub. No. 103, *supra* note 122, at 11-13.

excluding land was normally initiated by the landowner after organization.¹⁶⁶

2. The Financing of Irrigation Districts

One of the primary advantages of irrigation districts over mutual irrigation companies was their power to tax via assessments and issue bonds. According to Wells A. Hutchins, an irrigation economist in the Department of Agriculture in the early twentieth century, this advantage was so pronounced that the chief object in forming many irrigation districts was to issue bonds.¹⁶⁷ To issue bonds, the board of directors determined the amount of money needed and called a bond election. As with formation elections, bond elections normally required the affirmative vote of a majority of landowners. Although states authorized irrigation districts to issue bonds, they also placed restrictions on those issuances. In the early twentieth century, statutory restrictions on irrigation district bonds included denominational ranges, interest rate caps, maximum maturity periods or mandatory amortization schedules, prohibitions on selling bonds at less than par or less than a certain percentage of par (typically 85% or 95% of par), and prohibitions on redeeming at more than par.¹⁶⁸

In addition to the underlying financial condition of the irrigation district and the terms and conditions of the bonds, two selling points made irrigation district bonds attractive. First, irrigation districts were political subdivisions of the state, so the interest on irrigation district bonds was exempt from federal income taxes, which gave irrigation district bonds an advantage over the bonds of mutual irrigation companies.¹⁶⁹ Second, beginning in 1911 in California, some western states began certifying irrigation district bonds.¹⁷⁰ By certifying the bonds, the state did not guarantee the bonds. In some states, certification could be limited to a statement that the bonds had been issued in accordance with state law.¹⁷¹ In other states, certification involved a more extensive process of investigating the feasibility of the irri-

166. Circ. No. 934, *supra* note 49, at 64; Misc. Pub. No. 103, *supra* note 122, at 101-04.

167. Circ. No. 934, *supra* note 49, at 77.

168. Misc. Pub. No. 103, *supra* note 122, at 35-42. In all states except Kansas, it was also possible for landowners to petition to be excluded from the irrigation district after the district was formed. *Id.* at 101-04.

169. Circ. No. 934, *supra* note 49, at 59.

170. Misc. Pub. No. 103, *supra* note 122, at 50.

171. *Id.* at 46.

gation project to be funded by the bonds, or assuring that the irrigation district's debt did not exceed a certain percentage of the aggregate market value of the lands in the district and the water rights and irrigation works owned by the district.¹⁷² Typically, certification resulted in a statement from state officials declaring the bonds eligible as investment vehicles for private trust funds and the funds of insurance companies, banks, and public institutions.¹⁷³

Generally, the repayment record of irrigation district bonds was good, if uneven. By the end of 1928, approximately 71% of all bonds sold beginning in 1887 were considered in good standing because the districts had repaid all interest and principal then due.¹⁷⁴ However, there were dramatic variations from state to state, with 100% of bonds in Arizona and Nevada in good standing, 87% in California, 69% in New Mexico, 63% in Washington, 56% in Montana, 53% in Idaho, 31% in Wyoming, 11% in Colorado, and less than 1% in Utah.¹⁷⁵ There were also dramatic variations between different time periods corresponding to the boom-and-bust cycles in the agricultural economy and speculation in western land development in the late nineteenth and early twentieth centuries.¹⁷⁶

The security behind irrigation district bonds was not usually the property of the district, but rather the district's power under state law to levy annual assessments against all land in the district's boundaries that benefited from the district's irrigation works.¹⁷⁷ The definition of benefited land was broad, in keeping with one of the irrigation district's economic purposes of assembling sufficient assessable land to support the financing of irrigation systems via debt. Benefited land typically included irrigated land, land that could be farmed and irrigated by the district's irrigation system, and even, in some states, town lots, presumably

172. *Id.* at 46, 50.

173. *Id.* at 50. The role of state bond certification in the decision to form an irrigation district is disputed. *See* McDevitt, *supra* note 126, at 470 (asserting that state certification of district bonds greatly enhanced the organizational advantages of irrigation districts over private institutions in California); *contra* Misc. Pub. No. 103, *supra* note 122, at 52 (noting that outside California, certification became discredited when certified bonds also defaulted, leading several states, such as Idaho, Montana, and Utah, to repeal their certification statutes in the 1920s).

174. Misc. Pub. No. 103, *supra* note 122, at 42.

175. *Id.* at 39-41.

176. *Id.* at 34, 42.

177. *Id.* at 31.

under the theory that they indirectly benefited from the existence of an agricultural community with access to irrigation water.¹⁷⁸

To levy an assessment, the irrigation district's board of directors determined the amount of money needed to maintain and operate the district's irrigation works, make payments for reclamation water, and make payments on the district's outstanding bonds. In many states, the irrigation district used the existing county government tax infrastructure to levy and collect assessments.¹⁷⁹ Assessments could be made district-wide, or, in some states, limited to a subdistrict that was the beneficiary of a specific improvement.¹⁸⁰ When levied, an assessment became a lien on the land, subject to the state's general revenue laws on the collection of taxes.¹⁸¹ If the assessment was not paid, then the lien became subject to foreclosure and the land was sold at a tax sale, subject to redemption by the landowner.¹⁸²

Assessments took one of several forms across the western states by the late 1920s: (i) ad valorem assessments based on the value of property used in California, Nebraska, and Oklahoma; (ii) assessments based on a uniform rate per acre used in Arizona, Colorado, Montana, New Mexico, and Oregon; (iii) assessments based on benefits received used in Idaho, Nevada, North Dakota, South Dakota, Washington, and Wyoming; or (iv) in Utah, according to the maximum amount of water allotted by the state engineer to each forty-acre tract.¹⁸³ Ad valorem assessments resulted in high assessments for owners of lands with senior water rights and independent sources of water, which may have led to the initial opposition to irrigation district formation in California by existing farming interests.¹⁸⁴ To appease resisting landowners, ad valorem assessments led to undervaluations of property and the freezing of property values.¹⁸⁵ Assessments based on a uniform amount per acre reflected the idea that an irrigation district represented a community of interests involving equal benefits to all lands so that each acre should bear an equal burden.¹⁸⁶ Assessments based on the benefit re-

178. *Id.* at 55-60.

179. *Id.* at 77-84.

180. Misc. Pub. No. 103, *supra* note 122, at 66.

181. *Id.*, at 69, 73.

182. *Id.* at 38-39.

183. *Id.* at 21-23.

184. Benson, *supra* note 14, at 392.

185. *Id.* at 392-93.

186. Misc. Pub. No. 103, *supra* note 122, at 25.

ceived provided greater flexibility and allowed districts to adapt the tax burden to varying local needs and conditions.¹⁸⁷ Although assessments were taxes, the phrase "assessment" was used to avoid conflicts with state constitutional provisions requiring taxes to be equal and uniform.¹⁸⁸

In most western states, if an irrigation district defaulted on its bonds, the bondholders were given a right of foreclosure against the delinquent lands only and not against the district's irrigation system.¹⁸⁹ Depending on state law, the landowner's responsibility for bonds could extend to the entire issue or a pro rata share. In states providing for general liability, a cumulative levy was made each year to cover delinquencies in the payment of assessments in prior years, making each landowner liable for the delinquencies of other landowners.¹⁹⁰ With pro rata liability, some states allowed landowners to pay their proportionate part of the total outstanding bond indebtedness in advance to release their lands from further liability.¹⁹¹

3. Irrigation Districts and Water Rights

From the farmers' perspective, the purpose of bonds and assessments was to construct, operate, and maintain irrigation works that delivered water to their land. State law governed the apportionment of water, and apportionment schemes mirrored assessment schemes to avoid undermining the constitutional underpinnings for irrigation districts.¹⁹² Variations included: (i) an equal quantity of water for each acre assessed; (ii) an apportionment based on the ratio of the assessed value of the tract to the total assessments for the district; (iii) an amount determined by the state engineer's individual allotment of water; (iv) pro rata apportionment among the assessed lands of the district, subject to existing priorities; and (v) an apportionment of an equitable quantity of water based on beneficial use.¹⁹³ Reclamation water was distributed in accordance with the contract between the irrigation district and the Bureau of Reclamation and federal law.¹⁹⁴

187. *Id.* at 24.

188. *Id.* at 20.

189. *Id.* at 32.

190. *Id.* at 31.

191. *Id.*

192. Benson, *supra* note 14, at 411.

193. *Id.* (citing Circ. No. 934, *supra* note 49, at 51, and Misc. Pub. No. 103, *supra* note 122, at 94-97).

194. *Id.*

Most irrigation districts owned the appropriate water rights, which were appurtenant to the entire district, for the benefit of its landowners.¹⁹⁵ The district held legal title to the water rights while the landowners held a beneficial interest.¹⁹⁶ To obtain legal title, either the irrigation district acquired preexisting water rights from landowners upon formation, or the irrigation district appropriated or acquired additional water rights. In this case, the landowner had a right to the delivery of a proportionate share of water, subject to the payment of assessments. Another possibility was for the landowner to hold legal title to the water right. In this case, the landowners retained their priorities and the appurtenance of their water rights to specific tracts of land.¹⁹⁷ The irrigation district became a carrier or agent for the real owners of the water rights in accordance with their respective priorities.¹⁹⁸ A third possibility involved the irrigation district and the water user holding the water right in common based on the requirements in the prior appropriation doctrine of a diversion and beneficial use to create a water right.¹⁹⁹ Since the irrigation district was the diverter and the landowner was the user, both were necessary to maintain a valid water right. The type of variation determined whether an irrigation district merely delivered water to satisfy established water rights or whether the district had power to allocate water according to whatever discretion state law provided.²⁰⁰

4. Irrigation Districts and Transaction Costs

Irrigation districts were even more effective at overcoming transaction costs than mutuals due to the coercive governmental powers authorized by state enabling statutes. Key among these powers was the ability to include land within a district against an owner's will, and to issue bonds backed by assessments against land in the district. The high approval rates in formation elections for irrigation districts indicates that most farmers saw the eminent domain and taxing powers of government as effective mechanisms for overcoming holdout and free-rider problems in irrigation.

195. Circ. No. 934, *supra* note 49, at 49.

196. Benson, *supra* note 14, at 409.

197. Circ. No. 934, *supra* note 49, at 49.

198. HUTCHINS, *supra* note 96, at 564, 566-67.

199. Circ. No. 934, *supra* note 49, at 47.

200. Leshy, *supra* note 122, at 25.

Like mutuals, the transaction costs arising from asset specificity and opportunism and created by the varying economies of scale between the optimal size of an irrigation organization and the optimal size of a farm were resolved by placing ownership of the irrigation works in a single entity that served the interests of multiple farms. Also, as with mutuals, irrigation districts lowered transaction costs by providing collective decision-making mechanisms that did not require unanimity. As irrigation district voters were ultimately voting to tax themselves in formation and bond elections to irrigate their own lands, they had an incentive to form districts of a reasonably optimal size.

The transaction costs arising from the varying economies of scale and the holdout problem were eliminated via the power of eminent domain and the compelled inclusion of lands. Unlike mutuals, which were voluntary organizations, irrigation districts could use the coercive power of government to force farmers to participate based on a majority vote of their neighbors as long as their farms met the loose standards of susceptibility to irrigation from a common source and beneficial inclusion. This power allowed irrigation districts to overcome the numerous potential holdouts created by the multiple small farms that would otherwise prevent the amassing of sufficient capital for scale-appropriate irrigation works. In addition, this power combined with the eminent domain power allowed the construction of canals that had to cross the property of many different landowners by preventing a single landowner from potentially holding out for a larger share of rents from the project. Despite early resistance to the statutes enabling irrigation districts, the voting results for forty-six districts that were formed in California between 1915 and 1925 indicate an average "yes" vote of 92.2% favoring the formation of the district.²⁰¹ These and other voting results²⁰² demonstrate that landowners understood the advantages of the public-private partnership represented by irrigation districts.

The power of irrigation districts to issue bonds and assess lands overcame the free-rider problem. Decision rules based on a majority or a supermajority vote of an elected representative body

201. McDevitt, *supra* note 136, at 89.

202. The Riverside Irrigation District in Morgan County, Colorado was formed in 1907 as a result of a unanimous (35-0) formation election. Email from Don Chapman, Superintendent of the Riverside Irrigation District, to Stephen N. Bretsen, Associate Professor, Wheaton College (Sept. 25, 2006, 4:47 p.m. CDT) (on file with the author).

meant that farmers at the upper end of the irrigation system who did not have an incentive to invest in and maintain irrigation works for the benefit of downstream users were forced to pay assessments to do so or risk losing their farms. The larger public market for irrigation district bonds over the bonds of mutuals also meant that irrigation districts lowered the cost of obtaining and amassing sufficient capital for irrigation works that achieved the necessary economies of scale.

Historically, irrigation districts were not organized to transfer water for uses outside the district, but to develop and deliver water to landowners within the district for the irrigation of agricultural lands. As a result, irrigation districts created internal markets that enabled landowners within a district to transfer water among themselves more readily than traditional state statutory transfer procedures permitted.²⁰³ Changes in point of diversion, place of use, or type of use normally required state review and approval through a change-of-water-right proceeding.²⁰⁴ The focus of state review was to insure that no other water rights were injured by the change, especially junior or downstream water rights that depended on return flows.²⁰⁵ This state review created transaction costs via attorneys' fees, engineering expert witness fees, and the cost of obtaining data to show the lack of injury. Those transaction costs increased with opposition to the proposed change. Opposition increased the stakes since issues such as the validity of the original water right and the quantity of water represented by that right might be raised.²⁰⁶ Intradistrict transfers did not usually have to submit to the state's statutory transfer procedures since the district usually held legal title before and after the transfer.²⁰⁷ Since fewer people were notified and these people were neighbors, intradistrict transfers could be more cooperative than confrontational.²⁰⁸

The institutional features that helped irrigation districts overcome transaction costs in the late nineteenth and early twentieth centuries ultimately created transaction costs for external transfers in the late twentieth and early twenty-first centuries. The majoritarian decision rules of irrigation districts that initially de-

203. Thompson, *supra* note 15, at 673.

204. TARLOCK ET AL., *supra* note 127, at 225-29.

205. *Id.* at 232.

206. *Id.*, at 225-29.

207. Ruml, *supra* note 15, at 186-87.

208. *Id.* at 189.

creased transaction costs later meant that individual farmers could not contract with users outside the irrigation district to transfer water to those users for non-agricultural purposes. Water rights themselves became attenuated in the organizational process with legal and beneficial interests to the water rights divided between farmers and the irrigation district. Once Bureau of Reclamation water was delivered to an irrigation district, transfers became even more difficult because a third party was involved. Thus, the historical development of irrigation districts resulted in high transaction costs for any water transfers to municipalities or other users outside of the original organizational boundaries.

V.

CONCLUSION

When settlers crossed the ninety-eighth meridian in the United States, they entered a region that was fundamentally different in terms of agricultural production from the land east of that line. No longer could almost all untimbered land be considered useful for growing crops, especially on an annual basis. Some valleys and rain sheds of the Rocky Mountains were suitable for farming by the usual production methods of tilling and seeding the soil and relying on rainfall, but much more of the region either was suitable only for grazing animals or required the application of water beyond natural rainfall for crop production. Indigenous peoples had long known that fact and were either hunter-gatherers or, when they did engage in settled agriculture, had fashioned means for irrigating their crops.

The arrival of Euro-American settlers meant new technologies and new forms of organization were available to make irrigation possible. A change in property rights in water from the riparian form used in the eastern United States to the prior appropriation doctrine occurred early in the development of the West to allow for legal diversions of water. Building irrigation works to capture and distribute water for irrigation was often cheapest for an operation far beyond the efficient size of the ordinary farm. Thus, farmers were faced with a choice of either expanding their owner-operated farms to the size necessary to capture the economies of scale inherent in irrigation or carrying out institutional innovations that would involve either voluntary contracts or the coercive power of government. Both forms were ultimately chosen, and a variety of institutions arose to provide irrigation.

The history of irrigation organizations in the arid and semi-arid American West indicates that minimizing transaction costs was a major force in determining their institutional form. Contracting was complicated by asset specificity, potential spillovers between users, free-riding, and holdout problems. Asset specificity on the part of both farmers and irrigation infrastructure owners would ordinarily lead to vertical integration into a single firm that would own both the farmland and the infrastructure. However, the differing economies of scale between capturing and delivering irrigation water and farming meant that vertical integration would result in costly operations. Farmers opted neither for vertical integration nor for separate ownership of the farms and the irrigation infrastructure, but instead sought out intermediary institutions.

In some cases, simple contracts among a few farmers sufficed to divert water from streams and to carry it to crops. In other cases, developers formed commercial irrigation companies, bought up large blocks of land, installed irrigation infrastructure, and then sold off farms. However, the commercial irrigation company was not a solution to transaction costs but instead was fraught with transaction cost problems that undermined its usefulness. Mutuels, both incorporated and unincorporated, allowed farmers to contract with other farmers to own and operate the irrigation facilities. Irrigation districts, a form of localized government with coercive powers, were authorized in all of the western states, and these districts became another significant form of irrigation organization. In developing these institutions, farmers in the American West experimented with new institutional forms, such as the corporation and the special use district. The legal environment that allowed for this experimentation was a crucial element in the successful transformation of the American West into an area of enormous agricultural productivity. Given the transaction costs that had to be overcome to irrigate western farms, the approximately 15,000,000 acres of land that were under irrigation by 1920²⁰⁹ through the efforts of localized, bottom-up irrigation institutions represented a triumph of institutional ingenuity over transaction costs.

209. See *supra* Table 1.

