COUNTING EVERY DROP: MEASURING SURFACE AND GROUND WATER IN WASHINGTON AND THE WEST

BY

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Virtually every region of the United States has experienced a water shortage within the last five years and at least thirty-six states anticipate some sort of water shortage within the next five years. Although water shortages have long occurred in the United States, especially in the West, evidence suggests these shortages will continue to worsen due to climate change. Inadequate implementation of the doctrine of prior appropriation, the most popular water system in the western United States, exacerbates water shortages by failing to measure the amount of water a user diverts, a process known as "source metering."

States have taken differing degrees of interest in source metering. In 1993, Washington became the first western state to statutorily require the measurement of virtually all surface water withdrawals. Kansas and Texas have implemented some form of source metering and Oregon has attempted to implement it, although unsuccessfully. Although Washington's statute appears to have made the state's management of water more efficient, no other western state has successfully followed in Washington's footsteps. In fact, the western states, notoriously plagued by water shortages, seem the most resistant to source metering laws, even though they have the most to gain from efficient management of water resources.

This Article examines the implementation of Washington's source metering law, beginning with water consumption and waste issues in Washington and throughout the western United States and continuing through the enactment of the source metering law as part of Washington's water code. The Article moves on to explore the relationship between Washington's source metering law and actions in Texas, Kansas, and Oregon before ultimately proposing that other western states should adopt a statutory model similar to Washington's source metering statute to aid in the effective

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management of the their water supplies, especially in light of the risks posed by climate change.

I. INTRODUCTION

In autumn 2002, thousands of decomposing chinook salmon, a threatened species under the Endangered Species Act,[1] lined the dry river bed of the Klamath River and permeated the air with the smell of unnecessary death.[2] It was the worst fish kill in American history, with 34,000 to 70,000 adult fish carcasses lining the banks of the Klamath River for thirty miles.[3] Although these salmon perished due

[1] Endangered Species Act of 1973, 16 U.S.C. §§ 1531–1544 (2006); Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs, 70 Fed. Reg. 37,160 (June 28, 2005) (to be codified at 50 C.F.R. pts. 223–24) (listing West Coast salmon as threatened).

[2] MICHAEL BELCHIK, DAVE HILLEMEIER & RONNIE M. PIERCE, YUROK TRIBAL FISHERIES PROGRAM, THE KLAMATH RIVER FISH KILL OF 2002: ANALYSIS OF CONTRIBUTING FACTORS 4–5 (2004), *available at* http://www.klamathwaterquality.com/documents/Yurok%20Fisheries%20FINAL%20KILL%20REPORT%202-04%20w%20cover.pdf.

[3] The exact number of fish that died is disputed. In 2003, the United States Fish and Wildlife Service (USFS) reported the loss at just over 34,000. USFS, KLAMATH RIVER FISH DIE-OFF SEPTEMBER 2002: CAUSATIVE FACTORS OF MORTALITY, at ii (2002), *available at* http://www.krisweb.com/biblio/klamath_usfws_guillen_2003_killcause.pdf. However, environmental groups claim this number is "conservative," stating "actual losses may have been more than double that number." Don Thompson, *Klamath River Fish Kill Worse than Originally Thought*, ASSOCIATED PRESS, July 31, 2004, http://www.oregonwild.org/rivers_clean_water/restoring_balance_klamath_basin/klamath-fish-kills/klamath-river-fish-kill-may-be-worse-than-originally-thought (last visited Jan. 25, 2009). Adult chinook salmon (*Oncorhynchus tshawytscha)* represented approximately 97% of the dead salmonids, although coho salmon (*Oncorhynchus kisutch)*, steelhead (*Oncorhynchus mykiss)*, green sturgeon (*Acipenser medirostris)*, Klamath small scale sucker (*Catostomus rimiculus)*, American shad (*Alosa sapidissima)*, speckled dace (*Rhinichthys osculus)* and cutthroat trout (*Oncorhynchus clarki)* also perished. BELCHIK ET AL., *supra* note 2, at 4–5.

to two fish pathogens,[4] a contributing factor was a shortage of water in the Klamath River.[5]

In the last five years, virtually every region of the United States has experienced a water shortage and, by 2013, at least thirty-six states anticipate some sort of water shortage.[6] Shortages occur because virtually every aspect of American life ties itself to water, with vast amounts devoted to producing electricity, growing food, manufacturing household goods, and serving other personal uses.[7]

Although water shortages have long occurred in the United States, evidence suggests these shortages will continue to worsen, especially in the arid West.[8] Inadequate implementation of the doctrine of prior appropriation, the most popular water system in the western United States,[9] exacerbates this continued decline.[10] First, the doctrine gives priority to the earliest water users;[11] thus, if a shortage occurs, the state dispenses water in the order it granted permits and cuts off the most recent users.[12] Second, a water user may divert and use as much water as the diverter can put to "beneficial use."[13] Thus, under the prior appropriation system, the state grants each user a certain allocation of water which the user may not exceed, and which must be put to beneficial use.[14] However, because states largely have failed to measure the amount of water a user diverts, a process known as

4 Infections from two fish pathogens proximately caused the fish deaths, although "additional factors must have played a role for them to have become lethal." USFS, *supra* note 3, at ii. These additional factors included "[t]he high density of fish, low discharges, warm water temperatures, and possible extended residence time of salmon." *Id.*

5 *Id.* (stating low river discharges were apparently responsible for large numbers of fish congregating in a smaller area, which encouraged parasites); *see also* Ca. Dept. of Fish and Game, DFG Releases Final Report for the September 2002 Klamath River Fish-Kill (2004), http://www.dfg.ca.gov/news/news04/04072.html (last visited Jan. 25, 2009) (noting release of report finding that the primary causes of the salmon decline were two pathogens combined with stressful environmental conditions).

6 U.S. ENVTL. PROT. AGENCY, EPA-832-F-06-006, WATER SUPPLY AND USE IN THE UNITED STATES (2007), *available at* http://www.epa.gov/watersense/docs/ws_supply508.pdf.

7 Press Release, Food and WaterWatch, How Much Water Do You Really Use? The Truth May Shock You . . . (Jan. 8, 2008), http://www.csrwire.com/News/10661.htm (last visited Jan. 25, 2009). For example, the average American individual uses 176 gallons of water per day whereas the average African family uses just five gallons a day. The Water Information Program, Water Facts, http://waterinfo.org/resources/water-facts (last visited Jan. 25, 2009).

8 W. GOVERNORS' ASS'N, WATER NEEDS AND STRATEGIES FOR A SUSTAINABLE FUTURE 4–5 (2006), *available at* http://www.westgov.org/wswc/water%20needs%20and%20strategies-finalrev.pdf.

9 Throughout this paper, the "western United States" refers to the following 11 states: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. U.S. CENSUS BUREAU, CENSUS REGIONS AND DIVISIONS OF THE UNITED STATES (2000), *available at* http://www.census.gov/geo/www/us_regdiv.pdf.

10 Although application of the doctrine of prior appropriation differs from state to state, certain features exist among them all. *See generally* 2 WATERS AND WATER RIGHTS 11-18 (Robert E. Beck ed., 1991 ed., rev. vol. 2000) (surveying state water laws).

11 *Id.*

12 *Id.* at 12-2. *See also* CHARLES J. MEYERS, A HISTORICAL AND FUNCTIONAL ANALYSIS OF THE APPROPRIATION SYSTEM 3–4 (1971) (reviewing the prior appropriation system).

13 2 WATERS AND WATER RIGHTS, *supra* note 10, at 12-24. Beneficial use means not letting water "run to waste." *Id.*

14 *Id.* at 11-18.

"source metering,"[15] it is unclear whether users are complying with the conditions of their state permits.

In 1993, Washington became the first western state to require the measurement of virtually all surface water withdrawals,[16] allowing the state to determine the amount of water diverted from rivers and effectively manage water supplies.[17] The Washington legislature created this source-metering law, part of a larger package aimed at promoting salmon recovery, to ensure compliance with water appropriation permits, protect instream uses, and help determine whether the state has water available for appropriation.[18] After fifteen years and multiple revisions, the statute appears to have made the state's management of water more efficient.[19] However, no other western state has followed in Washington's footsteps.

In light of climate change, all western states should adopt source metering. One study suggests that in the West, "no other effect of climate disruption is as significant as how it endangers . . . already scarce . . . water suppl[ies]."[20] Climate change influences water supplies mainly by affecting precipitation.[21] As temperatures rise, less snow falls in the West and snowpacks shrink, making less water available.[22] In Washington, on the other hand, source metering has helped to leave more than 300,000 acre feet of water in streams.[23] Because source metering leaves more water in streams, it may be the most effective tool to ensure the efficient functioning of the prior appropriation doctrine in a climate-changing world.

Kansas and Texas have implemented some form of source metering, mainly to deal with water shortages.[24] Additionally, WaterWatch of Oregon, a river conservation group in the western state of Oregon, proposed a state bill to require source metering throughout the state, but the bill died in the 2007 state legislative

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15 Wash. State Dep't of Ecology, Water Resources: Source Water Measuring, http://www.ecy.wa.gov/programs/wr/measuring/measuringhome.html (last visited Jan. 25, 2009).

16 WASH. REV. CODE § 90.03.360 (2008).

17 WASH. ADMIN. CODE § 173-015 (2007).

18 *Id.*; *see also* Wash. State Dep't of Ecology, Water Resources: Measuring Water Use, http://www.ecy.wa.gov/programs/wr/measuring/measuringhome.html (last visited Jan. 25, 2009) (describing water metering policy and compliance measures) [hereinafter Measuring Water Use].

19 *See* SALMON RECOVERY FUNDING BD., INVESTING IN SALMON RECOVERY: A REPORT BY THE WASHINGTON STATE SALMON RECOVERY BOARD 2002–2004, at 3 (2004), *available at* http://www.rco.wa.gov/documents/srfb/SRFB_2002-2004_Final_Report.pdf (stating that Washington's water management practices have led to more water in streams).

20 STEPHEN SAUNDERS & MAUREEN MAXWELL, LESS SNOW, LESS WATER: CLIMATE DISRUPTION IN THE WEST 1 (2005), *available at* http://www.environmenttexas.org/uploads/EE/ff/EEffm0-ZddxiWgz7sfW-Lg/Less_Snow_Less_Water.pdf.

21 PATRICIA MULROY, THE BROOKINGS INSTITUTION, DIVING IN THE DEEP END: HELP WATER AGENCIES ADDRESS CLIMATE CHANGE 1 (2008), *available at* http://www.brookings.edu/papers/2008/~/media/Files/Projects/Opportunity08/PB_ClimateChange_Mulroy.pdf.

22 *Id.* at 9.

23 SALMON RECOVERY FUNDING BD., *supra* note 19, at 1.

24 *See* KAN. STAT. ANN. § 82a-732 (Supp. 2007); MARY SANGER, ENVTL. DEF., WATER METERING IN TEXAS 2 (2005), *available at* http://www.texaswatermatters.org/pdfs/articles/water_metering_in_texas.pdf (last visited Jan. 25, 2009). Georgia implemented a groundwater metering program in 2003 which will eventually require the metering of all agricultural groundwater wells. *Id.* However, the program is currently under a six year phase-in period with wells to be metered by 2009 and, due to the lack of information at this stage, that program is not discussed here. *See* GA. CODE ANN. § 12-5-105 (Supp. 2008) (enacting groundwater metering program).

session.[25] Curiously, the western states, notoriously plagued by water shortages,[26] seem the most resistant to source metering laws,[27] even though they have the most to gain from efficient management of water resources.[28]

This Article examines the implementation of Washington's source metering law to determine whether source metering does, in fact, aid in effective management of a state's water supply and, if so, whether western states should require the measurement of surface water. Part II provides background on water consumption and waste in Washington and throughout the western United States. Part III discusses the Washington legislature's 1993 decision to enact a source metering law as part of the state's water code, requiring the measurement of all surface water diversions, and explains the requirements of the statute. Part IV examines the relationship between Washington's source metering law and actions in Texas and Kansas, which impose some form of source metering, and in Oregon, where WaterWatch of Oregon has pushed for source metering. Part V looks at the effectiveness of source metering in managing state water supplies and discusses how source metering may mitigate the effects of climate change. The Article concludes that Washington's source metering does aid in effective management of the state's water supply and provides a successful model which other western states should adopt.

II. WATER CONSUMPTION AND WASTE

In the last fifty years, world water consumption has tripled.[29] Water use in the western United States continues to rise[30] as the demand for water to provide energy and support agricultural and metropolitan uses, recreation, fish and wildlife habitat, and water quality protection increases.[31] The climate of the West, with its arid, desert-like lands that receive less than twenty inches of rainfall per year,[32] exacerbates water shortage problems. However, even in the wet areas of western

25 H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007).

26 *See* Dean Mann, *Institutional Framework for Agricultural Water Conservation and Reallocation in the West: A Policy Analysis*, *in* WATER AND AGRICULTURE IN THE WESTERN U.S.: CONSERVATION, REALLOCATION, AND MARKETS 9, 13 (Gary D. Weatherford ed., 1982).

27 As iconic author Marc Reisner points out, although prostitution and gambling have historically been recognized as legal in Reno, Nevada, water metering was, for a long period of time, illegal. MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER 14 (Penguin Books 1993) (1986).

28 *See id.* at 3–12 (discussing the aridity of the western states and their wasteful use of water).

29 U.S. ENVTL. PROT. AGENCY, *supra* note 6.

30 Through the first half of the 1900s water use rose exponentially. During the 1970s, water use began to level off and even declined slightly in the 1980s, although water use levels are still much higher now than they were 50 years ago. The tapering off of water use levels appears to be caused by increased productivity in the use of water. Gary Wolff & Peter H. Gleick, *The Soft Path for Water*, *in* THE WORLD'S WATER 2002–2003, at 1, 23–24 (2002).

31 W. GOVERNORS' ASS'N, *supra* note 8, at 3.

32 W. WATER POLICY REVIEW ADVISORY COMM'N, WATER IN THE WEST: CHALLENGE FOR THE NEXT CENTURY (1998), *reprinted in* A. DAN TARLOCK ET AL., WATER RESOURCE MANAGEMENT: A CASEBOOK IN LAW AND PUBLIC POLICY 17 (5th ed. 2002).

Washington and Oregon, where rainfall can exceed more than 100 inches per year,[33] water shortages have become a concern.[34]

A. Agricultural Use

An estimated 408 billion gallons of water were withdrawn in the United States for all uses in 2000.[35] Of this amount, more fresh water is used in agriculture than for any other use.[36] Irrigation uses the overwhelming majority of water consumed in western states.[37] For example, irrigation withdrawals consume 80% of all water used in Utah and 90% of all the water used in New Mexico.[38] Additionally, many crops grown in the West are low-value crops.[39] In California, pasture, alfalfa, cotton and rice—the four largest water-using crops—use over 50% of all agricultural water. However, the economic value of all these crops together is similar to that of the state's grape crop, which uses only one-ninth as much water.[40] History is one reason for such inefficiency: states granted very generous water rights to early farmers, especially those raising livestock, and the farmers continue to pass down these property rights in water through generations.[41] Existing water users have essentially fully appropriated all available water, meaning that new users can only obtain water when prior existing uses change.[42]

Although agriculture traditionally employed more than half of the western population,[43] this number has been on the decline. By 1991, the natural resource industries together provided less than 6% of employment in the West.[44] As agriculture employs fewer people, and the demand for water remains high,[45] water use has shifted away from agricultural use and toward economically higher-valued industrial and municipal uses.[46] Farmers have begun to market their water rights,

33 *Id.*

34 *See id*. at 22 (discussing increased reliance on hydropower in the Pacific Northwest).

35 SUSAN S. HUTSON ET AL., U.S. DEP'T OF THE INTERIOR, ESTIMATED USE OF WATER IN THE UNITED STATES IN 2000, at 1 (2004), *available at* http://pubs.usgs.gov/circ/2004/circ1268/pdf/circular1268.pdf.

36 *Id*. Although a larger portion of total water consumed in the United States was for thermoelectric power, 30% of this was saline water. *Id*. at 4.

37 *Id.* at 20. The amount used for irrigation has varied less than 3% since 1985, suggesting that agricultural water use may be leveling off. Even if agricultural water use stabilizes, irrigation will likely remain the top water use in the United States. *Id.* at 1. *See generally* MARC REISNER & SARAH BATES, OVERTAPPED OASIS: REFORM OR REVOLUTION OF WESTERN WATER (1990), *reprinted in* TARLOCK ET AL., *supra* note 32, at 23, 24–26 (explaining three important facts about western water use and the economy based on it).

38 REISNER & BATES, *supra* note 37, at 24.

39 *Id.* at 25.

40 *Id*.

41 *Id.* at 26.

42 W. GOVERNORS' ASS'N, *supra* note 8, at 3.

43 A. Dan Tarlock & Sarah V. Van de Wetering, *Growth Management and Western Water Law: From Urban Oases to Archipelagos*, 14 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 983, 991 (2008).

44 *Id.* at 992.

45 *See supra* notes 36–41 and accompanying text.

46 THE NAT'L RES. COUNCIL ET AL., A NEW ERA FOR IRRIGATION 67 (1996).

realizing they can make more money selling their water supply than by growing low-value, water-intensive crops like alfalfa and rice.[47]

B. Urban Use

Population in the West has exploded over the last few decades.[48] Spatial changes have been the most significant, with people moving away from rural areas and congregating in urban areas.[49] As western metropolitan areas grow, so does the demand for water.[50] In fact, the most recent report from the United States Geological Survey found that municipal withdrawals increased by 8% between 1995 and 2000 alone.[51] Homes account for more than half of the municipal withdrawals, representing much greater consumption than either business or industry.[52] Location also causes these amounts to increase.[53] For example, the arid West has very high per capita residential water use, due to landscape irrigation.[54]

As more water moves toward urban use, the use becomes less elastic because a municipality must always provide water for the basic needs of its citizens.[55] On the other hand, a farmer can forgo applying water to his crops during a year of shortage.[56] Projections suggest that people will continue moving to the West for at least the next twenty-five years, meaning the demand on water will remain high and become less elastic.[57]

C. Salmon

In Washington and throughout the Pacific Northwest, salmon have played a critical role in history, culture, economy, and recreation.[58] Tribal people value salmon for subsistence and their cultural significance, fishermen value them for sport and economic importance,[59] and environmentalists value them for their

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47 Garance Burke, *As Supplies Dry Up, Growers Pass on Farming and Sell Water*, SFGATE, Jan. 25, 2008, http://www.enn.com/ecosystems/article/30012 (last visited Jan. 25, 2009).

48 PAMELA CASE & GREGORY ALWARD, PATTERNS OF DEMOGRAPHICS, ECONOMIC AND VALUE CHANGE IN THE WESTERN UNITED STATES, *reprinted in* TARLOCK ET AL., *supra* note 32, at 14–15.

49 *Id.* at 15.

50 *Id.*

51 HUTSON ET AL., *supra* note 35, at 1. Although municipal use has increased, some cities are taking steps to lower water consumption. For example, while the population of Seattle grew 10% from 1990 to 2000, water conservation caused Seattle's water consumption to decrease by 8% during that same period of time. Christopher Schwarzen, *County's Plans for Brightwater Questioned*, SEATTLE TIMES, Jan, 25, 2003, http://community.seattletimes.nwsource.com/archive/?date=20030125&slug=brightwater25m (last visited Jan. 25, 2009).

52 U.S. ENVTL. PROT. AGENCY, *supra* note 6.

53 *Id.*

54 *Id.*

55 W. GOVERNORS' ASS'N, *supra* note 8, at 4–5.

56 *Id.* at 4.

57 CASE & ALWARD, *supra* note 48, at 15.

58 STATE OF WASH. GOVERNOR'S SALMON RECOVERY OFFICE, 1999 STATEWIDE STRATEGY TO RECOVER SALMON, at I.1 (1999), *available at* http://www.governor.wa.gov/gsro/publications/strategy/1999_urgency.pdf [hereinafter 1999 STATEWIDE STRATEGY].

59 *Id.* ("[T]he U.S. Department of Commerce estimates that in 1996 sport fishing contributed more than $704 million to Washington's economy.").

ecological significance.[60] Habitat loss, however, poses a considerable threat to the existence of salmon.[61]

Wild salmon declined drastically during the twentieth century; by 1999, salmon had disappeared from 40% of their historic spawning grounds in Washington, Oregon, California, and Idaho.[62] Water shortages often cause habitat loss because salmon need clean, cool water in order to survive.[63] Low streamflows can interfere with upstream migration and may reduce or even eliminate spawning habitats.[64] In 1991, the federal government placed one population of Washington salmon on the list of Endangered Species List, partially due to lack of habitat.[65] Over the next eight years, the federal government listed three additional populations of salmon in Washington as endangered or threatened.[66] Lack of adequate salmon habitat played a dominant role in spurring the government to create these listings. [67]

Recognizing that salmon populations would not thrive without drastic changes, the Washington legislature enacted a legislative package to address salmon recovery.[68] One of the new laws established a requirement that all new and certain existing surface water users within the state measure their surface water diversions.[69] In response to these requirements, Washington became the first western state to implement source-metering at the statewide level.[70]

III. SOURCE METERING IN WASHINGTON

The slow implementation of Washington's 1993 source metering statute prompted a lawsuit in 1999 to spur completion.[71] As a result, the Washington State

60 *See id.*

61 *Id.* at I.3.

62 SALMON RECOVERY FUNDING BD., *supra* note 19, at 1.

63 *Id.* at 3.

64 1999 STATEWIDE STRATEGY, *supra* note 58, at I.2.

65 SALMON RECOVERY FUNDING BD., *supra* note 19, at 1.

66 *See* U.S. Fish and Wildlife Serv., USFWS Threatened and Endangered Species System, http://ecos.fws.gov/tess_public/SpeciesReport.do (last visited Jan. 25, 2009). See Michael C. Blumm, *Salmon and the Endangered Species Act: Lessons from the Columbia Basin*, 74 WASH. L. REV. 519, 521 (1999) for in-depth information about salmon and the Endangered Species Act.

67 *See* Endangered and Threatened Species; Final Rule Governing Take of 14 Threatened Salmon and Steelhead Evolutionarily Significant Units (ESUs), 65 Fed. Reg. 42,422, 42,422 (July 10, 2000) (to be codified at 50 C.F.R. pt. 223).

68 *See* ECON. & REGULATORY RESEARCH, WASH. STATE DEP'T OF ECOLOGY, EVALUATION OF PROBABLE BENEFITS AND COSTS, CHAPTER 173-173 WAC, REQUIREMENTS FOR MEASURING AND REPORTING WATER USE 1–2 (2001), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/cost%20benefit.pdf [hereinafter BENEFITS AND COSTS EVALUATION] (explaining that, by amending Chapter 90.03.360 to direct the Department of Ecology to require metering, the "Legislature made an implicit judgment . . . that the benefits of requiring metering . . . exceed costs . . . where wild salmonid stocks are distressed or critical").

69 WASH. REV. CODE § 90.03.360 (2008).

70 *Id.*

71 Petition for Judicial Review and Declaratory Relief at 2, Am. Rivers v. Wash. State Dep't of Ecology, No. 99-2-00480-6 (Thurston County Superior Ct. Mar. 18, 1999), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/measuringsuit.pdf.

Department of Ecology (WDOE) was ordered to submit a compliance plan.[72] Thus, fifteen years after its enactment and several lawsuits later, the statute finally seems to have achieved its goal of efficient state water management.[73]

A. The Beginning of the Source Metering Statute

The 1993 law required all new and certain existing water users to measure surface water diversions as part of a larger salmon recovery package.[74] The law required measurement of every 1) new surface water permit, 2) existing surface water permit exceeding one cubic foot per second (cfs), and 3) all new and existing permits, regardless of size, in areas where salmon stocks are "depressed or in critical condition."[75] Essentially, the only water users not regulated by the new statute consisted of those existing surface water users with permits of less than one cfs outside of critical salmon areas.[76] The legislature intended this statute to be the first step toward effective water management.[77] According to the legislature, water management requires information gathering, meaning the state must know who is using what amount of water and when they are using it.[78] Without this information, the WDOE could not efficiently identify any illegal uses of water, nor could it provide adequate water for fish, resolve conflicts between water uses, or promote conservation.[79]

Although state law required source metering in 1993, the WDOE failed to adopt implementing regulations.[80] Without new regulations, the existing regulations did not require, or even allow, metering of any kind.[81] The WDOE also failed to apply the source metering rule to groundwater.[82] Although the original statute applied only to surface water, the statutory provisions regulating groundwater incorporated all surface water regulations into the groundwater code.[83] Thus, when the legislature required source metering for surface water, the rules should have applied to groundwater as well.[84]

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72 Am. Rivers v. Wash. State Dep't of Ecology, No. 99-2-00480-6, slip op. at 3 (Thurston County Super. Ct. filed Mar. 30, 2001), *available at* http://www.ecy.wa.gov/programs/WR/measuring/images/pdf/measuringruling.pdf.

73 *See* Measuring Water Use, *supra* note 18.

74 *See* WASH. REV. CODE § 90.03.360 (2008) (requiring metering of diversions to ensure adequate flow rates in waters in which salmon stocks are depressed).

75 *Id.*

76 *See id.*

77 *See* WASH. ADMIN. CODE § 173-173-015(1) (2007) (seeking to "ensure the reliable, accurate measurement of state water that is diverted, withdrawn, stored and used so that sound decisions may be made in administering state water laws and regulations").

78 *Id.* § 173-173-015(2) (creating specific goals for water management enforcement and measurement reporting).

79 *See* Measuring Water Use, *supra* note 18 ("Successful water supply management requires knowing how much water is actually being used and whether there is any more water in specific areas available for new uses.").

80 Petition for Judicial Review and Declaratory Relief at 2, Am. Rivers v. Wash. State Dep't of Ecology, No. 99-2-00480-6 (Thurston County Superior Ct. Mar. 18, 1999), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/measuringsuit.pdf.

81 *Id.* at 10.

82 *Id.* at 3.

83 *See* WASH. REV. CODE § 90.44.020 (2008).

84 *See id.*

In 1999, as a response to these deficiencies, a coalition of environmental groups filed suit, contending that the WDOE failed to implement administrative rules regarding water diversions, particularly implementing the requirement to establish water metering.[85] The Thurston County Superior Court agreed, ordering the WDOE to create a compliance plan that included adopting either a new or revised administrative rule requiring source metering by December 31, 2001.[86] In addition, the court ordered the WDOE to require the metering of 80% of water use in each of the sixteen critical fish basins by December 31, 2002.[87]

The WDOE responded by creating a compliance plan[88] and adopting a revised administrative rule on source metering by the required deadline.[89] By 2003, the WDOE issued administrative orders requiring metering for 903 water rights, which amounted to 80% of the total estimated water diversions in the critical fish basins.[90] In order to ensure that water users met these requirements, the state legislature appropriated over $3 million to defray the installation costs of the metering equipment.[91] Moreover, the WDOE's rules required measuring devices on all new water rights for both surface and groundwater withdrawals and source metering for all water users requesting a change or extension to an old right.[92]

B. The Current Source Metering Statute

Washington's source metering statute gave the WDOE authority to require that all new and certain existing water users measure their water diversions.[93] The WDOE rules established standards for measuring devices as well as for recording and reporting water use data.[94] The agency's goal was to make sound water allocation decisions based on "the reliable, accurate measurement of state water that is diverted, withdrawn, stored and used."[95] The WDOE also aimed to determine the availability of water for apportionment among new users, while enforcing water rights compliance and protecting instream flows.[96]

The rules require source metering by anyone seeking a new surface water permit and by any existing permittee diverting in excess of one cfs. [97] The rules also apply to

85 Petition for Judicial Review and Declaratory Relief at 2, Am. Rivers v. Wash. State Dep't of Ecology, No. 99-2-00480-6 (Thurston County Superior Ct. Mar. 18, 1999), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/measuringsuit.pdf.

86 *See* BENEFITS AND COSTS EVALUATION, *supra* note 68, at 2.

87 *See id.*

88 WDOE, PLAN FOR DEMONSTRATING COMPLIANCE WITH RCW 90.03.360 AND ORDER OF THE SUPERIOR COURT FOR THURSTON COUNTY (2001), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/complianceplan.pdf.

89 *See* WASH. ADMIN. CODE ch. 173-173 WAC (2007).

90 WASH. STATE DEP'T OF ECOLOGY, REPORT TO THE LEGISLATURE: ACTIONS AND PROGRESS ON WATER USE-EFFICIENCY 14 (2003), *available at* http://www.ecy.wa.gov/biblio/0311014.html.

91 *Id.* at 15.

92 *See* WASH. ADMIN. CODE § 173-173-040 (2007).

93 *Id.* § 173-173-020.

94 *Id.* § 173-173-010 (establishing standards of acceptability that must conform to the rules outlined in the Code).

95 *Id.* § 173-173-015(1).

96 *Id.* § 173-173-015(2).

97 *Id.* § 173-173-040(2)(a), (d).

all permits in areas where salmonid stock are either "depressed" or in "critical" condition. [98] However, they do not apply to secondary users, such as customers of public water supplies and members of public irrigation districts, because that would result in duplicative and unnecessary expense.[99] Any water user subject to these rules may be required to inform the WDOE about its diversions, including the location, the flow rate of diverted water, and the type of measuring device.[100]

The WDOE rules require recording monthly measurements for diversion rates less than ten gallons per minute (gpm),[101] biweekly measurements for diversions from ten to forty-nine gpm, and weekly measurements for diversions over fifty gpm.[102] The measuring device must generally be installed[103] and maintained[104] to the manufacturer's specifications and be in good working order.[105] If a water user fails to comply with these requirements, the WDOE has authority to levy civil penalties ranging from $100 to $5000 per day.[106]

Although a water user bears the primary responsibility of complying with the source metering statute, the state legislature provided money to defray some of those costs.[107] To qualify for cost-share assistance, an applicant must have a valid water right and use the money only for metering projects.[108] Availability of cost-share assistance begins only after the first $250, with a maximum state share of $45,000.[109] Water users in fish-critical basins have priority for assistance.[110]

After the 1993 adoption of the source metering statute and the subsequent legislative revisions because of the 1999 lawsuit, the majority of the state's water

98 *Id.* § 173-173-040(2)(c).

99 *See id.* § 173-173-040(3).

100 *Id.* § 173-173-050(2)(b), (e), (f). The user must attest to the truthfulness of all the information. *Id.* § 173-173-050(3).

101 *Id.* § 173-173-060. One gallon per minute equals 0.002 cfs. *Id.*

102 *Id*.

103 *Id.* § 173-173-110 (outlining installation requirements for meters on pressure systems); *id.* § 173-173-130 (outlining open channel systems requirements).

104 *See id.* § 173-173-120(1) (requiring meters on pressure systems to be "inspected and maintained as specified by the manufacturer"); *id.* § 173-173-150(3) (requiring open channel systems to be maintained in a way that ensures "discharge can be measured accurately").

105 *See id.* § 173-173-090 (requiring that no withdrawal or diversion of water shall be made "unless measuring devices and facilities are in proper operating condition" unless one of the exceptions listed applies); *id.* § 173-173-150(3) (requiring that open channel systems accurately measure discharge). The WDOE provides a list of vendors and installers that have received training from the WDOE as to the technical requirements for assessing and selecting an accurate measuring system. WASH. STATE DEP'T OF ECOLOGY, METER VENDORS AND INSTALLERS (2007), *available at* http://www.ecy.wa.gov/programs/wr/measuring/images/pdf/metertrainingvendors72007.pdf.

106 WASH. REV. CODE § 90.03.600 (2008) (providing that when "determining the amount of a penalty to be levied, the department shall consider the seriousness of the violation, whether the violation is repeated or continuous after notice of the violation is given, and whether any damage has occurred to the health or property of other persons").

107 WDOE, Frequently Asked Questions: Applying for Cost-Sharing For Water Measuring Devices, http://www.ecy.wa.gov/programs/wr/measuring/yrbm_faq_cs.html (last visited Jan. 25, 2009).

108 *Id.*

109 *Id.* The state will not cost-share from $0 to $250 dollars, but will pay 100% of costs from $251 to $3000, 90% from $3001 to $5000, 80% from $5001 to $10,000, 70% from $10,001 to $50,000 and 60% from $50,001 to $75,000. *Id.*

110 *Id.*

users now comply with the statute.[111] This widespread compliance provides WDOE with measurement information to ensure compliance and promote conservation.[112] The source metering statute, coupled with regional recovery plans and international treaties to protect salmon, has led to more than 300,000 acre feet of water left in streams where salmon need it most, demonstrating the statute's success.[113]

IV. SOURCE METERING IN OTHER STATES

In the western United States, only Washington has implemented source metering at a statewide level.[114] However, both Kansas and Texas each require some form of source metering.[115] Certain regions in Texas require groundwater users to measure diversions,[116] and Kansas requires water use reporting for particular water rights holders.[117] Environmental groups in Oregon, such as WaterWatch of Oregon, have attempted to pass statewide source metering laws, but so far have been unsuccessful.[118]

A. Source Metering in Texas

Population growth in Texas exceeds every other state in the nation.[119] Studies suggest Texas will double in population by 2050. [120] As a result, the state's current dependable water supply will meet only 70% of the projected water demand by

111 *See* Measuring Water Use, *supra* note 18.

112 *See id.*

113 SALMON RECOVERY FUNDING BD., *supra* note 19, at 1.

114 *See* WASH. REV. CODE § 90.03.360 (2008).

115 *See* KAN. STAT. ANN. § 82a-732 (Supp. 2007) (requiring water right or permit holders to file annual use reports); SANGER, *supra* note 24, at 2 (noting that some Texas groundwater districts require water metering from larger users).

116 *See* SANGER, *supra* note 24, at 2 (describing the metering requirements of some Texas groundwater districts).

117 *See* KAN. STAT. ANN. § 82a-732 (Supp. 2007) (stating the owner of a water right for any beneficial use, except for domestic use, must file an annual water use report that "completely and accurately set[s] forth such water use" during the preceding year).

118 H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007). Although WaterWatch of Oregon has not yet been able to get statewide source metering passed, it has been successful in establishing a policy requiring measurement as a condition for most water use permits issued after 1993. It also has established a policy requiring municipalities and water districts to measure at their main points of diversion. These actions have led to the measurement of between 40%–50% of all water diverted in Oregon, depending on compliance. Interview with John DeVoe, Executive Dir., WaterWatch of Or., in Portland, Or. (Apr. 1, 2008).

119 TEX. WATER MATTERS, TEXAS' GROUNDBREAKING ENVIRONMENTAL FLOW REGULATION 1 (2007), *available at* http://www.texaswatermatters.org/pdfs/texas_water_legislation.pdf. Although California is currently the most populous state, Texas leads all states in numerical gain, with 8 Texas cities listed among the top 25. Texas Population Booming, http://www.keeptexasmoving.com/index.php/news/Texas_Population_Booming?theme=print (last visited Jan. 25, 2009).

120 Texas had 20.86 million inhabitants in 2000 and was projected to have 39.62 million by 2050. THE NAT'L WILDLIFE FED'N, SAVING WATERS, RIVERS AND MONEY: AN ANALYSIS OF THE POTENTIAL FOR MUNICIPAL WATER CONSERVATION IN TEXAS 2 (2002), *available at* http://www.texaswatermatters.org/pdfs/conservation_report.pdf.

2050.[121] Increased demand for water due to the growing population has led certain Texas water districts to encourage and even require specific users to install water meters, but the legislature has not yet taken any statewide action.[122]

Texas divides itself into five locally owned, landowner-operated, soil and groundwater conservation districts.[123] Texas is also partitioned into numerous water improvement districts that focus on surface water irrigation, mostly corresponding to county lines.[124] Many conservation and improvement districts have created rules imposing source metering, all varying from one another.[125] Some districts differentiate among domestic, industrial, and agricultural water users to determine who must measure water consumption.[126] For example, select districts require metering on wells capable of producing more than 25,000 gallons of water per day, essentially exempting domestic users.[127] Also, some districts require water users to employ only approved manufacturers and models of water meters, while other districts require that water meters "meet the American Water Works Association's accuracy reading range for actual flow."[128] Certain water managers conduct random checks to verify accuracy; others require certification tests or request third party tests of the meter.[129] Virtually all districts that require source metering expect the water user to keep track of the readings and provide information about the actual amounts pumped to the water manager.[130] For the most part, the conservation districts provide no money to water users to defray the cost of the meters,[131] although one surface water irrigation district does have a 50% cost-share program.[132]

Although the Texas legislature has yet to implement source metering statewide, support for statewide source metering does exist. In 1997, the Texas legislature passed legislation addressing future water demands in the state.[133] The

121 IAN GERSTON, MARK MACLEOD & C. ALLEN JONES, ENVTL. DEF., EFFICIENT WATER USE FOR TEXAS: POLICIES, TOOLS AND MANAGEMENT STRATEGIES 3 (2002), *available at* http://twri.tamu.edu/reports/2002/tr200/tr200.pdf.

122 SANGER, *supra* note 24, at 2.

123 Texas State Soil and Water Conservation Board, Texas Soil and Water Conservation Districts, http://www.tsswcb.state.tx.us/swcds/info (last visited Jan. 25, 2009).

124 El Paso County Water Improvement District Number 1, Welcome to the Irrigation District, http://www.epcwid1.org/ (last visited Jan. 25, 2009).

125 SANGER, *supra* note 24, at 2.

126 *Id*.

127 The Lone Star Groundwater District and the Post Oak Savannah Groundwater District require meters for ground water wells producing more than 25,000 gallons of water per day, and the "North Plains Groundwater District requires flow meters on all new wells." *Id.* at 2 n.3. Also, surface water irrigation districts in the Lower Rio Grande Valley and the El Paso County Water Improvement District both require metering of surface water diversions. *Id*. at 2.

128 *Id*.

129 *Id.* at 3.

130 *Id.*

131 *See id.*

132 *See id.* (describing a surface water irrigation district in the Lower Rio Grande River Valley that offers a 50% cost-share program).

133 S.B. 1, 1997 Leg., 75th Reg. Sess. (Tex. 1997). *See generally* REG'L WATER PLANNING GROUP, TEX. WATER DEV. BD., EXECUTIVE SUMMARY: TEXAS STATE SENATE BILL 1 REGION B (2003), *available at* http://www.twdb.state.tx.us/rwp/B/PDFs/B_Executive%20Summary.pdf (discussing water planning strategies in the Region B Regional Water Planning Area in light of Senate Bill 1); Martin Hubert, *Senate Bill 1, The First Big and Bold Step Toward Meeting Texas's Future Water Needs*, 30 TEX. TECH L. REV. 53 (1999) (discussing the history and impact of Senate Bill 1).

legislation tasked regional water planning groups[134] with developing water demand projections, and strategies to meet those demands, through 2050.[135] The Texas Water Development Board then compiled these projections and strategies into a state water plan.[136] Twelve of the sixteen planning groups recommended "water use management, such as . . . volumetric measurement of water use."[137] Although the suggestion applied only to irrigators, it reflects widespread support for source metering in Texas.

In comparison to Washington, Texas has not mandated source metering throughout the entire state. While only some water districts in Texas have mandated source metering, all of the districts have implemented varying rules regarding source metering, making it less streamlined than Washington's system. Almost none of the Texas districts provide monetary assistance to defray the cost of compliance, whereas Washington provides financial assistance after the first $250 spent. However, both Washington and Texas require that water users who must meter provide the state with the source metering data to demonstrate compliance.

B. Source Metering in Kansas

Kansas farmers produce more wheat and sorghum than any other state in the nation, making agriculture the largest industry in the state.[138] Cattle production also thrives throughout the state.[139] These agricultural pursuits require considerable amounts of water, something Kansas, especially its western half, has little to spare.[140] Although Kansas may not have the population crush affecting the western

134 *See* LAURA BALL & MARY KELLY, IRRIGATION DEMAND IN TEXAS: AN ANALYSIS OF METHODOLOGIES TO PREDICT IRRIGATION TRENDS 2 (2003), *available at* http://www.texaswatermatters.org/pdfs/irrigation_demands.pdf (discussing the regional water planning groups). To implement the planning process set out by the legislature, the Texas Water Development Board created regional water planning groups by dividing the state into 16 subparts. *See* REG'L WATER PLANNING GROUP, *supra* note 133, at 1 (discussing implementation of the planning process).

135 *See* BALL & KELLY, *supra* note 134, at 2 (discussing the regional water planning groups).

136 *See* 1 TEX. WATER DEV. BD., WATER FOR TEXAS 2007, at 3 (2007), *available at* http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/vol%201_FINAL%20113006.pdf (discussing the steps for water planning in Texas). Groups created the first plan in 2002 and revised it in 2007. *See* 2 TEX. WATER DEV. BD., WATER FOR TEXAS 2007, at 116 (2007), *available at* http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/CHAPTER%203%20final_102806.pdf (discussing the evolution of the planning process between the 2002 plan and the 2007 plan).

137 2 TEX. WATER DEV. BD., *supra* note 136, at 262–63.

138 KAN. FARM BUREAU, WHAT'S GROWING IN KANSAS: HOW DOES AGRICULTURE AFFECT YOU?, http://www.kfb.org/agcentral/agcentralimages/part 1 - What's Growing in Kansas.pdf (last visited Jan. 25, 2009) (using 2004 data).

139 Kansas was the leading state in number of cattle slaughtered in 2004 and second in the number of cattle and calves on farms. *Id.*

140 *See* KAN. STATE UNIV. AGRIC. EXPERIMENT STATION & COOP. EXTENSION SERV., THE WESTERN KANSAS IRRIGATION RESEARCH PROJECT 3 (1998), *available at* http://www.oznet.ksu.edu/library/misc2/WKIRP.pdf [hereinafter WESTERN KAN. IRRIGATION].

United States, water shortages still occur due to the high demand for water in the agricultural sector.[141]

The majority of water in Kansas comes from the Ogallala Aquifer, which underlies most of the midwestern United States.[142] Only a finite amount of water exists in the Ogallala Aquifer, but water users—especially irrigators—are rapidly depleting these water levels.[143] As a result of agriculture's high demand for water in Kansas, the state has long recognized the importance of water measuring efforts.[144] Beginning in 1980, Kansas groundwater management districts began to require meter installation for new and redrilled wells.[145] Ten years after the districts initially implemented metering requirements, the Kansas legislature enacted legislation requiring annual water use reporting.[146]

Two rules govern source metering as a mechanism for reporting water use in Kansas.[147] The first gives the Chief Engineer of the Division of Water Resources of the Kansas State Board of Agriculture authority to require any water user to install a measuring device.[148] An agent of the Chief Engineer may read the measuring device "at any time" and may require users to report "at reasonable intervals."[149] The agent also has authority to require a water user to report findings of water waste or water quality issues.[150] The Division of Water Resources has enforced this authority by requiring measuring devices on all new or changed points of diversion since 1987.[151] Kansas also requires measuring on existing points of diversion where 1) water right administration regularly occurs, 2) the state needs better data to comply with an interstate river compact, 3) the state has created intensive groundwater use control areas, and 4) the state administers "minimum desirable streamflows."[152]

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141 *See* V.L. MCGUIRE, U.S. GEOLOGICAL SURVEY, CHANGES IN WATER LEVELS AND STORAGE IN THE HIGH PLAINS AQUIFER, PREDEVELOPMENT TO 2005, at 1 (2007), *available at* http://pubs.usgs.gov/fs/2007/3029/pdf/FS20073029.pdf.

142 The Ogallala Aquifer, also known as the High Plains Aquifer, underlies 111.4 million acres (174,000 square miles) in parts of eight States—Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. WESTERN KAN. IRRIGATION, *supra* note 140, at 3; MCGUIRE, *supra* note 141, at 1.

143 *See generally* MCGUIRE, *supra* note 141, at 1–2 (showing increase since 1930 of irrigated acreage and groundwater withdrawals overlying the Ogallala).

144 *See* Marios Sophocleous, *The Origin and Evolution of Safe-Yield Policies in the Kansas Groundwater Management Districts*, NAT. RES. RESEARCH, June 2000, at 99, 100 ("Runoff to streams was estimated to have declined by one-half in western Kansas since 1959."); Myrl Duncan, *High Noon on the Ogallala Aquifer: Agriculture Does Not Live by Farmland Preservation Alone*, 27 WASHBURN L.J. 16, 45–48 (1987) (discussing history of water management in Kansas).

145 Duncan, *supra* note 144, at 62.

146 *See* KAN. STAT. ANN. § 82a-732(a) (Supp. 2007); Leland E. Rolfs, *Comparing and Contrasting the Roles of the Division of Water Resources and the Groundwater Management Districts in Groundwater Management and Regulation*, 15 KAN. J.L. & PUB. POL'Y 505, 511 (2006).

147 KAN. STAT. ANN. §§ 82a-706c, 82a-1028(*l*) (1997 & Supp. 2007).

148 *Id.* § 82a-706c (1997).

149 *Id.*

150 *Id.*

151 Rolfs, *supra* note 146, at 510.

152 *Id.* "Minimum desirable streamflows" ensure base flows in certain Kansas streams to protect existing water rights, while meeting in-stream water uses related to water quality, fish, wildlife, and recreation. KAN. STAT. ANN. § 82a-928(i) (1997).

The second rule governing source metering in Kansas gives authority to every groundwater management district to install measuring devices on water users' points of diversion or to require that water users install the measuring devices themselves.[153] The district may either read the measuring devices to determine water flow or require a water user to read their own device and report the readings "as may be necessary to determine the quantity of water withdrawn."[154] Every groundwater management district requires water meters for almost all nondomestic groundwater pumping.[155] The districts also have authority to give assistance to water users in their district.[156] This authority includes providing help with testing and maintaining water meters, as well as filling out water use reports and water appropriation applications.[157] In total, over 30,000 of the approximately 38,000 active points of diversion in Kansas require source metering.[158]

According to one account, Kansas has created the "best water use reporting program in the United States."[159] The Kansas Division of Water Resources uses eight employees to implement this apparently successful program.[160] These employees analyze the annual water use reports from metering water users to review and assemble a statewide annual water use report.[161] Participation among water users in annual water user reporting remains high: each year 99.9% of all water users file a report.[162] There is a civil fine of up to $250 per water right for failure to file an accurate and complete report,[163] which may encourage compliance.

Both Washington and Kansas require statewide source metering, although the states have different classifications as to who must meter. Also, Kansas requires metering for all new or changed points of diversion post-1987, whereas Washington state law requires source metering for all new and some existing users post-1993. Both Kansas and Washington require water users to file reports in order to demonstrate compliance with the state laws. Kansas and Washington require measuring of both surface and groundwater, although Washington regulates both under the same statutory provisions and Kansas divides the regulation between the Division of Water Resources and the groundwater management districts. Each state has noncompliance measures in place to penalize those who fail to meter.

153 KAN. STAT. ANN. § 82a-1028(*l*) (Supp. 2007).

154 *Id.*

155 KAN. ADMIN. REGS. §§ 5-21-6, 5-22-4, 5-22-4a, 5-23-6, 5-24-9, 5-25-5 (2008).

156 KAN. STAT. ANN. § 82a-1028(m) (Supp. 2007).

157 Rolfs, *supra* note 146, at 511.

158 *Id.* A more recent rule requires the installation of water meters on all nondomestic diversion points meeting predetermined criteria by the end of 2015. *See* KAN. WATER OFFICE, KANSAS WATER RESOURCES CONDITIONS 2006, AT 28 (2006), *available at* http://www.kwo.org/Reports%20%26%20Publications/Rpt_water_conditions_2006_031907_kf.pdf.

159 Rolfs, *supra* note 146, at 511.

160 *See id*. (including one manager, three environmental scientists, one clerical position, and four data entry positions).

161 *Id*. The reports are due on March 1 of each year. *Id.*

162 *Id.*

163 *Id.*

C. Source Metering in Oregon

Oregon has a national reputation for its progressive environmental protection efforts.[164] The state imposes progressive land use planning restrictions on development[165] and considers instream river flows to be a state water right.[166] Although Oregon often pioneers environmental change, the state has yet to enact a statewide source metering rule.[167]

WaterWatch, a river conservation group dedicated to protecting natural flows in Oregon's rivers,[168] has made several attempts to encourage statewide source metering.[169] Until recently, these efforts failed to gain political traction. However, in the 2007 legislative session, Democratic control of the House, Senate, and Governor's office resulted in a new political dynamic, allowing a variety of interest groups to move forward on issues which had garnered less attention in the past.[170] Thus, when WaterWatch proposed a bill calling for statewide source metering in 2007, the state legislature took notice.[171]

The original House bill called for all water users to measure and report uses, under the notion that "what gets measured gets managed."[172] Although current state law requires certain municipalities and irrigation districts to measure and report water use,[173] this bill attempted to codify a requirement that all unmeasured water right holders must measure diversions.[174] The bill would have implemented a cost-sharing program to help defray the cost of purchasing the measurement devices.[175]

164 WATERWATCH OF OR., LEGALLY DRY: HOW OREGON'S WATER LAWS FAIL OUR RIVERS 3, http://www.waterwatch.org/files/Legally%20Dry%20-%20WaterWatch.PDF. (last visited Jan. 25, 2009)

165 *See* OR. REV. STAT. ch. 197 (2007) (creating a comprehensive land use plan for the state). This may be overstated due to the current state of Measure 37, a land use initiative passed in 2004 allowing a land owner to seek compensation from state or local government if the property owner's land values have been reduced by environmental or other land use restrictions. *See generally* Michael C. Blumm & Erik Grafe, *Enacting Libertarian Property: Oregon's Measure 37 and Its Implications*, 85 DENV. U. L. REV. 279 (2007) (discussing Measure 37's history, scope, exceptions, and exportation as well as how the adoption of Measure 49 will affect results under Measure 37).

166 OR. REV. STAT. § 537.348 (2007).

167 *See* H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007) (failing to make it past the Ways and Means Committee).

168 WaterWatch of Or., About Us, http://www.waterwatch.org/about (last visited Jan. 24, 2009).

169 *See* H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007); WaterWatch of Or., 2007 Oregon Legislature, http://www.waterwatch.org/legislature (last visited Jan. 24, 2009).

170 Water for Life, Inc., 2007 Oregon Legislative Session Executive Summary, http://www.waterforlife.net/resources_session_2007.htm (last visited Jan. 24, 2009). Improving economic conditions and an increase in state revenues also factored into the different dynamic. *Id.*

171 *See* H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007).

172 WATERWATCH OF OR., PLEASE SUPPORT HB 2564-A (2007).

173 OR. REV. STAT. § 537.099(1) (2007).

174 WATERWATCH OF OR., *supra* note 172.

175 H. Amendments to H.B. 2564, 74th Leg., Reg. Sess. (Or. 2007). It is unclear how much money would be set aside to defray these costs; the amended bill called for the Water Resources Department to "[p]ursue available sources of public and private funding to support an increased stream gauging network and defray the costs of purchasing water measurement devices." *Id.*

The proposed bill created considerable controversy.[176] Although the bill had the support of many influential groups,[177] the agricultural community vehemently opposed it.[178] The agricultural community feared the cost of source metering and contended that the passage of the bill could lead to more intrusive laws that would infringe upon their water rights.[179] With no consensus, a work group convened by the chairperson of the House Committee on Energy and the Environment[180] recommended a compromise version of the bill that called for the measurement of significant diversions in priority watersheds[181] and provided for a cost-share program.[182] Although the bill died before this committee,[183] WaterWatch moved the source metering concept further along than in any prior session and claims to have "built a strong coalition around the bill."[184]

The source metering directives in Washington, Texas, and Kansas can serve as examples for Oregon as it pushes forward with the goal of statewide source metering. Oregon may use Washington's model to show how a western state has benefitted from source metering, while also serving as a cautionary tale that political strife and lawsuits may occur before implementation. Texas provides an example of district-wide source metering, a process with as many different rules as districts. Texas's use of a less streamlined approach with little uniformity and no financial assistance may work for a district wide approach, but Oregon may find such a plan difficult to implement at a statewide level. Finally, Kansas provides Oregon with a more established model for statewide source metering that demonstrates the benefits of statewide source metering.

176 Water for Life, Inc., *supra* note 170.

177 The League of Oregon Cities, Special Districts Association of Oregon, Oregon Association of Nurseries, Central Oregon Cities Organization, Oregon Council of Trout Unlimited, and WaterWatch of Oregon all supported this bill. WATERWATCH OF OR., *supra* note 172.

178 Water for Life, Inc., *supra* note 170.

179 *See id.* (highlighting agricultural community's opposition to HB 2564 and sensitivity to water right ownership issues).

180 Rep. Jackie Dingfelder (D-Portland), chairperson of the House Committee on Energy and the Environment, focused her efforts on passing this and another water-use bill. *Id*.

181 WaterWatch of Or., 2007 Oregon Legislature: Water Bill Descriptions, http://www.waterwatch.org/legislature/2007-oregon-legislature-bill-descriptions/?searchterm=HB 2564 (last visited Jan. 24, 2009). This essentially confirmed a strategy put forth by the Oregon Water Resources Commission in 2000. Interview with John DeVoe, Executive Dir., WaterWatch of Oregon, in Portland, Or. (Apr. 1, 2008).

182 Water for Life, Inc., *supra* note 170.

183 The amended version of the bill passed out of the House Committee on Energy and the Environment and was sent directly to the floor of the House of Representatives, bypassing the Ways and Means Committee. *Id.* The full House was scheduled to vote on the bill on May 15, 2007, but its proponents were unsure if they had enough votes to ensure passage. A procedural motion was made to send the bill to the Ways and Means Committee for consideration of its fiscal impact, avoiding a vote and keeping the measure alive. *Id.* Nonetheless, the bill's opponents succeeded in preventing a floor vote, and the session ended without the measure receiving additional consideration. *Id*.

184 WaterWatch of Or., 2007 Oregon Legislature, http://www.waterwatch.org/legislature (last visited Jan. 25, 2009).

V. THE BENEFITS OF SOURCE METERING

Although water users may have concerns about source metering, primarily due to cost and concern for increased water right restrictions,[185] the benefits clearly outweigh these concerns. The water itself costs nothing; however, a water user typically incurs some initial cost for purchasing and maintaining the source meter, although the source metering usually pays for itself over the long term.[186] Additionally, source metering does not automatically lead to increased water use restrictions—it has not in Washington, Texas, or Kansas; it only provides accountability for water use in the system.[187] Source metering may also give water users an effective mechanism for responding to climate change by providing an effective mechanism for managing a state's scarce water supply.[188]

A. Concerns over Source Metering

Water users frequently have two primary worries over requiring source metering: the cost and the potential for increased water use restrictions.[189] Water users do bear some of the cost of implementing metering, which typically costs from $600 to $2500 depending on the size of the diversion and type of meter involved.[190] However, a measuring device can function for up to twenty years.[191] Yearly maintenance generally costs about $200 per meter.[192] A water user pays nothing for the water it diverts.[193] Although water users bear some costs, Washington provides a cost-share program that helps to defray some of these costs.[194] Source metering, in fact, often pays for itself over the long term because it tends to produce water savings, lower energy costs, and optimum yields.[195] In Texas, some farmers found that source metering immediately paid for irrigation

185 SANGER, *supra* note 24, at 5.

186 *See id.*

187 *See id.*

188 These studies mention that a necessary step for addressing climate change is management of a state's water supply. *See* MULROY, *supra* note 21, at 2 (arguing that water agencies must use available data to evaluate vulnerability due to climate change-induced problems); U.S. GLOBAL CHANGE RESEARCH PROGRAM, WATER: THE POTENTIAL CONSEQUENCES OF CLIMATE VARIABILITY AND CHANGE FOR THE WATER RESOURCES OF THE UNITED STATES 114 (2000), *available at* http://www.gcrio.org/NationalAssessment/water/water.pdf ("[W]ater demand management and institutional adaptation are the primary components for increasing system flexibility to meet uncertainties of climate change." (quoting INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 1995: IMPACTS, ADAPTATIONS, AND MITIGATION OF CLIMATE CHANGE (1996)).

189 *See* SANGER, *supra* note 24, at 5.

190 *Id.* at 3. The average meter costs between $650 and $800, with high-end meters costing around $2500. *Id.*

191 *See* MARK MATHIS ET AL., TEX. WATER DEV. BD., WATER LOSS AUDIT MANUAL FOR TEXAS UTILITIES 13 (2008).

192 SANGER, *supra* note 24, at 3.

193 *See* WATERWATCH OF OR., *supra* note 164, at 1.

194 Wash. State Dep't of Ecology, Frequently Asked Questions—Applying for Cost-Sharing for Water Measuring Devices, http://www.ecy.wa.gov/programs/wr/measuring/yrbm_faq_cs.html (last visited Jan. 24, 2009); *see also supra* notes 107–10 and accompanying text (discussing how much assistance Washington provides).

195 *See* SANGER, *supra* note 24, at 5.

systems tied to multiple wells.[196] Another Texas water user saved almost $2000 after discovering that although the pumps on a water well were running, no water flowed from the well.[197] Yet another Texas study concluded that water measurement alone reduced water usage by 10%.[198] An Oregon study showed that water measurement alone can decrease diversions and increase streamflows; when the state ordered the measurement of diversions on the upper Wood River in the Klamath River Basin, river flows increased by twenty to thirty cfs.[199] Perhaps most significantly, in Washington, more than 300,000 acre feet of water has been left in streams where salmon need it most, protecting aquatic species against habitat loss and perhaps creating a buffer against climate change.[200]

There is no evidence that source metering leads to an increase of water use restrictions.[201] Under most state water laws, the state specifies the amount of water a water user may divert; thus, water metering cannot take away the water right of any water user.[202] Instead, source metering helps only to ensure that all water users fall within the scope of their water rights.[203] Source metering allows the state to gather information, but does not necessarily cause the onset of regulation.[204] No examples of source metering leading to an increase in water use restrictions in Kansas, Texas, or Washington could be found.

B. Climate Change

Global surface temperatures have increased by 1.1 degrees Fahrenheit during the past century.[205] Average temperatures in the West have risen higher than in any other region in the contiguous United States, increasing by two to five degrees Fahrenheit during the twentieth century.[206] Climate change influences water supplies mainly by affecting precipitation.[207] As the temperature increases, snowfall and snowpacks have decreased throughout the West, reducing the amount of water available for reservoir storage.[208] Snowpacks melt earlier due to higher temperatures, requiring more reservoir storage to capture and hold the runoff until summer, the highest demand period for water.[209]

Studies have already documented the occurrence of climate change in the West.[210] According to National Weather Service data, the western United States,

196 *Id.*

197 *Id.*

198 *Id.*

199 WATERWATCH OF OR., WATERWATCH OF OREGON'S POSITION ON HB 2564: SUPPORT REQUIRING MEASUREMENT AND REPORTING OF ALL WATER USE (2007).

200 SALMON RECOVERY FUNDING BD., *supra* note 19, at 1.

201 *See* WATERWATCH OF OR., *supra* note 172.

202 *See id.*

203 *See id.*

204 *See id.*

205 W. GOVERNORS' ASS'N, *supra* note 8, at 21.

206 *Id.*

207 MULROY, *supra* note 21, at 1.

208 SAUNDERS & MAXWELL, *supra* note 20, at 9.

209 *Id.* at 6.

210 *Id.* at 1; *see also* U.S. GLOBAL CHANGE RESEARCH PROGRAM, *supra* note 188, 81–99 (2000) (discussing the impact of climate change on U.S. water resources).

along with the rest of the world, has warmed.[211] With warmer temperatures, less snow has fallen and western snowpacks have reduced in size.[212] One study of 200 western mountain sites discovered more than two-thirds of the sites showed less winter precipitation falling as snow and more as rain.[213] Another study analyzed the records from 824 government snowpack measurement sites in the West and found that snowpack levels had declined at virtually all of the sites from 1950 to 1977.[214] Yet another study found that western snowpacks are melting earlier in the year; this study looked at 279 western rivers and streams dominated by snowmelt to determine that the timing of peak flows advanced from ten to thirty days from 1948 to 2000.[215]

Although these studies depict changes that have already occurred, further studies suggest these changes will only continue in the future.[216] For example, a growing body of scientific research indicates that many parts of the western United States will experience reduced water availability in the future, especially during the high-demand period of the summer months.[217] In fact, one study proposes that in the West, "no other effect of climate disruption is as significant as how it endangers the region's already scarce . . . water supply."[218] Climate change has already occurred in the West and will likely only continue into the future.

Source metering can mitigate the effects of climate change by providing an effective mechanism for managing a state's scarce water supply.[219] Source metering provides a state with information about the amount of water a water user consumes and the amount of water left in a stream,[220] making it easier for a state to manage the water supply. Source metering has been shown to produce watering savings, optimum yields, and lower energy costs[221] and has reduced water usage in

211 SAUNDERS & MAXWELL, *supra* note 20, at 9; *see also* Climate Prediction Ctr., Nat'l Weather Serv., Nat'l Oceanic & Atmospheric Admin., U.S. Temperature and Precipitation Trends: Annual, http://www.cpc.ncep.noaa.gov/anltrend.gif (last visited Jan. 24, 2009) (showing National Oceanic and Atmospheric Administration map of the United States and indicating rate of long-term trend in temperature and precipitation change).

212 SAUNDERS & MAXWELL, *supra* note 20, at 9.

213 *Id.*

214 P. W. Mote et al., *Declining Mountain Snowpack in Western North America*, 86 BULL. AM. METEOROLOGICAL SOC'Y 39, 40–47 (2005).

215 Iris T. Stewart et al., *Changes in Snowmelt Runoff Timing in Western North America Under a 'Business as Usual' Climate Change Scenario*, 62 CLIMATIC CHANGE 217, 217, 223 (2004), *available at* http://meteora.ucsd.edu/cap/stewart/_clch.pdf.

216 W. STATES WATER COUNCIL, WESTERN STATES WATER: ADDRESSING WATER NEEDS AND STRATEGIES FOR A SUSTAINABLE FUTURE 1759 (2008); *see also* Tim P. Barnett et al., *Human-Induced Changes in the Hydrology of the Western United States*, 319 SCI. 1080, 1080 (2008) (suggesting hydrological "changes are highly likely to accelerate, making modifications to the water infrastructure of the western United States a virtual necessity").

217 W. WATER POLICY REVIEW ADVISORY COMM'N, *supra* note 32, at 18; *see also* SAUNDERS & MAXWELL, *supra* note 20, at 17–19 (discussing effects of climate disruption on the Colorado River basin, the Columbia River basin, and California); Barnett et al., *supra* note 216, at 1082 ("Our results [foretell] water shortages, lack of storage capability to meet seasonally changing river flow, transfers of water from agriculture to urban uses, and other critical impacts.").

218 SAUNDERS & MAXWELL, *supra* note 20, at 1.

219 *See* MULROY, *supra* note 21, at 1 (outlining steps needed for water agencies to address climate change); U.S. GLOBAL CHANGE RESEARCH PROGRAM, *supra* note 188, at 113–14 (discussing the need to address climate change in water planning and management).

220 *See* WASH. ADMIN. CODE § 173-173-015 (2007).

221 *See* SANGER, *supra* note 24, at 5.

Texas,[222] Kansas,[223] and Washington.[224] As climate change produces more water shortages, the additional water that source metering leaves in a stream may mitigate the effects of rising temperatures by providing the extra water a state needs both for its water users and for protecting instream flows.

Western states, which are experiencing a disproportionate amount of climate change-induced water shortages, should follow Washington's statutory model and require virtually all water users to measure both surface and ground water diversions. These states should couple a source metering requirement with a cost-sharing program and perhaps a loan program, so that water users do not bear the full cost of the program, because the entire state would ultimately benefit from this program.[225] Western states should also realize that implementation of source metering may be difficult: the regulating body may not implement the needed rules immediately and lawsuits may be filed, as in Washington,[226] and senior agricultural water users may be resistant to the passage of such a statute, as in Oregon.[227] However, source metering may be the most effective mechanism available to ensure the efficient functioning of the prior appropriation doctrine in a climate-changing world in which there is surely going to be less available water in the future.

VI. CONCLUSION

Washington created the first western statewide source metering statute to promote salmon recovery, determine the amount of water diverted from rivers, and effectively manage water supplies. Washington's source metering statute has led to effective management of the state's water supply by providing the state with needed information about the water supply and by leaving more water in the streams. Additionally, Texas and Kansas provide examples of successful source metering statutes in nonwestern states, while Oregon exemplifies the struggle of adopting source metering in a western state. Although these examples strengthen the notion that Washington has provided a successful model for statewide source metering, no other western state has followed suit.

Due to the efficacy of source metering and the impending consequences of global warming, all western states should adopt a source metering statute similar to Washington's. This statute provides a successful model for use in western states in light of the arid nature of the West, the increase of population, the decrease of water availability in this area, and the onset of climate change. To ensure the full value of water in the West, states must move toward counting every drop.

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222 *See id.*; *supra* notes 195–98 and accompanying text (discussing reduced water use resulting from source measuring in Texas).

223 *See* Rolfs, *supra* note 146, at 512.

224 *See* SALMON RECOVERY FUNDING BD., *supra* note 19, at 1; *supra* notes 111–13 and accompanying text (discussing the success of source metering in Washington).

225 It may be questioned why the public should subsidize the management of a public resource that is given away for free, but it appears that doing so will best ensure that a state's citizens will push to adopt source metering.

226 *See supra* Part III.A.

227 *See supra* Part IV.C.