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## Drought Proofing Water Law

Janet C. Neuman

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# DROUGHT PROOFING WATER LAW

JANET C. NEUMAN†

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## I. INTRODUCTION

Lake Arrowhead, California, is one of many communities recently struggling with drought. The small town's population normally doubles with summer tourists who come to enjoy the Lake Arrowhead reservoir; however, a lack of water dropped the lake to historic low levels in the spring of 2003, leaving many boat docks and marinas high and dry.<sup>1</sup> The drought also triggered an outbreak of bark beetles in the surrounding pine forests, causing more trees to die in one year than in the last 300 years.<sup>2</sup> What was once lush and scenic forest turned into a fire waiting to happen.<sup>3</sup> Drought made the community tense. Disputes arose over management of the lake's water, including criticism of the 95% water discount given to the country club and golf course.<sup>4</sup> The Arrowhead Lake Association filed a complaint against the local water agency with the State Water Resources Control Board,<sup>5</sup> and a local homeowner filed a lawsuit against the county for approving several thirsty housing developments without environmental

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1. Louis Sahagun, *The Dissension Flows Freely in Lake Arrowhead*, L.A. TIMES, May 19, 2003, at B1.

2. *Id.* (quoting Richard Minnick, fire ecology professor at University of California, Riverside).

3. *Id.* In fact, the wait was not long. The region suffered devastating wildfires as this article was going to press in the fall of 2003. See, e.g., Gordon Smith & Matt Krasnowski, *Wildfire Pauses Before Arrowhead*, SAN DIEGO UNION-TRIBUNE, Oct. 31, 2003, at A10; Hector Becerra, *Fire Alters Arrowhead in Ways Big and Small*, L.A. TIMES, Nov. 8, 2003, at B12.

4. Sahagun, *supra* note 1.

5. Sahagun, *supra* note 1.

reviews. Residents anxious over the fire danger were also concerned about the impact of the anxiety on business.<sup>6</sup> A local community leader described the community infighting in response to the drought as “like arguing over the best deck chair on the Titanic twenty minutes after hitting the iceberg.”<sup>7</sup>

This article explores how to make water law more responsive to the inevitable reality of drought and less like an argument over the Titanic’s deck chairs—in other words, how to “drought proof” water law.<sup>8</sup> Much of the focus is on the prior appropriation systems of the more arid states in the West, but many of the changes are equally necessary and applicable to eastern states. The article first considers what constitutes a drought, reviews recent drought news, and examines how droughts affect various sectors of society and the economy. The article next discusses how the legal system currently responds to drought and then considers what legal and policy changes could provide improved resilience in the face of expected increases in the frequency and severity of drought and the mounting demands on water supplies generally.

## II. WHAT IS A DROUGHT?

The old dictionary on my bookshelf defines a “drought” as a “prolonged period of dryness.”<sup>9</sup> By this definition, most of the western United States experiences a drought at least once a year. After the mountain snows melt in spring but before more rain and snow fall in winter, a prolonged period of dryness occurs; sometimes a few months pass with almost no precipitation. In fact, since much of the West receives less than ten inches of precipitation annually,<sup>10</sup> the West as a whole has experienced drought for eons, beginning when the last marine life disappeared from the fossil record and the region began its transition to the landforms and climate we know today.<sup>11</sup> If an eon or two does not qualify as a prolonged period of dryness, nothing does. Furthermore, since nearly 37% of the United States’ population now lives west of the Mississippi River, and an increasing share of the country’s food supply is grown there, the West’s aridity affects the entire country economically.<sup>12</sup>

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6. *Id.*

7. *Id.* (quoting Bill Battison, president of a coalition of eighteen homeowners’ associations).

8. I am talking primarily about the law of water quantity and allocation, and only indirectly about water quality issues.

9. WEBSTER’S SEVENTH NEW COLLEGIATE DICTIONARY 255 (1967).

10. JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES 5–6 (3d ed. 2000).

11. DONALD WILHITE, NAT’L DROUGHT MITIGATION CTR., IMPROVING DROUGHT MANAGEMENT IN THE WEST: THE ROLE OF MITIGATION AND PREPAREDNESS 6, 8 (report to W. WATER POLICY REV. ADVISORY COMM’N 1997).

12. BUREAU OF THE CENSUS, U.S. DEP’T OF COMMERCE, RESIDENT POPULATION OF THE 50 STATES (Dec. 28, 2000), *at* <http://www.census.gov/population/cen2000/tab01.pdf>. Between 1970 and 1995 the population of the West increased by 32%, compared with a growth rate of 19% for the rest of the nation. PAMELA CASE & GREGORY ALWARD, U.S. DEP’T OF AGRIC., PATTERNS

My dictionary's alternate definition of drought is a "prolonged or chronic shortage."<sup>13</sup> Shortage is inherently a relative term—a shortage is less than normal, or perhaps more to the point, less than that which is needed. By this definition, both the normally dry West and even much of the relatively wet East recently experienced drought conditions.<sup>14</sup>

Although Webster's does its best to provide a lay definition of drought, there really is no precise and universally accepted scientific definition of the term.<sup>15</sup> For one reason, because drought is more of a "creeping phenomenon"<sup>16</sup> than other immediately recognizable natural hazards like floods or hurricanes, it is more difficult to pin down.<sup>17</sup> Droughts also vary greatly in the consequences to various activities, so different economic sectors and disciplines developed their own working definitions.<sup>18</sup>

A drought may be acute, occurring within a single season or year, or chronic, stretching over several years. Scientists—though acknowledging that the extreme conditions are deviations from the average—recognize both short and long dry periods as quite normal and expected.<sup>19</sup> Droughts set the lower range of normal or average just as wet years and floods set the upper range.<sup>20</sup> However, most of us tend to forget that extremes are always part of the pattern. Non-scientists often think of the good years as "normal" and any deviation from that as an aberration.

### III. HERE A DROUGHT, THERE A DROUGHT, EVERYWHERE A DROUGHT?

In the summer of 2003, the United States Geological Survey's "U.S. Drought Monitor" showed most of the western United States, from the Great Plains almost to the Pacific, ranging from "abnormally dry" to "severe drought."<sup>21</sup> Abnormally dry conditions also prevailed in parts of the Midwest, Northeast, Alaska, and Hawaii.<sup>22</sup> Four years of below average snowfall in the Rockies wreaked havoc on the Colorado River

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OF DEMOGRAPHIC, ECONOMIC AND VALUE CHANGE IN THE WESTERN UNITED STATES 7 (report to W. WATER POLICY REV. ADVISORY COMM'N 1997). In 1920, 50% of all United States' crops were still grown in the East, but by 1982, more than 66% of the country's crops were grown in the West. WILLIAM ASHWORTH, *NOR ANY DROP TO DRINK* 20 (1982).

13. WEBSTER'S DICTIONARY, *supra* note 9.

14. *See infra* Part III.

15. WILHITE, *supra* note 11, at 2.

16. *Id.*

17. *Id.*

18. *Id.* at 3.

19. *Id.* at 1, 6, 40.

20. KATHLEEN A. MILLER, NAT'L CTR. FOR ATMOSPHERIC RESEARCH, CLIMATE, VARIABILITY, CLIMATE CHANGE, AND WESTERN WATER 1, 10 (report to W. WATER POL'Y REV. ADVISORY COMM'N 1997).

21. Nat'l Drought Mitigation Ctr., *U.S. Drought Monitor* (Sept. 9, 2003), at <http://www.drought.unl.edu/dm/monitor.html/>.

22. *Id.*

reservoirs, which supply water to 25 million people across seven states.<sup>23</sup> Lake Mead dropped seventy-five feet over two years and was only at 63% of capacity last spring; Lake Powell dropped ninety-five feet and was only half full.<sup>24</sup> New Mexico was in the second year of a gubernatorially declared drought emergency.<sup>25</sup> The Phoenix area was facing its worst drought in 100 years.<sup>26</sup>

In fact, large portions of the country experienced officially declared drought status for parts of the last few years.<sup>27</sup> In the spring of 2001, the famously rain-drenched Pacific Northwest found itself in the midst of one of the worst droughts on record; the winter snow pack amounted to only 65% of normal, and by early spring, the Columbia River ran at an unprecedented low flow of 50% of average.<sup>28</sup> Washington's governor declared an official drought emergency on March 14, 2001, saying "[t]his is already the worst drought in our state since 1977, and it's only March . . ."<sup>29</sup> The plight of the Klamath Basin in southern Oregon and northern California that summer, when the Bureau of Reclamation cut off deliveries of irrigation water from the federal Klamath Project to approximately 1400 farmers to save scarce water for two endangered fish species, appeared in the pages of the *New York Times*.<sup>30</sup>

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23. John Ritter, *Vegas Drought May Wither Growth*, USA TODAY, May 30, 2003, at 3A.

24. *Id.*

25. Associated Press (Santa Fe), *Year-Old N.M. Drought Emergency Continues* (June 12, 2003), at

<http://www.ledger-enquirer.com/mld/ledgerenquirer/news/nation/6072974.htm> (last visited Dec. 15, 2003).

26. Charles J. Babbitt, *Drought Created This Nightmare; It Will End With Patience, Wisdom*, ARIZONA REPUBLIC, June 30, 2002, at <http://www.azcentral.com/news/specials/wildfires/0630charles.html> (last visited Dec. 15, 2003).

27. Nat'l Drought Mitigation Ctr., *Drought Impacts in the U.S.*, at <http://www.drought.unl.edu/risk/us/archives/2001/usjul01.htm> (July 8–Aug. 7, 2001); <http://www.drought.unl.edu/risk/us/archives/2002/usjul02.htm> (July 6–Aug. 6, 2002); <http://www.drought.unl.edu/risk/us/archives/2003/usjul03htm> (July 9–Aug. 8, 2003).

28. Mike Lewis, *Locke Declares Drought Emergency*, SEATTLE POST-INTELLIGENCER, Mar. 14, 2001, available at <http://seattlepi.nwsourc.com/local/drought14.shtml>.

29. *Id.* In Oregon, Governor Kitzhaber activated the state's Drought Council for the first time in nearly eight years in anticipation of a severe water shortage. Jeff Mapes, *Kitzhaber Urges Restrained Water Use*, THE OREGONIAN, Mar. 22, 2001, at B5, <http://www.oregonian.com/mainindex.html>.

30. Editorial, *Oregon's Water War*, N.Y. TIMES, July 15, 2001, at 14. By the middle of the summer of 2001, crops were dying on about 200,000 acres of land. *Id.* Senator Gordon Smith unsuccessfully asked Congress to override the Bureau's decision and deliver water, and the farmers resorted to self-help, breaching the Bureau headgates to turn water into the irrigation canals. Tom Detzel, *Senator Loses Bid to Release Water for Parched Farms*, THE OREGONIAN, July 13, 2001, at A1, <http://www.oregonian.com/mainindex.com>; Michael Milstein, *Farmers Defy Feds, Escalate Fight*, THE OREGONIAN, July 14, 2001, at A1, <http://www.oregonian.com/mainindex.com>.

Recently in the East, parts of Florida, Georgia, and Louisiana experienced three or four years of drought,<sup>31</sup> with Florida's 2001 drought its worst in fifty years.<sup>32</sup> Dry conditions in Florida sparked wildfires that closed highways and blanketed areas not far from Disney World with smoke.<sup>33</sup> Dried-up wetlands forced some alligators into residential swimming pools in search of water.<sup>34</sup> Governor Jeb Bush of Florida wrote a letter to his brother, the President, asking the federal government for permission to inject untreated rainwater into groundwater wells to bank the water for future drinking water supplies.<sup>35</sup> Georgia, too, battled wildfires over thousands of acres, and restricted homeowners' water use.<sup>36</sup> The state conducted a "no irrigation" auction in 2001 and paid \$4.5 million to farmers not to irrigate 33,000 acres of land.<sup>37</sup>

What's going on? Are the frequency, severity, and distribution of droughts actually on the increase? Climatologists, who take the long view, point out that drought is a normal and recurrent feature of the climate throughout the United States, particularly in the West.<sup>38</sup> Both seasonal and multi-year droughts occurred with regularity since long before humans began measuring and recording droughts.<sup>39</sup> As population increases (particularly in more arid regions), and the needs and desires for water increase commensurately, human activities and the human economy accordingly become more vulnerable to the effects of drought.<sup>40</sup> Another problem is that record keeping covers a fairly short period of time, and thus we sometimes remain blissfully unaware of longer-term patterns.<sup>41</sup> For instance, although current dry spells are certainly significant from the perspective of human impacts, a 50 or even 100 year period is really not that long when trying to

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31. Patrick Peterson, *Drought Could Worsen This Summer, Climatologist Says*, THE SUN HERALD (Biloxi, Miss.), May 30, 2001, available at <http://nl.newsbank.com/nl-search/we/Archives>; David Stooksbury and Pam Knox, *Drought Expected to Worsen In Georgia*, Georgia State Climatology Office (Apr. 22, 2002), available at <http://georgiafaces.caes.uga.edu/viewtext.cfm?id=1500>; *Expert: La. Suffers 'Moderate' Drought*, THE ADVOCATE (Baton Rouge), May 22, 2001, at 1A.

32. Douglas Jehl, *Florida, Low on Drinking Water, Asks E.P.A. to Waive Safety Rule*, N.Y. TIMES, Apr. 13, 2001, at A1.

33. Patrick Reyna, *Firefighters Battle Blazes Across Drought-Stricken Florida*, ASSOCIATED PRESS, May 20, 2001, <http://associatedpressarchive.com>.

34. Philip Morgan, *Stumbling into Suburbia*, THE TAMPA TRIBUNE, May 8, 2001, at 1, <http://www.TBO.com>.

35. Jehl, *supra* note 32.

36. Rhonda Cook, *South Georgia Fires Burn 10,000 Wooded Acres*, THE ATLANTA JOURNAL-CONSTITUTION, May 27, 2001, at G3; Press Release, Georgia Dep't of Natural Resources, EPD Does Not Change Current Outdoor Watering Restrictions (May 30, 2002), [http://www.state.ga.us/dnr/environ/gaenviron\\_files/drought\\_files/drought\\_fa.pdf](http://www.state.ga.us/dnr/environ/gaenviron_files/drought_files/drought_fa.pdf)

37. Richard Whitt, *Farmers Feel Sting of Water Payoffs*, THE ATLANTA JOURNAL-CONSTITUTION, May 2, 2001, at B1.

38. WILHITE, *supra* note 11, at 6-8.

39. MILLER, *supra* note 20, at 1.

40. WILHITE, *supra* note 11, at 1.

41. MILLER, *supra* note 20, at 8.

discern long-term climatic trends and repeating cycles.<sup>42</sup> The lack of appreciation for the reality of severe recurrent drought is particularly significant in the western United States, where substantial population growth and increase in water-dependent activities occurred in the last few decades, a ridiculously short period of time from a climatological perspective.<sup>43</sup>

As we all learned in grade school, the amount of water on the earth is finite, although it is always changing form as it moves through the hydrologic cycle. Approximately 97.5% of the earth's water at any given time exists in the oceans, too saline for most human purposes.<sup>44</sup> Another 1.8% of the total is tied up in the polar ice caps and glaciers, also unavailable for use.<sup>45</sup> Less than 0.5% is available as freshwater for human use.<sup>46</sup> Even so, total freshwater supply in the continental United States alone amounts to approximately 1400 billion gallons per day, about fourteen times more than our total national consumption.<sup>47</sup> The distribution of the available water supply is highly variable, however, with the eastern United States receiving twenty to sixty inches of annual precipitation on average and most of the West receiving an average of less than ten or twenty inches annually.<sup>48</sup> Of course, an average is just that; variations in any given year can be considerable.

The fastest growing areas are not those with the most plentiful water supply. Most of the fastest growing states are located in the West, with most in the extremely arid intermountain West.<sup>49</sup> Georgia, the eastern state with the highest growth rate, is already experiencing serious water problems, both in terms of overall long-term supply and due to recent severe drought conditions.<sup>50</sup> Furthermore, even in relatively wet areas with plenty of water to meet existing needs up to this point, the demands placed on the finite water supplies are increasing many-fold.<sup>51</sup> Domestic uses and municipal demands, instream flow needs for recreation and ecosystem purposes, water quality problems, and long-neglected Indian tribes all clamor for water.<sup>52</sup>

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42. On the other hand, perhaps Arizona can be forgiven for feeling a bit besieged, since some scientists label the current drought the driest period not just in 50 or 100 years, but in 1400 years, based on studies of growth rings in trees. Patrick O'Driscoll, *Drought Conditions Still Grip West*, USA TODAY, April 28, 2003, at 3A.

43. CASE & ALWARD, *supra* note 12, at 4-5, 7; MILLER, *supra* note 20, at 4-8.

44. A. DAN TARLOCK ET AL., WATER RESOURCE MANAGEMENT 4 (4th ed. 1993).

45. *Id.*

46. *Id.*

47. *Id.*

48. *Id.* at 5.

49. CASE & ALWARD, *supra* note 12, at 4, 29.

50. *Id.* at 29-30; Whitt, *supra* note 37.

51. See, e.g., Editorial, *Water, Water Everywhere*, 10 N.J. LAW: WKLY. NEWSPAPER 814, April 30, 2001, available at WL 4/30/01 NJLNP 6; see generally Jehl, *supra* note 32.

52. See *id.* (amount of water on Earth is fixed; as population grows, shortages will become more frequent and severe); Edgar Sandoval, *DEP Discusses Local Water Woes and Worries*, MORNING CALL (Allentown, Pa.), Apr. 18, 2001, at B3 (Pennsylvania Dep't

To top it all off, predictions of climate change complicate the picture considerably. The scientific community agrees global warming is occurring; the only remaining questions are how much and how fast.<sup>53</sup> The specific impacts on water resources vary greatly from place to place. However, predicted widespread changes in precipitation, evaporation, and runoff will likely cause both more floods and more droughts in many regions, both arid and humid.<sup>54</sup> Global warming presents a special challenge to water management in arid areas, because these regions already cope with a great deal of variability and have very little margin of safety in the water supply.<sup>55</sup> Thus, arid regions are particularly vulnerable to the uncertainties that will intensify with climate change.<sup>56</sup>

Population is growing in the drier regions of the country—both East and West. Consumptive and instream demands on water supplies are growing exponentially. Throw in the monkey wrench of global warming, and the first thing we need to better cope with drought is an attitudinal change. We need to revise what we think of as “normal” to include much more drought. Before discussing current drought responses and how to improve them, the next section reviews the socioeconomic impacts of drought and highlights the magnitude of the challenge.

#### IV. THE IMPACTS OF DROUGHT

The impacts of drought vary greatly among different sectors of water users. Consider the disparate consequences of a water shortage to municipal and domestic water users, industrial users, hydropower producers (and its various customer constituencies), ranchers, irrigators, foresters, the recreating public, and environmental or instream needs.<sup>57</sup> The agricultural sector often experiences the effects of a drought first.<sup>58</sup> Drought increases the chance of fire, and thus also acutely affects both ranchers and foresters. Domestic supplies may be affected fairly quickly if the source of supply is flowing surface water, but when domestic and municipal supplies come from storage facilities or groundwater wells, that sector will experience a somewhat delayed

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of Environmental Protection calls for conservation in face of dramatic increase in water use for household, industry, recreation, and agricultural purposes); see generally Frank Clifford, *Tapped Out? Shortage of Water Looms as One of the World's Most Critical Problems in the Next Century, Authors Say*, L.A. TIMES, Feb. 15, 1996, at B2 (increased worldwide consumption of fresh water); see also WESTERN WATER POLICY REVIEW ADVISORY COMM'N, WATER IN THE WEST: CHALLENGE FOR THE NEW CENTURY 3-45 to 3-46 (1997).

53. MILLER, *supra* note 20, at 12 n.2; see also CLIMATE CHANGE AND U.S. WATER RESOURCES 1-2 (Paul E. Waggoner ed., 1990) (predicting global temperature rise).

54. MILLER, *supra* note 20, at 20.

55. See *id.* at 1, 4-6, 40.

56. *Id.* at 1.

57. See *id.* at 25.

58. WILLIAM E. RIEBSAME, ET AL., DROUGHT AND NATURAL RESOURCES MANAGEMENT IN THE UNITED STATES, IMPACTS AND IMPLICATIONS OF THE 1987-89 DROUGHT 44 (1991); WILHITE, *supra* note 11, at 3.



reaction to decreased precipitation.<sup>59</sup>

Large areas of the United States experienced a severe drought during 1987–1989.<sup>60</sup> According to one report, the 1987–1989 drought created one of the most costly natural disasters in the nation's history.<sup>61</sup> Agricultural relief payments alone totaled over \$7 billion; total losses during just one year of the drought (1988) were estimated at \$39 billion.<sup>62</sup> The drought of 2002, which affected portions of thirty states in the West, Plains, and East, caused damages preliminarily estimated at over \$10 billion; the western fire season that year caused another \$2 billion in damages, in part due to drought.<sup>63</sup> Figures totaled in the billions of dollars for droughts in 2000, 1999, 1998, 1996, and 1993, with a notable portion of those costs occurring in the eastern states.<sup>64</sup>

Loss, like beauty, is in the eye of the beholder. However, most “beholders” probably acknowledge an objective difference between inconveniences caused by drought—such as urban water users restricted in the amount of their household use or in their recreational pursuits—and direct impacts to someone's personal livelihood, such as an individual farmer dependent on water for keeping crops or livestock alive from one day to the next. Of course, an urban water user's recreation may support someone else's livelihood, as the recreation industry is a significant economic sector in and of itself.<sup>65</sup> In other economic sectors, such as agribusiness, hydropower, and manufacturing, water shortages may also affect operations and profits, from moderately to drastically.

But what is absolutely necessary in times of drought? If people do not have water, they die. The same is true for animals and plants. For purposes of drinking, regardless of whether you are animal or plant, water is not fungible with anything else. But for almost every other purpose—except perhaps fire-fighting, which also requires the genuine article—money can usually replace water. In fact, for those animals and plants raised for profit, money can still partially replace

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59. See MILLER, *supra* note 20, at 25–27.

60. RIEBSAME, *supra* note 58, at 1.

61. *Id.* at 43.

62. *Id.* at 1, 44. In comparison Hurricane Hugo produced losses of \$9 billion, while the Loma Prieta earthquake resulted in losses from \$6 to \$10 billion. 6 COMM. ON NATURAL DISASTERS, NAT'L RESEARCH COUNCIL, HURRICANE HUGO 1, 3 (1994); U.S. GEOLOGICAL SURVEY, PROGRESS TOWARD A SAFER FUTURE SINCE THE 1989 LOMA PRIETA EARTHQUAKE 1 (1999). Another difference between droughts and other natural disasters is that droughts do not normally produce offsetting economic benefits, such as the reconstruction booms that follow floods, fires, storms, and earthquakes.

63. TOM ROSS & NEAL LOTT, NAT'L CLIMATIC DATA CTR., U.S. DEP'T OF COMMERCE, BILLION DOLLAR U.S. WEATHER DISASTERS: 1980–2000 (2003), available at <http://www.ncdc.noaa.gov/oa/pub/data/special/billionz-2003.pdf> (Aug. 1, 2003).

64. *Id.*

65. Associated Press, *Deadlock in Colorado Supreme Court Favors Kayakers in Water Rights Dispute*, SHAWNEE NEWS-STAR, May 20, 2003 (noting that rafting and other river recreation generated \$125 million in Colorado in 2001), available at [http://www.news-star.com/stories/052003/New\\_26.shtml](http://www.news-star.com/stories/052003/New_26.shtml).

water in the sense that crops can be allowed to die, and crop losses can then be reimbursed.<sup>66</sup> In this country, our food supply is not only national but even global, and is well able to withstand even severe regional droughts.

With animals raised as livestock, reimbursement is a little trickier. Under some drought conditions, some ranchers could sell livestock, perhaps at a loss, and then receive loss reimbursement instead of water. The availability of this option depends on a number of factors, including whether the livestock are raised for sale or are normally kept for a longer time, whether it is possible to gather the livestock and move the animals to market, whether a market even exists at the relevant time, and many other variables particular to each individual operation. Even accounting for all of these issues, the only thing truly "needed" in times of drought is water to satisfy the essential needs of human survival, and some plants and animals as well; everything else is really a matter of policy choice, loss allocation, and damage reimbursement.

Drought can also produce harsh impacts to plants and animals that exist in natural ecosystems, rather than as assets of farming and ranching, but wildlife and habitat are not directly represented in the human economy. Nor do most states' water laws leave water for aquatic ecosystems and other wildlife habitat well-protected.<sup>67</sup> Therefore, while emergency means may exist for providing water, or for reimbursing the loss of animals and crops that are part of the economy, impacts to natural vegetation and wildlife can be severe, unprotected, and uncompensated.<sup>68</sup> The next section explores in more detail how current law handles drought impacts.

## V. CURRENT LEGAL AND POLICY RESPONSES TO DROUGHT

An examination of current drought responses demonstrates the existing system as a hodgepodge of approaches, primarily consisting of crisis management and financial relief. Existing law, policy, and practice seek to provide water during periods of drought, not only for crucial human survival purposes, but for many other arguably less critical purposes as well. When it is not possible to provide actual water, the approach is to provide loss reimbursement in the form of money. The approach is clearly reactive, rather than pro-active. The law treats droughts as natural disasters, like floods or hurricanes, and applies crisis management. After the crisis is over, business as usual returns, and water users are usually no more ready to cope with the

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66. At least this is true for annual crops. In the case of perennial crops that are not replanted every year, such as nurseries, the damage done by lack of water can be long-term or permanent, and losses may also be correspondingly long-term.

67. See, e.g., Janet C. Neuman, *Implementing Instream Flow Protections in Prior Appropriations Systems: Continuing Challenges*, 7 RIVERS 345 (2000); see also Cynthia F. Covell, *A Survey of State Instream Flow Programs in the Western United States*, 1 U. DENV. WATER L. REV. 177, 180-88 (1998) (reviewing states providing such protection).

68. Neuman, *supra* note 67, at 345.

next drought than with the current drought, even though the next drought is inevitable and may come as soon as the next year. As flood policy has allowed and even encouraged rebuilding in the flood plains, thereby assuring that flood damage will occur again and again, our drought response policy assures that drought disasters continue to recur because water users return to the same behavior and attitudes as before.

For example, Oregon law is fairly representative of western prior appropriation states in its drought management provisions. In Oregon (as with most states in the West), even in so-called “normal” years, diminishing water supplies by middle or late summer often fail to serve all water rights holders. During those times, the prior appropriation doctrine itself allocates water by cutting off junior users one by one until enough water exists for the most senior users.<sup>69</sup> However, if the situation progresses beyond the usual summer and fall low flows, the governor has the authority to declare “that a severe, continuing drought exists or is likely to exist.”<sup>70</sup> Once this occurs, a number of special powers come into play. For example, the governor may order state agencies and local governments to implement water conservation or curtailment plans.<sup>71</sup> The Water Resources Commission may suspend normal administrative review procedures to issue temporary permits for emergency use or exchange of water, to approve changes in existing water right terms, and to more quickly permit new wells.<sup>72</sup> The Commission may also override existing priorities to grant use preferences to those holding rights for human consumption or stock watering use.<sup>73</sup> State and local governments, public corporations, and other water rights holders may buy or otherwise obtain an agreement to use any existing water right to replace another water right unavailable due to the drought.<sup>74</sup>

Administrative rules further detail the requirements for obtaining the emergency permits. Significantly, if the changes allowed during

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69. In a riparian doctrine state, in the event of a temporary water shortage, cutbacks are made on a pro rata basis by all water users.

70. OR. REV. STAT. §§ 536.720, 536.740 (1999). The Water Availability Committee of Oregon (“WACO”), a group of water experts from state and federal agencies, meets regularly early in years when conditions such as precipitation, snow pack, and weather forecasts indicate the possibility of imminent drought. Drought Watch, Or. Water Res. Dep’t, *Water Availability Committee of Oregon*, [http://www.wrd.state.or.us/drought\\_watch/waco.shtml](http://www.wrd.state.or.us/drought_watch/waco.shtml). WACO compiles its information in a report to Oregon’s Emergency Management Office (“OEM”). *Id.* OEM then makes a recommendation to the Drought Council, which in turn advises the governor of the drought. *Id.* Upon receiving requests from individual counties, the governor then may declare a state of emergency due to drought, pursuant to section 401.055 of the Oregon Revised Statutes, on a county-by-county basis. Thus, a drought emergency declaration requires federal, state and local coordination.

71. *Id.* § 536.720(2)(a).

72. *Id.* §§ 536.750(1)(a)–(f).

73. *Id.* § 536.750(1)(c).

74. *Id.* § 536.770(1)(b). The acquiring user can thus override the place of use and type of use in the acquired water right.

the drought result in injury to other water right holders, the Commission may revoke permits or may require mitigation.<sup>75</sup> The rules also require that scenic waterway flows and minimum streamflows receive protection through permit conditions.<sup>76</sup> The rules further authorize temporary leases to transfer water to other places or purposes of use, including instream flows, without the normal process and requirements.<sup>77</sup> However, both statutes and rules state very clearly that all of these special processes and authority last only while the drought continues, and terminate when the governor declares the drought “over.”<sup>78</sup>

Thus, Oregon’s approach, which is fairly typical, clearly manages drought as a temporary crisis, justifying a temporary suspension of the usual rules. The overall goal of these statutes is simply to make it easier for users to find water in a drought—by drilling a new well, seeking a temporary use permit from a different source, or transferring water from one place or use to another. For the most part, the State’s role is reactive, to facilitate transferring water to the users who come forward. The normal procedural reviews, designed to determine impacts of the activity, are eliminated. The State may only proactively acquire water from willing water rights holders in order to dedicate the water to a particular beneficial use, and grant use preferences for human consumption or stock watering rights, even if it conflicts with prior appropriation.

Even the State’s authority to require conservation and curtailment of water use is carefully circumscribed and limited to the duration of the drought.<sup>79</sup> Once the Water Resources Commission has found a drought likely to occur, the Commission may order individual state agencies and political subdivisions to submit water conservation and/or curtailment plans within thirty days, specifying efforts to curb water use for nonessential public purposes, and to promote conservation, prevention of waste, salvage and reuse of water.<sup>80</sup> However, the statute explicitly declares, “it is the intent of the Legislative Assembly that [these] curtailments, adjustments, allocations, and regulations . . . be continued only so long as a declaration by the Governor of the existence of severe, continuing

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75. OR. ADMIN. R. 690-019-0040(5)(3) (2003), [http://arcweb.sos.state.or.us/rules/OARS\\_600/OAR\\_690/690\\_019.html](http://arcweb.sos.state.or.us/rules/OARS_600/OAR_690/690_019.html).

76. *Id.* 690-019-0040(5)(a). Technically, “minimum streamflows” no longer exist under Oregon law, but all such flows were converted to instream water rights after passage of the 1987 instream water rights law. OR. REV. STAT. § 537.346(1) (2001).

77. *Id.* 690-019-0055(1), -0058(1).

78. OR. REV. STAT. § 536.720(4) (2001); OR. ADMIN. R. 690-019-0030(1)-(2), -0040(5)(d), -0055(4), -0058(4), -0059(6) (2003). The Oregon Drought Council, upon recommendation from the Water Availability Committee, advises the Governor as to when the drought is over. *See supra* note 70.

79. OR. ADMIN. R. 690-019-0010(2) (2003).

80. OR. REV. STAT. § 536.780 (2001). This authority of the Commission is in addition to the governor’s authority to order such plans under section 536.720 of the Oregon Revised Statutes.

drought is in effect.”<sup>81</sup>

California law illustrates another approach. Rather than waiting for a drought declaration to require conservation plans from municipalities and water suppliers, California requires every “urban water supplier” to prepare a water management plan that includes a water shortage contingency plan, complete with draft ordinances to implement it.<sup>82</sup> Such a plan is a prerequisite to receiving drought assistance from the State.<sup>83</sup> Even when a shortage plan is not in effect, the statute requires considerable ongoing conservation efforts.<sup>84</sup> California also directly authorizes local water suppliers to declare water shortage emergencies and then take action accordingly, such as restricting consumption in order to conserve water for domestic use, sanitation, and fire protection, and denying new applications for water service.<sup>85</sup> Again, these special restrictions remain in force only during the emergency, until the water supply is replenished or augmented.<sup>86</sup>

During the severe drought of the late 1980s and early 1990s, California also experimented with a drought water bank, which is a state-run “brokerage” designed to enable and encourage the voluntary transfer of water rights, primarily from agricultural users to municipal suppliers.<sup>87</sup> Briefly, the water bank allowed parties to “deposit” water by selling it to the State; that water was then available for “withdrawal” by other parties through a purchase from the State.<sup>88</sup> The State set the price of deposits to the water bank at \$125 an acre-foot, and the price of withdrawals at \$175 an acre-foot.<sup>89</sup> The major purpose of the bank was to encourage farmers, who hold the majority of the state’s water rights, not to irrigate and instead make water available to municipal users, who hold often-junior rights to a much smaller amount of the state’s water, to meet their needs during the drought.<sup>90</sup> Other goals, however, included acquiring water to meet water quality standards (diluting salinity in the Sacramento–San Joaquin River Delta),<sup>91</sup> providing instream flows for fish and wildlife, and acquiring water for carryover storage for the next year. The general consensus is that the drought water bank was a success, particularly in the second year of its

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81. *Id.* § 536.720(4).

82. CAL. WATER CODE §§ 10620, 10632(h) (West 1992).

83. *Id.* § 10656.

84. *Id.* §§ 10630, 10631.

85. *Id.* §§ 350, 353, 31026 (West 1971 & 1984).

86. *Id.* § 355 (West 1971).

87. Brian E. Gray, *The Market and the Community: Lessons from California’s Drought Water Bank*, 1 WEST-NORTHWEST 17, 17, 20–21 (1994); Kevin M. O’Brien & Robert R. Gunning, *Water Marketing in California Revisited: The Legacy of the 1987–92 Drought*, 25 PAC. L.J. 1053, 1075–76 (1994). Although a complete discussion of the drought water bank is beyond the scope of this article, several good analyses—including the preceding two articles—exist of the bank and its successes and failures.

88. Gray, *supra* note 87, at 20.

89. *Id.* at 21, 23.

90. *See id.* at 17, 22.

91. O’Brien & Gunning, *supra* note 87, at 1054–56, 1060.

operation after the implementation of some adjustments and amendments.<sup>92</sup> The bank facilitated expedited transfers of water from those who could manage without water during the drought (and take cash in exchange) to those who needed additional supplies.<sup>93</sup>

Idaho law also authorizes a water bank for facilitating temporary water transfers.<sup>94</sup> In Idaho, the bank is primarily designed to provide flexibility to irrigators, by allowing irrigators who do not need water in a particular year or years to provide water to others who need water without forfeiting their water rights.<sup>95</sup> From 1992 to 2005, the Department of Water Resources may also authorize the use of the water bank to provide instream flows for salmon migration in the Snake River.<sup>96</sup> The bank operates regardless of any official drought or shortage declaration.

Other drought-inspired temporary water markets recently sprang up as well. As previously mentioned, the State of Georgia paid farmers not to irrigate.<sup>97</sup> In the Pacific Northwest, during the spring of 2001, the Bonneville Power Administration ("BPA") offered \$30 million to Columbia Basin farmers not to irrigate over 90,000 acres of land in order to save both water and electricity.<sup>98</sup> Due to the drought, coupled with California's energy problems at that time, BPA needed every bit of hydroelectric power it could generate.<sup>99</sup> Buying back electricity from farmers who would have used it to pump groundwater or surface water, as well as keeping as much water as possible in the rivers to turn the turbines, resulted in some fairly hefty payments.

The federal government also gets involved in drought response. In fact, as many as forty-seven federal programs exist with some type of drought-related relief, as well as eighty drought-related programs overall, scattered among numerous agencies and departments.<sup>100</sup> These programs are not well coordinated or

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92. See, e.g., Gray, *supra* note 87, at 24.

93. Gray, *supra* note 87, at 21-24.

94. IDAHO CODE § 42-1761 (Michie 2003).

95. The water bank is not expressly limited to use by irrigators, but that has been its primary focus. Idaho Water Res. Bd., *Water Supply Bank* (referencing irrigators and canal companies), <http://www.idwr.state.id.us/waterboard/water%20bank/default.htm> (last visited Nov. 20, 2003).

96. IDAHO CODE § 42-1763B. Interestingly, the statute also declares that "[n]othing in this section shall be construed to alter in any way the existing contractual obligations of the U.S. bureau of reclamation or to constitute a finding by the legislature that the rental or use of water storage for augmentation of flows for salmon migration is a beneficial use of water, that it is in the public interest, or whether such use injures existing water rights." § 42-1763B(4).

97. See Whitt, *supra* note 37.

98. Janet Neuman, Editor's Note, *Turning to the Market in a Crisis: Winners and Losers*, BIG RIVER NEWS, Summer 2001, at 2, available at <http://www.lclark.edu/dept/water/objects/brn73.pdf>.

99. *Id.*

100. NAT'L DROUGHT POLICY COMM'N, PREPARING FOR DROUGHT IN THE 21ST CENTURY 2-3, 5 (2000), available at <http://www.fsa.usda.gov/drought/finalreport/execreport/execdownload.htm>.

integrated, however.<sup>101</sup> Most of the federal programs emphasize financial reimbursement for drought-caused losses, either in the form of after-the-fact emergency relief payments or through subsidized insurance programs, such as various federal crop insurance programs.<sup>102</sup> Although there is currently some movement at the federal level toward more emphasis on risk management and drought preparedness, rather than crisis management, this new thrust is not yet fully codified in federal law or programs.<sup>103</sup>

Current laws, both state and federal, thus embody certain clear policy choices. Droughts are treated as natural disasters requiring emergency response, not as normal and regular occurrences integrated into ongoing water management. Understandably, human consumption is placed at the top of the list of essential water uses, as are sanitation and fire protection. However, economic water uses are not far behind and will be accommodated with water or drought relief whenever possible, without any overall cost-benefit analysis. Procedural reviews are readily dispensed with as impediments to meeting water users' immediate needs.

How adequate is the existing approach for dealing with future droughts—droughts of increasing severity, frequency, and duration, exacerbated by the additional uncertainties of projected climate change? Existing legal tools for drought management are band-aids only. Much more preventative work is needed to address the systemic issue of improving resiliency. New legal tools are needed, or at least some of the old tools need sharpening in order to deal with the drought problem. Following are a number of suggestions to improve the system's resiliency overall, from big-picture changes to incremental changes made to existing laws to improve coping with drought.

## VI. DROUGHT PROOFING THE LAW: MOVING FROM CRISIS MANAGEMENT TO RISK MANAGEMENT

As I mentioned earlier, we must revise our view of normal to include many more droughts. Unless both Congress and state legislatures plan to appropriate large sums of money for the emergency response approach to drought crises, and suspend the rules on a regular basis, we also need to adjust our legal drought response as well. We need less crisis management and more risk management. We need to build in more resiliency and flexibility and

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101. *Id.* at 6.

102. *See, e.g.*, 7 U.S.C. §§ 1471a(a), 1508(a)(1), 7333(a)(1) (2000).

103. *See generally* NAT'L DROUGHT POLICY COMM'N, *supra* note 100; National Drought Preparedness Act of 2002, S. 2528, 107th Cong. (2002) (potentially establishing a National Drought Council with FEMA, to improve national drought preparedness, mitigation, and response efforts). The bill was introduced in the 107th Congress and sent to the Senate Committee on Environment and Public Works, which has yet to act on it. While this proactive bill languished in committee, the Senate passed the Small Business Drought Relief Act of 2003, S. 318, 108th Cong. (2003), which continues the reactive approach by expanding federal financial assistance to small businesses that suffered substantial economic harm from drought.

decrease our vulnerability to the inevitable droughts, in effect “drought proofing” the system. What we are really trying to drought proof is the economy and the livelihoods of those who are vulnerable to the effects of drought. We need to drought proof and reform the law in order to cushion the economy.

To start, in order to truly improve the resilience of the system, both eastern and western states need a much greater appreciation of water as a precious and finite resource. Water managers must change their view of the big picture and work with, instead of against, the available water in each region.

Western states, in particular, must acknowledge the limits of the natural environment. Much of the West is effectively desert. If the West is to support a viable and sustainable agricultural industry, agriculture must become much more desert- and drought-friendly than it has been in most places. Does it really make sense, or cents, to produce 66% of the nation’s crops in the most arid parts of the country, particularly when those same areas experience the fastest population growth and suffer from severe species degradation?<sup>104</sup> Although it is sacrilege to ask, would we be better off, as a nation, investing in redeveloping the eastern and midwestern agricultural industry rather than continuing to subsidize growing cotton and cows in the desert?<sup>105</sup> If policy makers decide to continue subsidizing western agriculture, they must consider what is “best for the West” in terms of crops and agricultural practices, such as dry-land hay farming, high-value produce, or vineyards that take advantage of the natural climate.

At the very least, American agriculture should become a model of conservation and efficiency; government spending to that end would be a wise investment. In addition to emergency relief payments, the federal government sponsors and funds millions of dollars of agricultural research annually. Perhaps the federal government should target a great deal more of this research money to developing low-water crops and practices. Indeed, perhaps federal spending ought to be invested in weaning communities away from desert agriculture and toward more sustainable and diversified economies.

Such large-scale changes are not likely to come overnight, if at all. Therefore, states should develop comprehensive drought management plans as a starting point, if plans are not already in place. The National Drought Mitigation Center publishes a number of planning aids and protocols, including a detailed description of a ten-step drought planning process.<sup>106</sup> The planning guidelines encourage

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104. Ashworth, *supra* note 12, at 19–20.

105. See Michael Lind, *The New Continental Divide*, THE ATLANTIC MONTHLY, Jan./Feb. 2003, at 86, 87–88 (suggesting cutting off western irrigation subsidies to drive irrigated agriculture back “eastward to states like Illinois and Iowa”), available at <http://www.theatlantic.com/issues/2003/01/lind.htm>.

106. Donald A. Wilhite et al., *The Basics of Drought Planning: A 10-Step Process*, at [www.drought.unl.edu/plan/handbook/process.htm](http://www.drought.unl.edu/plan/handbook/process.htm) (last visited Nov. 21, 2003).



states to identify the geographic areas and economic sectors most vulnerable to future droughts, and to outline specific actions before a drought occurs in order to help reduce the risk.<sup>107</sup> The only action examples provided, however, identify new or alternative sources of water that might increase resiliency to subsequent droughts.<sup>108</sup> Significant new water development is not possible or feasible in many locations.

Furthermore, the planning protocols seem to assume the status quo in local economies. Of course, it certainly is not the job of the National Drought Mitigation Center to rethink existing patterns and practices of water use, but nothing in the suggested planning process even encourages the states to ask hard questions about whether the degree of water dependence in local economies is appropriate given the available water supply. The type of planning suggested is a vast improvement over no plan, but is essentially “new and improved” crisis management rather than true drought preparedness. A state would do well to attempt a more ambitious drought plan that takes significant steps towards greater sustainability in water use.

Another big-picture item needing further development is technology and data gathering to support drought planning and management. Water managers—from individual farmers, to state water resources department officials, to federal water facilities managers—need to obtain excellent data (both real-time and predictive) about water availability, and must possess the ability to manipulate that data easily to determine the impact of their decisions and activities. The problem is not a lack of data; the technology of drought prediction is becoming more and more sophisticated all the time. The problem, instead, is one of data coordination, dissemination, and responsibility.<sup>109</sup> Clear, useable data needs to be available at all levels of decision making on a timely basis, and state management officials need clearly defined responsibilities for responding to early drought warning signals.

Comprehensive planning and good data are still only the beginning, however. Water managers still need to do more to eliminate bailout as the primary drought policy. What else would help integrate the reality of regular and recurrent drought into ongoing water management? Some incremental changes in current law and practice are also possible. For instance, many states engage in some kind of water availability analysis as part of the decision to grant water rights. These analyses should be refined to reflect the regular occurrence of drought, and to build in cushions and reserves, rather than handing out every drop to private users based on what might be available only a portion of the time. When states set minimum streamflows and instream water rights, drought years need consideration as well.

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107. *Id.* (Step 10: Post-Drought Evaluation).

108. *Id.* (Step 5: Develop Organizational Structure and Prepare Drought Plan).

109. RIEBSAME, *supra* note 58, at 3.

Water rights should thus come with some kind of a warning label, noting that nothing guarantees water availability. Water users must clearly understand the risks they are taking in order to protect themselves with insurance, if available, or with contingency plans and agreements for alternate water sources or other coverage, when a drought does in fact materialize. This seems like a fair and easy proposition, and is certainly consistent with the prior appropriation doctrine itself. However, the difficulty in assigning risk to water users and then making it stick was illustrated in the state of Washington during a recent drought.<sup>110</sup> Since 1980, certain new water rights issued in Washington were designated “interruptible” rights, because the rights were subject to minimum streamflows.<sup>111</sup> The rights’ terms specified that if streamflows fell below a certain level, the rights would not be satisfied.<sup>112</sup> Yet, when that very thing happened in the spring of 2001, the State bent over backwards to avoid cutting off the interruptible rights.<sup>113</sup> If the State assumed the risk in any event, then what was the point of purportedly assigning the risk to the water rights holders in the explicit terms of the water right? This is another example of elevating emergency relief to be the primary policy.

Federal and state water managers should build in cost and pricing data to foster rational decisions about water use (and land use), both in and out of drought. Water should be priced like the scarce, precious, and irreplaceable resource it is, instead of treating water as a free good available to all private users for their own benefit. If the idea of putting a price on a good on which we all depend for survival is too abhorrent, then water should be treated like a true public resource, available for loan to private parties, but not for exclusive private ownership. We simply cannot continue to encourage overuse of water with our pricing policies, especially in the arid regions, and expect to appreciate and plan for scarcity.

Other incremental changes might involve simply institutionalizing some of the accepted drought responses on an ongoing basis. For instance, why wait until a drought is declared before requiring conservation plans of water suppliers? Tiered conservation plans for

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110. *Despite Drought, 300 Irrigators Will Get Water*, THE COLUMBIAN (Vancouver), Apr. 6, 2001, at C2.

111. *Id.*

112. *Id.*; Associated Press, *Drought 2001: Water Supply Cut Off Early for Some Users*, COLUMBIAN, May 15, 2001.

113. *See id.* The State Department of Ecology modified the minimum flow requirement, and also scrambled to find substitute water for the interruptible rights holders by purchasing water with state funds from other water rights holders. Many of the interruptible rights holders are nursery growers and orchardists, who could suffer long-term damage from lack of water, so their plight was compelling. Erik Robinson, *Irrigators to Get Water Break, Relaxing Rules Will Let East-Side Farmers Use River Longer*, COLUMBIAN, Mar. 30, 2001, at A1; *see also* Mike Lee, *Washington, Idaho Farmers Mull Offers for Land Purchase by Energy Firms*, TRI-CITY HERALD (Washington), Apr. 29, 2001 (explaining that growers give water to perennials like vineyards and orchards first because they are harder to reestablish). But the state seemed all too willing to completely ignore the very terms of the water rights and shift immediately to a bailout approach.

so-called normal years as well as for moderate and severe droughts, and contingency plans for coping with drastic reductions in available water supply, should be required of all water suppliers and other large water users. Such plans should be required of the sectors most vulnerable to drought as well. States without conserved water statutes allowing water users to save water without forfeiting their rights, should adopt them. Conserved water statutes reward people for conserving and provide the users, the state, and the streams with some cushion for dry years.<sup>114</sup>

Another way to “mainstream” emergency responses is to create ongoing authority for a drought water bank or other state-run brokerage system of some sort, similar to the Idaho program and the California water bank of the early 1990s.<sup>115</sup> In California, an unusual situation exists, because there is a statewide water delivery infrastructure that can move water hundreds of miles through the state, and thus a statewide bank can actually function. Several other states have at least some available infrastructure that could be used to facilitate a smaller-scale brokerage, and those states without an infrastructure could still provide basin-by-basin clearinghouse and brokerage services. These types of water markets could exist all the time, even if there was little activity in normal years, so the brokerage would be ready before the crisis period of a severe drought. Even if the support did not exist for an ongoing brokerage, if the legal framework were in place, with specific triggering mechanisms, the framework could spring into action when necessary. For instance, predictions of lack of snowpack or reduced rainfall for an upcoming irrigation season could trigger the activation of water bank operations, statewide or in smaller localities, setting in motion a series of dry year lease transactions or other short-term transactions well in advance of a crisis. Furthermore, since emergency relief and compensation probably will continue to play a role in drought response, the programs and terms should be unified and coordinated, with clear eligibility standards, central points of contact, uniform terms, streamlined paperwork, and realistic timelines.

In order to make comprehensive drought planning, conservation, and new pricing policies effective, all water use needs measuring and monitoring. Because the need to measure water use is such a basic and obvious point, it is hard to believe measuring is still a political hot potato. Again, government funding to overcome this resistance would probably be a sound investment.

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114. In this regard, increased federal funding for conservation is promising. See Press Release, U.S. Dep't of Interior & Agric., Initiative Will Help Agriculture Producers, Communities Hit by Severe Water Shortages (June 5, 2003) (describing \$60 million of funding), <http://www.doi.gov/news/030605b.htm>; but see Mark Cromer, *Lawyers Debate Land Use*, SAN FRANCISCO DAILY JOURNAL, Feb. 13, 2003.

115. See *supra* Section V.

Although I recognized earlier that new water development is not always feasible, an enlightened storage policy is certainly part of improved drought resiliency. Enlightened storage means low-tech, localized storage to the greatest extent possible. Aquifer storage and recovery programs show promise, though proceeding with caution is certainly important. Other small, off-stream storage projects designed to limit evaporation and leakage may also help provide drought buffers, particularly for smaller water users. Flexible, back-up storage becomes even more important as efficiency improves, because the tighter the efficiency, the less slack available in times of shortage.

In summary, we should approach our water situation like a conservative bank or financial institution. We need sound investments, lots of reserves, and a rainy-day (or not, in this case) contingency fund.

## VII. CONCLUSION

Droughts are normal. In fact, more drought in the future is likely. We need to manage our water resources with that reality in mind. That means expecting and planning for drought; decreasing our water vulnerability as much as possible ahead of time; recognizing and readying ourselves for a drought when it is coming; and responding with as much flexibility as possible, allowing water to move freely to essential and valuable uses, while maintaining an environmental baseline of water in place. Incremental changes in current laws can help prepare the system to respond to the next drought, but only a major attitudinal overhaul and comprehensive drought planning will begin to reduce drought's catastrophic losses.