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Balancing Compassion And Risk In Climate Adaptation: U.S. Water, Drought, And Agricultural Law

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BALANCING COMPASSION AND RISK IN CLIMATE ADAPTATION: U.S. WATER, DROUGHT, AND AGRICULTURAL LAW

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Abstract

It is inevitable that the world will experience a significant amount of global warming before efforts to mitigate the buildup of greenhouse gases (GHGs) in the atmosphere can even begin to succeed. Therefore, adaptation to climate change impacts, as well as mitigation, will be necessary to deal with climate disruption. In designing climate change adaptation efforts, a looming issue is how to balance the need and compassionate impulse to provide financial and other relief to victims of climate disruption impacts with the equally compelling need to reduce the overall risk of those impacts. U.S. water, drought, and agricultural law and policy provide a good example of how past disaster relief efforts have sought to compensate drought victims or to insulate them against the effects of drought, but in the process have encouraged behavior that increases long-term risk and vulnerability. For example, past and ongoing water and agricultural law and policy encourage production of crops with high water demand and with inefficient irrigation methods, even in arid regions, and fail to provide significant incentives for sustainable water use.

In the long run, a more "compassionate" approach, particularly as a strategy for climate change adaptation, is to implement systemic policies to reduce vulnerability to drought and other climate-induced disasters by increasing the sustainability of various economic sectors in advance. For example, drought should be defined such that governmental relief is available only for impacts that are beyond the range of reasonable predictability; and drought relief should be conditioned on actions to use water more sustainably, and thereby to reduce drought vulnerability. Similarly, agricultural policy should provide incentives to shift production, particularly of water-intensive crops, to regions with increasing, rather than decreasing, water supply. These efforts to balance compassion and risk will become increasingly important as drought and other impacts of climate disruption become more frequent and more severe.

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INTRODUCTION

The prevailing consensus among climate scientists is that the world is now "committed" to a significant amount of global warming before efforts to reverse the buildup of greenhouse gases (GHGs) in the atmosphere can even begin to succeed.[1] The magnitude, timing, and distribution of expected warming remains uncertain and depends on future political decisions about climate change mitigation, as well as the inherent uncertainty in our ability to predict future climatic conditions, given available modeling and assessment methods. Current model projections, however, suggest that even the lowest projected levels of warming will generate significant disruption in a wide range of physical conditions around the globe and that the highest levels of warming could cause human and environmental impacts of catastrophic proportions, at least in many regions.[2]

Given these realities, it is increasingly clear that adaptation, as well as mitigation, will be necessary to deal with climate disruption.[3] In the case of adaptation, a looming issue is how to balance the likely need and compassionate impulse to provide financial and other relief to victims of climate disruption impacts with the equally compelling need to reduce the overall risk of those impacts. Those two goals, however, are not always compatible or consistent.

Even absent climate change, disaster relief is often controversial if it encourages behavior that increases long-term risk. For example, compensating property owners in flood- or storm-prone regions may encourage construction in those areas, thus increasing societal risk.[4]

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1. NAT'L RES. COUNCIL, ADAPTING TO THE IMPACTS OF CLIMATE CHANGE 17 (2010) (noting that impacts of climate change are already being felt in the United States and that future impacts are unavoidable); *see also* V. Ramanathan & Y. Feng, *On Avoiding Dangerous Anthropogenic Interference with the Climate System: Formidable Challenges Ahead*, 105 PROC. NAT'L ACAD. SCI. 14,245–46 (2008) (estimating committed warming of 2.4°C even if greenhouse gas concentrations are held to 2005 levels); Susan Solomon et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT'L ACAD. SCI. 1704, 1709 (2009).

2. *See* UNITED NATIONS ENV'T PROGRAMME, CLIMATE CHANGE SCIENCE COMPENDIUM 2009, at 8 (Catherine P. McMullen & Jason Jabbour eds., 2009) [hereinafter CLIMATE CHANGE SCIENCE COMPENDIUM] (identifying inevitable commitment to ocean acidification, sea level rise, glacier loss, changes in the hydrological cycle, ecosystem destruction, and species extinction given current levels of change, and more severe effects absent effective and timely mitigation).

3. *See generally* Holly Doremus & Michael Hanemann, *The Challenges of Dymanic Water Management in the American West*, 26 UCLA J. ENVTL L. & POL'Y 55, 56 (2008); J.B. Ruhl, *Climate Change Adaptation and the Structural Transformation of Environmental Law*, 40 ENVTL. L. 363 (2010); A. Dan Tarlock, *Now Think Again About Adaptation*, 9 ARIZ. J. INT'L & COMP. L. 169 (1992); Matthew F. Zinn, *Adapating to Climate Change: Environmental Law in a Warmer World*, 34 ECOL. L.Q. 61 (2007).

4. *See* James M. Wright & Don L. Porter, *Floodplain Management and Natural Systems*, *in* WATER RESOURCES ADMINISTRATION IN THE UNITED STATES: POLICY, PRACTICE AND

Likewise, subsidized drought relief programs might encourage farmers to engage in riskier agricultural practices—such as growing water-intensive crops in arid regions or using inefficient irrigation methods—because the promise of public relief and subsidized water reduces or eliminates incentives for farmers to internalize those risks in their business decisions. As a result, drought relief policy might impede more sustainable agricultural practices and policies, including policies designed to match agricultural practices to local environmental conditions. That perverse feedback can render the community even more vulnerable to future drought.

This balance between compassion, risk allocation, and risk reduction in disaster relief policy will become even more important if adverse effects of climate disruption materialize as predicted.[5] The compassionate response will be to compensate victims for changes in local conditions caused by global economic forces that are beyond their control. If relief allows those victims to continue practices that render them vulnerable, however, those policies will increase long-term risks. Moreover, vulnerability increases with the frequency of the event, decreasing the recovery interval between disasters.[6] The result will likely be a vicious cycle of relief and increased risk. Given the likelihood of this scenario, perhaps a more "compassionate" approach is to implement systemic policies to reduce vulnerability to climate-induced disasters by increasing the sustainability of various economic sectors in advance.

Although the same analysis could be performed for other changes expected due to climate disruption (such as sea level rise or increased flooding), drought and agricultural policy provides one good model for analysis of this concept. First, increased incidence and severity of drought are among the most serious expected climate change impacts.[7]

EMERGING ISSUES 142, 143 (Martin Reuss ed., 1993) (noting that new floodplain development continued after adoption of National Flood Insurance Program (NFIP)). The Federal Emergency Management Agency (FEMA) recently solicited public input on reforms to address ongoing concerns with the NFIP. *See* Federal Emergency Management Agency: Public Meetings of National Flood Insurance Program (NFIP) Reform Effort, 75 Fed. Reg. 69,096, 69,096 (Nov. 10, 2010).

5. Although it is difficult to trace any given flood, drought, or other hydrological phenomenon to global average changes in climate, some scientists suggest that climate catastrophes are already increasing due to climate disruption. *See, e.g.*, Justin Gillis, *Scientists Perplexed by Weird Weather Patterns*, SEATTLE TIMES (Jan. 23, 2011), http://seattletimes.nwsource.com/html/nationworld/2014020916_weather24.html.

6. *See infra* Section I.B.

7. *See, e.g.*, LUIS SANTOS PEREIRA ET AL., COPING WITH WATER SCARCITY: ADDRESSING THE CHALLENGES 26–27 (2009); Syukuro Manabe et al., *Simulated Long-Term Changes in River Discharge and Soil Moisture Due to Global Warming*, 49 HYDROLOGICAL SCI. 625, 626 (2004); Guiling Wang, *Agricultural Drought in a Future Climate: Results from Fifteen Global Climate Models Participating in the IPCC Fourth Assessment*, 25 CLIMATE DYNAMICS 739, 739–40

Second, past drought relief policies have faced similar tensions in balancing compassion and risk. As is true with respect to many kinds of disasters, the modern governmental response to drought has been driven by the desire to compensate victims for harm caused by unpredictable changes in natural conditions through financial aid, free or subsidized water, or relief from regulations or other legal requirements. Although drought relief is the product of a range of political, economic, and other factors,[8] compassion is arguably one dominant motivating force. We do not like to see people and their livelihoods suffer, especially for factors that are beyond their control and for events that are relatively rare and unpredictable. Moreover, when farmers—arguably the most frequent victims of drought—bear the economic risk of uncertainty to produce essential products, it seems equitable to distribute those risks across society.

Another legitimate goal of drought policy, however, is long-term risk reduction. For example, policies could be designed to promote drought-resistant crops or crop varieties, encourage more efficient irrigation methods, and encourage farmers to relocate from areas expected to face increasing aridity to those likely to experience more favorable conditions. Rather than devoting scarce financial and other resources to reactive policies that are likely to increase long-term risks, a sustainability-based approach to disaster prevention will reduce long-term vulnerability and potentially enhance the welfare of the beneficiaries and society as a whole.

A disaster prevention strategy designed to reduce vulnerability to drought may require changes to deep-rooted economic policies in the agricultural and other sectors of the economy. At the most basic level, it will require us to rethink what constitutes a "disaster," as opposed to the normal range of variability in weather and other conditions within particular regions. This requires an initial inquiry into what is meant by the term "drought." Second, a prevention-oriented strategy requires us to identify factors that tend to increase drought vulnerability and to evaluate potential ways to reduce that vulnerability. Third, it will require us to revise our philosophy regarding the range of conditions that warrant subsidized public drought relief to protect farming and other water-intensive activities, especially in areas that may no longer be hospitable to those pursuits. In the United States, however, that shift will also require us to reevaluate some of the core components of national agricultural policy dating back to the New Deal. Thus, to understand the effect of current laws and policies that have the greatest impact on drought in the United States, we also need to explore the

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(2005).

8. *See infra* Part I.

history of, and rationale for, both drought law and policy and relevant aspects of U.S. agricultural law and policy.

Part I of this Article provides the analytical framework for a prevention-based or sustainability-based approach to drought mitigation in a changing climate. First, it explores the nature and definition of drought and examines how the conceptualization of drought affects drought law and policy. Second, it evaluates conditions that increase human vulnerability to drought and what might be done to reduce that vulnerability. Part II critiques the history of U.S. water and drought law and policy and related aspects of federal agricultural law and policy and evaluates changes in U.S.[9] law and policy that would promote more sustainable water use and thereby reduce society's vulnerability to drought. Finally, this Article concludes with some preliminary comments on the broader lessons that the preceding analysis might suggest for adaptation strategies to address other impacts of climate change.

I. AN ANALYTICAL FRAMEWORK: FACTORS AFFECTING DROUGHT RISK AND IMPACTS

Public policy toward drought response is shaped by perceptions about the nature and frequency of drought and its impacts on various economic sectors. Risk allocation decisions regarding drought have significant implications for public and private investment. Those decisions are based on a range of considerations, including the perceived rarity and predictability of drought, the nature and value of activities to be protected, and the fairness of concentrating drought risk among a few individuals and businesses rather than distributing risks across society. However, drought policy is also influenced by the nature and location of activities affected by drought, and the vulnerability of those activities to scarce water supplies and other conditions associated with drought, such as heat spells and high winds. A more detailed analysis of competing drought laws and policies, therefore, should consider both the nature and definition of drought and factors that affect drought vulnerability.

A. *Impacts and Perceptions of Drought*

Drought has plagued civilizations throughout history.[10] Extreme drought can cause severe economic and social dislocation, as in the

9. Although this Article focuses on U.S. law, the analysis also suggests lessons for other parts of the world.

10. *See* WAYNE C. PALMER, *Foreword* to U.S. WEATHER BUR. RESEARCH PAPER NO. 45: METEOROLOGICAL DROUGHT, at ii (1965) ("Drought has been cited as a scourge of mankind since biblical times.").

Dust Bowl in the United States during the Great Depression,[11] or societal collapse,[12] as some historians believe happened to the Sumerian and Mayan civilizations.[13] While not as immediate as hurricanes, tornadoes, floods, or other hazards, drought often causes as much or more human suffering and loss of life.[14] Between 1900 and 2005, at least ten million people died and two billion people were adversely affected by drought and related famines; indeed, those statistics likely underestimate human impacts.[15] And as with other natural disasters, the most severe burdens of drought (famine, malnutrition, disease, loss of livelihood, and economic dislocation) often fall on those least able to cope with them (the poor, women, children, and the elderly), due to inadequate financial or material reserves or lack of other sources of food or income.[16]

Climate disruption is likely to exacerbate drought impacts. Climatologists predict significant shifts in global precipitation, with

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11. *See generally* JOHN C. HOYT, DROUGHT OF 1936, WITH DISCUSSION ON THE SIGNIFICANCE OF DROUGHT IN RELATION TO CLIMATE (1938) (discussing the major droughts experienced by almost all of the states during the 1930–1934 period); VANCE JOHNSON, HEAVEN'S TABLELAND, THE DUST BOWL STORY (1974); GREAT PLAINS COMMITTEE, THE FUTURE OF THE GREAT PLAINS (1936) [hereinafter THE FUTURE OF THE GREAT PLAINS] (discussing the migrations from the Great Plains Region resulting from the droughts of the 1930s); John Opie, *Moral Geography in High Plains History*, 88 GEOGRAPHICAL REV. 241, 250–51 (1998) (describing the economic and socioeconomic effects of the Dust Bowl).

12. *See* THOMAS V. CECH, PRINCIPLES OF WATER RESOURCES: HISTORY, DEVELOPMENT, MANAGEMENT, AND POLICY 1 (2d ed. 2005) ("[P]oor water management brought a decline in the health and well-being of citizens and, in extreme cases, even death to an entire civilization.").

13. *See* EUGENE LINDEN, THE WINDS OF CHANGE: CLIMATE, WEATHER, AND THE DESTRUCTION OF CIVILIZATIONS 49–53, 69–73 (2006) (discussing the effects of drought on both the Akkadian and Mayan civilizations); David Getches, *Water Wrongs: Why Can't We Get It Right the First Time?*, 34 ENVTL. L. 1, 2 (2004) (noting that the fall of the Sumerian civilization followed "environmental degradation from intensive irrigation"); G.H. Haug et al., *Climate and the Collapse of the Maya Civilization*, 299 SCIENCE 1731, 1731–35 (2003). *But see* LINDEN, *supra*, at 69, 151 (noting scientific disagreement on the causes of civilization collapse); M.J. Ingram, G. Farmer & T.M.L. Wigley, *Past Climates and Their Impact on Man: A Review*, *in* CLIMATE AND HISTORY: STUDIES IN PAST CLIMATES AND THEIR IMPACT ON MAN 3, 18–22 (T.M.L. Wigley et al. eds., 1981) (discussing factors favoring and disfavoring "climate determinism" in human history).

14. *See* Heather Cooley, *Floods and Droughts*, *in* THE WORLD'S WATER 2006–2007: THE BIENNIAL REPORT ON FRESHWATER RESOURCES 91, 95–96 (Peter H. Gleick ed., 2006).

15. *See id.* at 96–97 & n.4. These figures are probably significant underestimates due to inadequate data and reporting, especially before the 1960s. *Id.* Available data are dominated by a few catastrophic cases. For example, the 1941–1942 drought in China killed an estimated three million people due to starvation, and the 1984 drought in Ethiopia likely caused a million deaths. *Id.* Many less catastrophic episodes likely caused deaths and other severe impacts but are less likely to have been recorded.

16. *See* JANET N. ABRAMOVITZ, UNNATURAL DISASTERS 23–27 (2001); Cooley, *supra* note 14, at 91–92 (discussing how droughts "in the poorest nations reinforce the cycle of poverty"); *see also infra* Section I.B.

some regions getting wetter and others drier.[17] The United Nations Environment Programme reports that these shifts will lead to persistent drought and water scarcity in many areas of Africa, the Mediterranean, the Middle East, Central Asia, the Indian subcontinent, "southern and eastern Australia, northern Mexico, and the southwestern United States—a distribution similar to current water-stressed regions."[18] In the United States, drought frequency and severity are expected to increase markedly, not only in the Southwest, but also in other regions.[19]

Despite these serious past and predicted future impacts, however, modern societies have developed a generally complacent attitude toward drought. This complacency reflects a natural tendency to forget bad times once they are over, at least until they return again. John Steinbeck expressed that attitude famously in *East of Eden*: "And it never failed that during the dry years people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way."[20] In economic terms: "[A]s a society, we tend to place a high discount rate on the future when faced with a crisis."[21]

Complacency occurs in part because drought is a "creeping" phenomenon, the onset of which is gradual and therefore difficult to identify until serious impacts have already occurred.[22] As a result, governments usually respond to drought on an emergency basis, and measures developed in that atmosphere tend to be reactive rather than preventive and proactive.[23] Moreover, because even the most serious

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17. *See* Robert W. Adler, *Climate Change and the Hegemony of State Water Law*, 29 STAN. ENVTL. L.J. 1, 10–17 (2010).

18. CLIMATE CHANGE SCIENCE COMPENDIUM, *supra* note 2, at 38; *see also* Aiguo Dai, *Drought Under Global Warming: A Review*, 2 ADVANCED REV. 45, 58–59 (2011) (reviewing studies predicting increased aridity due to climate change in Africa, Southern Europe, the Middle East, most of the Americas, Australia, and Southeast Asia).

19. *See* CLIMATE CHANGE SCIENCE COMPENDIUM, *supra* note 2, at 38–39 (noting that "[i]t will likely be only a matter of years before drought becomes the region's new climatology" and predicting that future droughts "will be worse than current extremes"); U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 42, 75, 83, 107–08, 112, 120, 123–24, 129–30 (Thomas R. Karl et al. eds., 2009) (predicting more frequent and more severe droughts).

20. JOHN STEINBECK, EAST OF EDEN 6 (2002); *see also* JOHNSON, *supra* note 11, at 288 ("It was hard, when everybody was making money, to remember how fast men could go broke when the rain quit.").

21. PETER H. GLEICK & LINDA NASH, THE SOCIETAL AND ENVIRONMENTAL COSTS OF THE CONTINUING CALIFORNIA DROUGHT 61 (Pac. Inst. For Studies in Dev., Env't & Sec., 1991).

22. *See* Kelly T. Redmond, *The Depiction of Drought: A Commentary*, 2002 BULL. AM. METEOROLOGICAL SOC. 1143, 1144 ("Like twilight, drought creeps stealthily into existence . . . ."); Donald A. Wilhite & Michael H. Glantz, *Understanding the Drought Phenomenon: The Role of Definitions*, 10 WATER INT'L 111, 111–12 (1985); *see also* ABRAMOWITZ, *supra* note 16, at 16.

23. *See* INT'L FED'N OF RED CROSS & RED CRESCENT SOCIETIES, WORLD DISASTERS REPORT 2009: FOCUS ON EARLY WARNING, EARLY ACTION 131–32 (2009) [hereinafter WORLD

droughts inevitably give way to more favorable conditions, the public and private sectors alike tend to fall prey to what drought experts have called the "hydro-illogical" cycle. This phenomenon is characterized by panic and ad hoc, reactive approaches in the face of serious drought, followed by apathy and a return to past practices once the rains return.[24]

The creeping nature of drought generates a difficult policy tension in determining when various policy responses to drought (such as relief payments or water rationing) should begin. If drought relief is triggered too readily, farmers might receive unintended windfalls and be encouraged to engage in riskier practices in the future; but if relief comes too late, the ability of farmers to recover from drought might be impaired. More importantly, complacency and collective loss of memory during "the rich times" can lead societies to pursue unsustainable water and agricultural policies and practices. Those policies and practices, in turn, render regions more vulnerable to the effects of drought when dry weather returns. Avoiding this cycle requires attention to the definition of drought.

B. *Drought Definitions*

Drought defies universal definition because it is a relative concept that varies with location and economic, social, and political context. However, the definition of drought can profoundly change the implications of drought response policies. As two prominent drought experts noted, "[D]rought, like beauty, is largely defined by the beholder and how it may affect his or her activity or enterprise."[25] A survey conducted in 1985 identified more than 150 published definitions of drought in academic literature.[26] The most basic and universally accepted definitions compare supply to need—that is, in general, drought is a deficiency in precipitation that leads to deficits in water supply relative to human and environmental needs.[27] Thus,

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DISASTERS REPORT 2009]; NAT'L DROUGHT POLICY COMM'N, PREPARING FOR DROUGHT IN THE 21ST CENTURY 1 (2000) [hereinafter PREPARING FOR DROUGHT IN THE 21ST CENTURY]; Donald A. Wilhite et al., *Drought Preparedness Planning: Building Institutional Capacity*, *in* DROUGHT AND WATER CRISES: SCIENCE, TECHNOLOGY, AND MANAGEMENT ISSUES 93, 94 (Donald A. Wilhite ed., 2005).

24. *See* Wilhite et al., *supra* note 23, at 94–95.

25. Donald A. Wilhite & Margie Buchanan-Smith, *Drought as Hazard: Understanding the Natural and Social Context*, *in* DROUGHT AND WATER CRISIS, *supra* note 23, at 3, 6; *see also* PALMER, *supra* note 10, at 1 ("Drought means various things to various people."); Redmond, *supra* note 22, at 1147 ("Drought is a many-headed creature, and its full description requires an equally diverse menagerie of indices and indicators.").

26. *See* Wilhite & Glantz, *supra* note 22, at 113–15; *see also* Michael J. Hayes, *Types of Drought*, NATIONAL DROUGHT MITIGATION CENTER, *available at* http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx (evaluating drought indices).

27. *See* U.S. ARMY CORPS OF ENG'RS, NATIONAL STUDY OF WATER MANAGEMENT DURING

drought has a physical component (deficiency in precipitation) and an environmental, social, or economic component (need or demand).

Experts group drought definitions into four categories.[28] "Meteorological drought" is a sustained reduction in precipitation over a defined period of time relative to a defined baseline condition.[29] "Agricultural drought" is a deficiency in soil moisture relative to crop or forage needs,[30] leading to reduced crop yield or quality or total crop failures. "Hydrological drought" is a deficiency in water storage and flow in natural or artificial systems, including reduced soil moisture, groundwater depth, stream flow, runoff volume, and water levels in lakes and reservoirs.[31] "Socioeconomic drought" is a deficiency in water relative to some economic need or resource, such as livestock watering, irrigation, hydroelectric power generation, or municipal and industrial use.[32] The latter three categories might be grouped together as "effects-based" drought definitions.

This system of categorization, however, does not deal with other variables that further complicate policy responses to drought. Precipitation, for example, varies relative to geography.[33] Levels that would be abundant in an arid region might set record lows in a normally humid zone.[34] Therefore, a legal drought definition that fails to account for regional variation could result in perverse policy incentives or

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DROUGHT: THE REPORT TO THE U.S. CONGRESS 4 (1995) [hereinafter NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT] (defining drought as "periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or streamflow"); Cooley, *supra* note 14, at 92 (defining drought as "a hydrological extreme caused by a persistent and abnormal moisture deficiency that has adverse impacts on vegetation, animals, and people over a relatively large area"); Wilhite & Buchanan-Smith, *supra* note 25, at 4 (defining drought as a deficiency in precipitation relative to "expected" or "normal" conditions resulting in insufficient water to meet human or environmental needs).

28. *See* Richard R. Heim, Jr., *A Review of Twentieth-Century Drought Indices Used in the United States*, 2002 BULL. AM. METEOROLOGICAL SOC. 1149, 1149 (citing 1997 categorization by the American Meteorological Society); Wilhite & Glantz, *supra* note 22, at 113; *see also* PALMER, *supra* note 10, at 1–3.

29. *See* Wilhite & Glantz, *supra* note 22, at 113–14.

30. *See id.* at 114–15.

31. *See id.* at 115.

32. *See id.* at 115–16. Arguably, agricultural drought could be considered a subset of socioeconomic drought, but it is distinguished by the direct physical relationship between meteorological and other related climatic conditions (such as temperature and humidity) and both soil moisture and plant needs.

33. *See id.* at 113.

34. As such, absolute measures of low precipitation (less than x inches per year) are suited only to the specific climates for which they are derived. More relative approaches define drought by reference to a percentage of "normal" or "average" precipitation within a region (less than x% of average per unit of time), but suggest other difficulties. *See id.* at 113–14; Hayes, *supra* note 26.

socioeconomic impacts. A definition based on conditions in humid areas might trigger drought relief too readily in an arid region, leading to insufficient incentives to reduce drought risk through more sustainable water policies. Conversely, a definition based on arid conditions might lead to significant hardship in an area accustomed to more abundant water supplies.

Even within a given region there is no such thing as "normal" precipitation, due to significant natural variation.[35] Historical data can be used to calculate "average" precipitation within an area or to characterize the statistical probability of different amounts of precipitation within a defined region. However, there is no single correct rule defining what variance from an established norm, and over what period of time, is appropriate to characterize a deficiency as meteorological drought.[36] Does drought occur whenever precipitation drops below "average," or only when it deviates from the norm by a specified amount, such as the lowest quartile of the normal range? Does one month of such deviation suffice to declare a meteorological drought, or is a longer period required? Scientific factors might influence those decisions, but a policy judgment is necessary to determine when drought relief or other governmental response is justified; that choice will influence the degree to which the policy promotes relief at the expense of risk reduction, or vice versa.

The definition of meteorological drought can also depend on the length of the available historic record and the sources and reliability of the information. Even longstanding historic records (of a century or more) may not fully characterize the climate within a given region.[37] For example, based on dendochronological research[38] and other sources

35. *See* Michael J. Hayes, *Comparison of Major Drought Indices: Introduction*, NAT'L DROUGHT MITIGATION CTR., *available at* http://drought.unl.edu/Planning/Monitoring/ComparisonofIndicesIntro/PercentofNormal.aspx (noting that mean precipitation can vary from the median because precipitation often does not reflect a normal probability distribution); Wilhite & Glantz, *supra* note 22, at 114 (critiquing use of thirty-year regional mean as definition of "normal" precipitation due to significant interannual variability).

36. *See* PALMER, *supra* note 10, at 2 (noting that all drought definitions reflect some degree of arbitrariness); Heim, *supra* note 28, at 1150 (noting that no single index captures all aspects of the drought phenomenon).

37. *See* Kevin Trenberth et al., *Exploring Drought and Its Implications for the Future*, 85 EOS 27, 27–29 (2004) (identifying "mega-droughts" based on paleoclimate analysis indicating that "the full range of drought variability is potentially much larger than has been seen in the last 100 years"); Wilhite & Glantz, *supra* note 22, at 114 (noting that "[t]hirty years . . . represents only a small part of the historical record for most locations and would not be representative of the long-term climatic record").

38. Scientists can correlate the width of annual tree ring growth with available moisture and use that information to deduce the amount of runoff within a drainage basin over time, as far back as tree rings are available. *See, e.g.*, CHARLES W. STOCKTON & GORDON C. JACOBY, JR., LAKE POWELL RESEARCH PROJECT BULL. NO. 18: LONG-TERM SURFACE-WATER SUPPLY AND

of information, the past century has been among the wettest in the American West for at least the past millennium.[39] Thus, if we use "below normal" by reference to the past century to characterize drought, and if conditions revert to "normal" as defined by the past millennium, we can expect persistent "drought" conditions to occur in the future even absent additional changes induced by climate disruption. That interpretation could result in drought response virtually all of the time, converting drought "relief" into a permanent subsidy for water use.

Even with these definitional complexities, the concept of meteorological drought addresses only the supply side of the equation. The remaining three categories of drought relate water supply to various human needs as well as antecedent conditions. Meteorological drought usually precedes agricultural, hydrological, or socioeconomic drought, but not always; rather, these types of drought additionally depend on prior conditions, either natural or artificial in origin.[40] Agricultural drought might not follow from meteorological drought if a preceding wet period caused significant storage of soil moisture, or if crop water needs decline due to cooler temperatures.[41] Similarly, whether meteorological drought leads to hydrological drought depends on preceding water conditions and other factors.[42] If a dry year follows a wet period in which a lot of water has been stored in the system (soil, aquifers, surface water, and reservoirs), physical impacts to natural or human water resources may be small. However, even a moderately dry year following a long period of incremental reduction in stored water can have more significant hydrologic impacts. Other environmental variables that affect the hydrologic effects of drought include temperature and humidity, which affect evapo-transpiration rates as well as precipitation timing and intensity (that is, snow versus rain or steady, moderate rain versus infrequent downpours).[43]

More importantly, effects-based drought depends on the balance between supply and demand, which reflects controllable artificial factors and uncontrollable natural conditions.[44] For example, we might

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STREAMFLOW TRENDS IN THE UPPER COLORADO RIVER BASIN 3, 4 (1976); Connie A. Woodhouse et al., *Updated Streamflow Reconstructions for the Upper Colorado River Basin*, 42 WATER RESOURCES RES. 1, 2 (2006).

39. *See* NAT'L RESEARCH COUNCIL, COLORADO RIVER BASIN WATER MANAGEMENT: EVALUATING AND ADJUSTING TO HYDROCLIMATIC VARIABILITY 108–09 (2007); *see also* David M. Meko et al., *Medieval Drought in the Upper Colorado River Basin*, 34 GEOPHYSICAL RES. LETTERS 4 (2007).

40. *See* Heim, *supra* note 28, at 1149; Wilhite & Glantz, *supra* note 22, at 114–15.

41. *Supra* note 40.

42. *See* Wilhite & Glantz, *supra* note 22, at 115.

43. *Supra* note 40.

44. *See* Redmond, *supra* note 22, at 1144 (commenting that demand factor is more subject to human manipulation).

prevent or mitigate agricultural drought either by supplementing water sources or by reducing water needs—by growing less water-intensive crops or crop varieties, fallowing marginal lands, or using more efficient irrigation methods.[45] Likewise, municipal water demand can be reduced through a wide variety of mechanisms, such as real cost and accelerating block pricing, other financial incentives, mandatory regulations, or rationing.[46] Thus, water supplies that might seem luxurious to low-demand communities might be considered a severe socioeconomic drought in profligate ones. For effects-based drought definitions that relate supply to demand, human behavior can "cause" droughts through unsustainable land or water use.[47] Drought definitions that establish a low threshold for relief might relieve serious local or regional impacts, but in ways that decrease incentives to reduce drought risk and impacts through sustainable water use and management. Effects-defined drought can occur more readily due to vulnerability, but drought definitions and policies can also exacerbate vulnerability.

C. *Vulnerability Assessment*

Disaster assessment is a function of both the natural hazard itself (for example, the probability that an earthquake of a certain magnitude will occur) and the population's vulnerability to the effects (such as the ability of buildings to withstand an earthquake of a particular strength).[48] Overall risk reflects both the likelihood and potential severity of a hazard and the vulnerability of the at-risk population. Vulnerability is defined as "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard,"[49] or more simply as "the potential for loss."[50] Actual harm depends on both the likelihood and magnitude of the hazard and the ability of various populations to withstand or respond

45. *See* COPING WITH WATER SCARCITY, *supra* note 7, at 270–316 (describing various water conservation techniques).

46. *See id.* at 243–63; Amy Vickers, *Managing Demand: Water Conservation as a Drought Mitigation Tool*, *in* DROUGHT AND WATER CRISES, *supra* note 23, at 178–86.

47. *See* PALMER, *supra* note 10, at 3 (referring to the concept of man-made drought where usage exceeds available water supply); Redmond, *supra* note 22, at 1144 (noting that population growth can "turn a dry spell into a drought"); Wilhite & Glantz, *supra* note 22, at 116 (commenting that land use can create or exacerbate droughts, citing the Dust Bowl of the 1930s and more recent droughts in Africa as examples).

48. *See generally* PIERS BLAIKIE ET AL., AT RISK: NATURAL HAZARDS, PEOPLE'S VULNERABILITY, AND DISASTERS 5 (1994) (analyzing vulnerability in terms of the "social, economic, and political processes that influence how hazards affect people").

49. *Id.* at 9.

50. Susan L. Cutter, *Vulnerability to Environmental Hazards*, 20, 4 PROGRESS IN HUMAN GEOGRAPHY 529, 529 (1996); *see also* ADAPTING TO THE IMPACTS OF CLIMATE CHANGE, *supra* note 1, at 126–27.

to its effects.[51]

Vulnerability is a function of geographic factors, such as where people live relative to potential natural disasters (floodplains, seismic risk zones), plus a range of less easily characterized but equally important social, economic, and political factors. Those factors include financial reserves and alternative sources of income when livelihoods are disrupted, access to physical assets and resources to cope with and to recover from hazards, distribution of wealth within a society or economy, stability and security of legal and political rights, and discrimination between population groups.[52] Thus, although poverty is one key factor in generating vulnerability, poverty alone neither guarantees that particular individuals or groups will be vulnerable to particular hazards, nor fully explains why.[53]

From a global perspective, it is critical to assess vulnerability to drought induced by climate disruption. For people in developing countries who already live a marginal existence, relatively small shifts in the availability of water and other key resources will have drastic adverse impacts on food security.[54] Drought and ensuing famine often either cause or coincide with armed conflict, and conflict significantly exacerbates the effects of drought and famine.[55] Experts predict that higher temperatures and drought will cause a major food crisis in many parts of the world over the next century.[56] Those effects are likely to produce a crisis of refugees and ensuing internal and external conflicts.[57]

Even in the United States, scientists predict an increase in the frequency, severity, and geographic extent of drought due to climate disruption.[58] And despite the comparatively large amount of financial, technical, and other resources available to adapt to drought in the United States, past U.S. drought responses suggest that improvements are possible. If more severe and prolonged droughts occur in the United

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51. *See* BLAIKIE ET AL., *supra* note 48, at 9.

52. *See id.* at 9–10; W. Neil Adger & P. Mick Kelly, *Social Vulnerability to Climate Change and the Architecture of Entitlements*, 4 MITIGATION AND ADAPTATION STRATEGIES FOR GLOBAL CHANGE 253, 258–60 (1999).

53. *See* Adger & Kelly, *supra* note 52, at 258.

54. *See* AFRICAN DEVELOPMENT BANK ET AL., POVERTY AND CLIMATE CHANGE: REDUCING THE VULNERABILITY OF THE POOR THROUGH ADAPTATION (2003) [hereinafter POVERTY AND CLIMATE CHANGE]; Hans G. Bohle et al., *Climate Change and Social Vulnerability: Toward a Sociology and Geography of Food Insecurity*, 4 GLOBAL ENVTL. CHANGE 37, 37 (1994).

55. *See* BLAIKIE ET AL., *supra* note 48, at 5, 24 (citing examples in Somalia, Sudan, Ethiopia, Chad, Liberia, Angola, and Mozambique).

56. *See* David S. Battisti & Rosamond L. Naylor, *Historical Warnings of Future Food Insecurity with Unprecedented Seasonal Heat*, 323 SCIENCE 240, 241 (2009).

57. *See* Ben Wisner et al., *Climate Change and Human Security*, RADIXONLINE, http://www.radixonline.org/cchs.html (last visited Sept. 30, 2011).

58. *See* GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES, *supra* note 19.

States due to climate disruption, the choice between relief-based responses and vulnerability-reducing strategies will become even more difficult but even more important.

While poverty is the main source of vulnerability in the developing world, inefficiency may be the most significant culprit in the developed world. In countries with access to sufficient capital and engineering expertise, the traditional approach to imbalances between supply and demand has been to increase water storage or supply.[59] Therefore, regions with high water demand, such as agricultural areas that depend on irrigation, experience more serious impacts from a given shortage than areas with lower water needs. Likewise, growing cities that fail to curb per capita water use or to reduce leaks and other sources of inefficiency in their storage and delivery systems will be more vulnerable to drought than more efficient regions. Of course, efficiency improvements will only decrease vulnerability if the "saved" water really functions as a reserve to guard against future drought, and not to fuel additional growth.[60] Moreover, government investments, subsidies, and other incentives can promote excess water use and development in drought-prone regions in ways that increase vulnerability. A comparison of responses to two historically significant droughts highlights these issues.

1. The Dust Bowl Experience in the Great Plains

The history of farming and ranching in the Great Plains exemplifies the boom-and-bust cycles and patterns of complacency[61] that can increase vulnerability even in wealthy and resilient societies. The Great Plains has been vulnerable to devastating boom-and-bust cycles over the past 150 years, and the downturns usually coincided with severe drought.[62] Aided by U.S. government land policies designed to promote westward expansion, and encouraged by railroad companies, land speculators, and newspapers formed largely to promote those interests,

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59. *See* COPING WITH WATER SCARCITY, *supra* note 7, at 101 (arguing that "[m]ost water supply schemes need to incorporate reservoirs"). *See generally* WORLD COMM'N ON DAMS, DAMS AND DEVELOPMENT, A NEW FRAMEWORK FOR DECISION-MAKING (2000).

60. Some argue that inefficiency is a useful buffer against drought because efficiency improvements can be tapped when needed during a drought. *See* NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at 20. Except for simple rationing programs, however, which can be disruptive, water efficiency improvements often require time and money to implement and cannot simply be turned on or off when drought hits.

61. *See supra* notes 20–24 and accompanying text.

62. *See generally* THE FUTURE OF THE GREAT PLAINS, *supra* note 11 (describing various droughts suffered in the Great Plains); JOHNSON, *supra* note 11; DROUGHT OF 1936, *supra* note 11; Opie, *supra* note 11; Deborah Epstein Popper & Frank J. Popper, *The Great Plains: From Dust to Dust*, PLANNING (Dec. 1987), at 12; William E. Riebsame, *Sustainability of the Great Plains in an Uncertain Climate*, 1 GREAT PLAINS RES. 133 (1991).

settlers from the East flocked to the Great Plains during the late 1800s and early 1900s.[63] Those migrants were lured by the promise of economic self-sufficiency, cheap and fertile land, and favorable weather. However, they brought farming practices and assumptions about weather rooted in the cultural knowledge of Europe and the eastern United States, but that ultimately were unsustainable in the very different and highly variable climate of the Great Plains.[64]

Farmers and ranchers in the Great Plains fell victim to the "hydro-illogical" cycle.[65] Settlers overstocked the range and overplanted crops during favorable weather and high prices, leading to serious failures during drought, excess summer heat, and freezing winters.[66] Government policies and economic conditions encouraged boom cycles when commodity prices rose and export markets expanded; and booms were driven by advancements in agricultural technology, such as the steel plow, the gasoline-powered tractor, and the combine.[67] Thus, as with overuse of water, ultimately an excess use or misuse of resources (land, capital, and technology) during the rich times, rather than simply an absence of resources during the poor times, contributed to the vulnerability of Great Plains agriculturalists to drought.

The ultimate example came during the Dust Bowl years of the Great Depression, which devastated both the land and its settlers.[68] The physical causes of the Dust Bowl were the heat and drought—the worst to date in the measured meteorological record throughout much of the United States.[69] However, similar conditions of wind, drought, and heat had occurred previously, without the dramatic dust storms, soil erosion, and other catastrophic environmental impacts.[70] Overgrazing denuded

63. *See* DROUGHT OF 1936, *supra* note 11, at 30–31; Popper & Popper, *supra* note 62, at 12–13; THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 40–44; JOHNSON, *supra* note 11, at 35–37, 46–63, 71–80.

64. *See* DROUGHT OF 1936, *supra* note 11, at 57–58; THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 27–28, 64; JOHNSON, *supra* note 11, at 38. Static views about farming and weather also led to false assumptions in Australia, South Africa, and other regions in which Europeans introduced historical practices in very different climates. *See* Donald A. Wilhite et al., *National Drought Policy: Lessons Learned from Australia, South Africa, and the United States*, *in* DROUGHT AND WATER CRISIS, *supra* note 23, at 137, 149, 153–54.

65. *See supra* note 23 and accompanying text.

66. *See* THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 53–62; JOHNSON, *supra* note 11, at 35–38, 55–63, 75–91, 101–05, 109–22.

67. *See* THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 40–42; JOHNSON, *supra* note 11, at 35, 37, 77, 109–10, 112–14, 116, 127–35.

68. *See* THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 40–42; JOHNSON, *supra* note 11, at 155–96; PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23, at vii.

69. *See* DROUGHT OF 1936, *supra* note 11, at 8–9.

70. In the native prairies of the region, a dense and diverse flora of drought-resistant grasses stabilized the soil during periods of high winds, and the native species evolved to withstand periods of heat, cold, aridity, and rain. *See* THE FUTURE OF THE GREAT PLAINS, *supra*

the natural rangelands, and mechanical plowing, cultivation, and harvest in long, straight rows exposed the underlying topsoil to the effects of heat, wind, and drought.[71]

Likewise, the Dust Bowl highlights the relationship between unsustainable fiscal and economic policies and drought vulnerability. Enticed by easy access to credit and optimism that land values and commodity prices would inevitably continue to rise, farmers and absentee owners saddled themselves with mortgages and chattel debt to finance a new generation of efficient but expensive equipment to support the industrial farm economy.[72] When crop prices declined dramatically or when crop yields fell or failed altogether due to drought and the accompanying dust storms, this speculation and leverage could not be sustained. Land values plummeted, and farmers had no reserves to cover their debt and to buy seed grain or livestock feed to carry them through the protracted drought. This left insufficient equity to cover loans, leading to farm failures, bankruptcies, foreclosures, and bank failures.[73]

The U.S. government responded to the Dust Bowl with drought relief and other agricultural policies designed both to provide compassionate assistance to farmers and to change farming practices to prevent similar effects in the future.[74] Some policies sought to reduce vulnerability through more sustainable farming practices, such as conservation tillage, planting of windbreaks, and return of marginal farmlands to native grasses.[75] Price supports, bankruptcy relief, and crop insurance were adopted to reduce the financial vulnerability of affected communities to natural variables such as drought and to fluctuations in domestic and global agricultural markets.[76] However, as

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note 11, at 23; JOHNSON, *supra* note 11, at 164–66; Popper & Popper, *supra* note 61, at 16 (quoting a late nineteenth century Pawnee chief in northeast Colorado who lamented, "Grass [is] no good upside down").

71. *See* THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 27, 32, 40, 43, 49; JOHNSON, *supra* note 11, at 37, 114–15, 165–66.

72. *See* DROUGHT OF 1936, *supra* note 11, at 30; THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 42, 45, 53; JOHNSON, *supra* note 11, at 122, 130–32.

73. *See* THE FUTURE OF THE GREAT PLAINS, *supra* note 10, at 45, 53–54; JOHNSON, *supra* note 11, at 122, 130–32.

74. *See infra* Subsection II.B.2.b.

75. *See* JOHNSON, *supra* note 11, at 198–201, 218–20, 227–28, 231–44.

76. *See id.* at 213–14, 227–28; William S. Eubanks, II, *The Sustainable Farm Bill: A Proposal for Permanent Environmental Change*, 39 ENVTL. L. REP. 10,493, 10,494–95 (2009); L. Leon Geyer, *Risk-Sharing Down on the Farm: A Comparison of Farmer Bankruptcy and Insolvency Statutes or Selling the Farm*, 45 DRAKE L. REV. 331, 332–34 (1997); Opie, *supra* note 11, at 250–51. *See generally* DONALD A. WILHITE, NORMAN J. ROSENBERG & MICHAEL H. GLANTZ, GOVERNMENT RESPONSE TO DROUGHT IN THE UNITED STATES, LESSONS FROM THE MID-1970S, PART 2, THE HISTORY OF DROUGHT RESPONSE IN THE GREAT PLAINS, 1850–1950S (1984) [hereinafter THE HISTORY OF DROUGHT RESPONSE].

discussed further in Part II, some of those policies can contribute to vulnerability by distorting risk decisions by farmers about what crops to grow and under what conditions.

The federal government also subsidized a large system of dams to store water for irrigation during times of low precipitation in the Great Plains.[77] Widespread use of the centrifugal pump to power deep wells and center pivot irrigation systems later allowed farmers to tap into the High Plains aquifer.[78] As a result, Great Plains farmers no longer need to rely entirely on precipitation to support millions of farmed acres. Productivity has increased even further due to hybrid crops, fertilizers, pesticides, and herbicides.[79] This technologically assisted increase in productivity, however, is unlikely to last indefinitely. Groundwater levels in the High Plains aquifer have plummeted,[80] and water demand for crops and livestock will increase with rising temperatures.[81] These factors may once again render the Great Plains vulnerable to drought caused by climate disruption.

2. Comparison to Recent Droughts in California

In 1988, drought blanketed large portions of the United States, from California to the Northwest, eastward to the Northern Rockies and the Upper Midwest, and as far south as Georgia. The drought was most pronounced in California and other western states, where it persisted through 1992.[82] Because of improved response capability, a much more diversified economy, and the increased capacity and resilience of water and agricultural infrastructure in California and other parts of the United States, however, both the response to the California drought and its social, economic, and human impacts were vastly different than those experienced during the Dust Bowl. It would reflect another form of complacency, however, to assume that the same would be true if even longer and more severe droughts occur due to climate disruption.

From a meteorological perspective, the California drought of the late 1980s and early 1990s was as severe as that of the late 1920s and early

77. *See* Popper & Popper, *supra* note 62, at 14.

78. *See* JOHN OPIE, OGALLALA: WATER FOR A DRY LAND 129–32, 146–49 (1993).

79. *See* Eubanks, *supra* note 76, at 10, 497–98.

80. *See* OPIE, *supra* note 78, at 5–6, 162–65; U.S. GEOLOGICAL SURVEY, FACT SHEET FS-078-03: WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER, PREDEVELOPMENT TO 2001, 1999 TO 2000, AND 2000 TO 2001 (2003); DAVID E. KROMM & STEPHEN E. WHITE, CONSERVING WATER IN THE HIGH PLAINS 1–3 (1990).

81. *See* GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES, *supra* note 19, at 124 ("Current water use on the Great Plains is unsustainable, as the High Plains aquifer continues to be tapped faster than the rate of recharge.").

82. *See* U.S. GEN. ACCOUNTING OFFICE, WATER RESOURCES: FEDERAL EFFORTS TO MONITOR AND COORDINATE RESPONSES TO DROUGHT 2 (1993) [hereinafter FEDERAL EFFORTS TO MONITOR AND COORDINATE RESPONSES TO DROUGHT].

1930s, and in some parts of the state it was the worst in the twentieth century.[83] Some sources estimated gross agricultural losses in excess of $500 million and increased ratepayer electric costs in the range of $3 billion.[84] However, the California drought did not cause the massive economic, social, and political impacts that similar droughts caused during the Great Depression. The water resources infrastructure developed by the federal and state governments and the private sector since the early twentieth century buffered the region against the full effects of the drought.[85] Because it has a sufficiently sophisticated set of legal and political institutions, California reduced demand through efficiency improvements adopted, encouraged, or required by municipal and agricultural users, and reallocated water among users through water banks and other market tools.[86] Still, by the end of the drought, reserves of both surface water and groundwater had declined, meaning that more serious impacts might have occurred if the drought had continued. California is unlikely to be able to "store its way" out of the more severe and protracted declines in precipitation and snowpack expected due to climate disruption.[87] Moreover, reservoirs and extensive related

83. *See* GLEICK & NASH, *supra* note 21, at 4–5; NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at 23.

84. *See* GLEICK & NASH, *supra* note 21, at 29 n.4, 35, 45. Other impacts included increased monetary and energy costs to pump and move water, lost hydroelectrical generation and higher costs to replace it (in money and pollution), reduced agricultural income and increased costs to purchase livestock feed and other inputs, millions of dollars in losses due to depleted salmon stocks, declining waterfowl populations, increased forest fires and ensuing damage to property and natural resources, declining tourism and recreation, especially to the ski industry, diminished supplies to municipal users, and weakened natural ecosystems. *Id.* at 17–58.

85. Colorado River water stored in Lake Mead and Lake Powell during the early 1980s offset shortages from other sources, and California's own system of more than 150 major reservoirs provided additional reserves during the early years of the drought. As a result, California farmers did not face reduced water deliveries for at least the first three years of the drought. Additional water stored in aquifers offset declining surface water supplies. *See id.* at 5; *see also* NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at 25.

86. *See generally* BRENT M. HADDAD, RIVERS OF GOLD: DESIGNING MARKETS TO ALLOCATE WATER IN CALIFORNIA (2000) (describing California's water allocation system and its complex legal approach to water rights). Those programs and transactions have been criticized on numerous grounds as insufficient, inefficient, and not reflective of true markets. *See, e.g.*, Joseph W. Dellapenna, *Climate Disruption, the Washington Consensus, and Water Law Reform*, 81 TEMP. L. REV. 383, 422–28 (2008); Morris Israel & Jay R. Lund, *Recent California Water Transfers: Implications for Water Management*, 35 NAT. RESOURCES J. 1, 5, 14 (1995). There is little doubt, however, that the effects of the drought would have been worse absent those market-based water transfers.

87. *See* Ajay Kalra et al., *Changes in U.S. Streamflow and Western U.S. Snowpack*, 13 J. HYDROLOGIC ENGINEERING 156, 156 (2008); Philip W. Mote, *Climate-Driven Variability and Trends in Mountain Snowpack in Western North America*, 19 J. CLIMATE 6209, 6209 (2006); Philip W. Mote et al., *Declining Mountain Snowpack in Western North America*, 2005 BULL. AM. METEOROLOGICAL SOC'Y 39, 39.

water diversions and conveyances cause serious environmental impacts that reduce the health of ecosystems in other ways.[88]

The California drought was also buffered by the diverse economies of California and other affected states, and by the size, diversity, flexibility, and economic strength of the United States as a whole. Although some economic sectors incurred more harm than others, the economy of the state and the region was better able to withstand the effects of the drought because some sources of jobs and income are relatively less dependent on water than others, and because resulting tax and other revenues could be invested in drought response and relief efforts.[89] Even within California, if the market functions properly, gross income from declining yields can be offset in part by increased crop prices due to declining supplies.[90] Moreover, given the national or international scope of agricultural markets, the absence of trade barriers, and the presence of functional markets within the country, declines in crop yields in one region can be offset by increased production elsewhere, as in fact occurred during the California drought.[91]

D. *Implications for Drought Mitigation in a Disrupted Climate*

The nature and characterization of drought suggest several distinct focal points for the analysis of future law and policy. First, viewed from the perspective of meteorological drought, and as Dean David Getches and Professor Janet Neuman have both noted independently, we need to abandon the concept of drought as an aberrational phenomenon, rather than as a regular part of the inherently variable climates of particular regions.[92] Conceptualizing drought as an aberrational phenomenon

88. *See* ROBERT W. ADLER, RESTORING COLORADO RIVER ECOSYSTEMS: A TROUBLED SENSE OF IMMENSITY 55–69 (2007).

89. For example, large southern California municipalities were able to pay farmers in the Imperial Valley to fallow land and to improve irrigation efficiency in ways that allowed more water to be conveyed to the thirsty, still thriving cities. *See* Israel & Lund, *supra* note 86, at 7–11; Kevin M. O'Brien & Robert R. Gunning, *Water Marketing in California Revisited: The Legacy of the 1987–92 Drought*, 25 PAC. L.J. 1053, 1054 (1994).

90. *See* GLEICK & NASH, *supra* note 21, at 29–30.

91. *See* NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at 14. Shifts in regional production cause distributive changes in farm income. However, given that drought strikes different agricultural areas over longer periods of time, temporary distributive effects can even out over time, with each region gaining or losing relative market share during different periods. Moreover, if the locus of agricultural production shifts in the face of regional drought, a country as a whole will not face food shortages and resulting malnutrition. The ability of farmers in a drought-stricken region to withstand temporary shifts in production and income, however, depends on their overall economic condition, cash and other reserves, or the existence of government risk allocation programs (price supports, crop insurance, or otherwise) to carry them through the crisis. In California, the agricultural sector was strong enough to bear the drought impacts. *See* GLEICK & NASH, *supra* note 21, at 39.

92. *See, e.g.*, Getches, *supra* note 13, at 7 (critiquing water policies that assume "normal" or "average" precipitation); Janet C. Neuman, *Drought Proofing Water Law*, 7 U. DENV. WATER

encourages maximum use of water during wet periods, leaving little or no resilience to drought during drier periods. Of course, any statistical probability curve has high and low extremes, at increasingly remote levels of probability. Thus, even an approach to water law and policy that considers a range of expected conditions must reflect some policy decision about what extreme conditions should be considered aberrational—that is, beyond the range of probability for which prudent managers should be expected to plan. Moreover, climate change now introduces a considerable amount of additional uncertainty about the range of expected precipitation and other conditions (such as temperature and evaporation rates) that affect water resources supply and demand, and the frequency with which drought conditions should be expected relative to past cycles.

Second, the three effects-based definitions of drought (agricultural, hydrologic, and socioeconomic), all of which reflect an imbalance between available water supply and some aspect of human or environmental demand, suggest that drought response must focus on both the supply and demand sides of the equation. Drought relief and response efforts that rely exclusively on financial aid and emergency water supplies will miss important opportunities for drought mitigation, particularly those that can be implemented in advance of drought.

Vulnerability analysis suggests some of these same lessons for drought response, but it unearths other lessons as well. Societies will be vulnerable to drought if they push the limits of water resources during wet periods, leaving little or no reserve during drought. Adequate reserves will become increasingly important if droughts become more frequent and more severe due to climate disruption because there will be little to no time for recovery between droughts. Likewise, because wasteful societies will be more vulnerable to drought, future drought prevention and response efforts should focus as much on demand-side strategies as on supply-side strategies. Vulnerability analysis, however, also suggests that policymakers should focus on broader policies that drive decisions about how much water is used and for what purposes. Those policies include government subsidies and insurance policies, as well as the levels of risk deemed appropriate by private financial markets. Further, drought policies might include broader economic and resource-based strategies to prevent and mitigate drought risks, such as restoring ecosystem components that can buffer drought impacts (including wetlands, floodplains, and other natural water storage areas), diversifying economically in drought-prone regions, establishing legal and market institutions to reallocate water and products produced with

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L. REV. 92, 94–96 (2003) (noting that both droughts and floods are just extremes of the spectrum of "normal" or "average" conditions).

water, and designing relief strategies to promote self-reliance, rather than dependence or risky economic decisions that perpetuate cycles of vulnerability.

II. U.S. WATER, DROUGHT, AND AGRICULTURAL LAW IN A DISRUPTED CLIMATE

Water law allocates a scarce resource among competing users and defines rights and interests in that resource according to a predictable set of rules. Thus, it would be logical to assume that water law would have the most influence on the use and allocation of water during times of greatest scarcity, and therefore the most impact on behavior and vulnerability in anticipation of and during a drought. It is notable, then, that drought experts have referred to existing law as imposing constraints on sound drought management and policy, rather than serving as a beneficial tool.[93] Law governing water allocation during drought poses a balance between compassion and risk because water is essential to lives and livelihoods, but guaranteed water has the potential to encourage waste and thereby to increase vulnerability.

A disconnect arguably exists between water law and drought policy in the United States for several reasons. First, although state water law varies considerably,[94] by and large it addresses drought planning and response as an afterthought. Especially in the arid and semi-arid regions of the country most prone to drought, state water law is primarily an instrument of water resource development,[95] and drought policies generally have been tacked on incidentally in response to drought emergencies. Second, to the significant extent that federal law also influences water resources,[96] it too is generally designed to promote resource development rather than sustainable water use and conservation.[97] Third, agriculture is the second largest consumptive user of water in the United States (after thermoelectric power plants, which use huge volumes of water for cooling); and agriculture is especially dominant in areas historically prone to drought.[98] Since the New Deal,

93. *See, e.g.*, Wilhite et al., *supra* note 23, at 103.

94. In the United States, water law is largely dictated by individual states. *See* Adler, *supra* note 17, at 4–5.

95. *See* Charles F. Wilkinson, *Western Water Law in Transition*, 56 U. COLO. L. REV. 317, 320–21 (1985).

96. *See* Reed D. Benson, *Deflating the Deference Myth: National Interests Vs. State Authority Under Federal Laws Affecting Water Use*, 2006 UTAH L. REV. 241, 253; David H. Getches, *The Metamorphosis of Western Water Policy: Have Federal Laws and Local Decisions Eclipsed the State Role?*, 20 STAN. ENVTL. L.J. 3, 8 (2001).

97. *See* Robert W. Adler, *Addressing Barriers to Watershed Protection*, 25 ENVTL. L. 973, 1013–37 (1995); Hamilton Candee, *The Broken Promise of Reclamation Reform*, 40 HASTINGS L.J. 657, 657–58 (1989).

98. *See* U.S. GEOLOGICAL SURVEY, SUMMARY OF ESTIMATED WATER USE IN THE UNITED

federal intervention in agricultural markets, especially for the largest commodity crops,[99] is arguably the dominant factor driving production in the agricultural sector, including decisions affecting water use.[100] Therefore, analysis of U.S. drought law and policy and the changes needed in the face of climate disruption should focus on both federal and state law, and on both agricultural and water law.[101] What is remarkably constant across these areas of law, however, is the tension between the goals of providing drought relief (compassion) and reducing drought vulnerability (risk).

A. *State Law and Policy*

The major doctrines of U.S. water law are not well suited to problems of scarcity.[102] This is ironic because, absent scarcity, "the role of water law is relatively insignificant."[103] As such, the question becomes what modifications to water law are warranted as a means of adaptation to drought.

1. State Water Law and Policy

The manner in which water law might address drought can be viewed from two perspectives: (1) the policy question of what goals we want to achieve during drought, and (2) the structural question of what legal means are best suited to achieve those goals. One potential goal of water law is to buffer water users from the adverse impacts of drought, either by enhancing or rationing water supplies or by providing economic compensation or relief. An alternative policy goal, however, is to provide incentives for more water sustainable practices to reduce

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STATES 2005 (2009).

99. A "commodity" crop is an agricultural product that is easy to store and transport (as opposed to being quickly perishable) and can therefore be traded on large scales or stored, depending on market conditions. *See* Charlene C. Kwan, Note, *Fixing the Farm Bill: Using the "Permanent Provisions" in Agricultural Law to Achieve WTO Compliance*, 36 B.C. ENVTL. AFF. L. REV. 571, 574 (2009).

100. *See id.*; Mary Jane Angelo, *Corn, Carbon and Conservation: Rethinking U.S. Agricultural Policy in a Changing Global Environment*, 17 GEO. MASON L. REV. 593, 597–98 (2010); John H. Davidson, *The Federal Farm Bill and the Environment*, 18 NAT. RESOURCES & ENV'T 3, 4 (2003).

101. Other sectors of the economy, of course, can also have significant water demands. This analysis focuses on agricultural water use and demand because of its predominance in the water economy.

102. Adler, *supra* note 17, at 18–26; Joseph W. Dellapenna, *Adapting Riparian Rights to the Twenty-First Century*, 106 W. VA. L. REV. 539, 543–44 (2004); A. Dan Tarlock, *Now, Think Again About Adaptation*, 9 ARIZ. J. INT'L & COMP. L. 169, 173–75 (1992); Frank J. Trelease, *Climatic Change and Water Law*, *in* CLIMATE, CLIMATIC CHANGE, AND WATER SUPPLY 70, 70–71 (1977).

103. Christine A. Klein et al., *Modernizing Water Law: The Example of Florida*, 61 FLA. L. REV. 403, 409 (2009).

the frequency and impact of effects-based drought. Consistent with the thesis of this Article, however, those two goals may conflict. The knowledge that government relief is likely during drought can reduce incentives to take precautionary measures against it.

Structurally, there are several possible approaches to drought in water law. The first, "drought neutrality," would maintain uniform rules of water law regardless of the balance between water supply and demand at any given time, that is, any separate body of "drought law" would not modify the general rules of water law. Indeed, if water law is significant mainly in times of scarcity, and if the background system of water law is modified significantly for scarcity conditions, then the exception would swallow the rule. In theory, under a drought-neutral approach, stable legal rules would allow the market to allocate water in scarcity as well as abundance, while providing incentives to use water efficiently. As such, there would be no need for special drought allocation rules. Water users would make risk decisions on the basis of the background legal regime and have an incentive to use market mechanisms to reallocate water more efficiently.[104] In theory, those with preferred rights would have an incentive to use water more efficiently so they would have more rights to sell during shortages; those with less preferred legal rights would also have an incentive to conserve in order to avoid unnecessary purchase costs. Over time, these incentives might prompt rational parties to engage in more sustainable water practices in advance, rather than waiting for a drought to occur. Various aspects of U.S. water law, however, impose barriers to such efficient marketing of water rights.[105] As a result, "winners" under the prevailing legal regimes do not necessarily have significant incentive to conserve.

The second approach, "drought exceptionalism," would modify the usual rules of water law during periods of drought to provide relief to affected users or to allocate the risk of loss in a manner that differs from what would occur under nondrought conditions. A threshold question regarding drought exceptionalism is how to define the exception—that is, how to establish the conditions under which background rules are modified or under which some form of relief is provided. This threshold question obviously relates to the problems of drought definition already

104. *See* Tarlock, *supra* note 102, at 173–74 (describing "[w]ater marketing," a similar approach calling for "the voluntary sale and transfer of existing rights to new uses," which is currently the "remedy of choice to reallocate more water to higher valued uses"); Trelease, *supra* note 102, at 73 (describing water reallocation in terms of economic incentives).

105. *See* CRAIG BELL & JEFF TAYLOR, WATER LAWS AND POLICIES FOR A SUSTAINABLE FUTURE: A WESTERN STATES' PERSPECTIVE 109–22 (2008); Dellapenna, *supra* note 102, at 573; C. Peter Goplerud III, *The Permit Process and Colorado's Exception*, *in* 2 WATERS AND WATER RIGHTS § 14.04 (Robert E. Beck ed., 1991); Tarlock, *supra* note 102, at 173. *But see* Jedediah Brewer et al., *Transferring Water in the American West: 1987–2005*, 40 U. MICH. J.L. REFORM 1021, 1041–50 (2007).

discussed. If there is no clear ex ante definition of drought, water users have insufficient signals by which to alter their conduct or to assess the real risk of loss under various conditions. If a water law regime triggers special drought provisions too readily, the background rules become largely irrelevant, as suggested above, and users have little incentive to take actions to prevent or otherwise provide for shortages.

The third and most common approach to drought in water law is, for want of a better term, ad hoc. This approach responds to individual droughts with specific changes that either remain embedded in the background system of water law, or expire when the emergency ends or is perceived to have ended. The ad hoc approach has the benefit of flexibility because water law modifications and relief provisions can be tailored to variable drought conditions and impacts. Different impacts on human and environmental water uses might suggest different legal and policy responses. An ad hoc approach leaves water users with less clear signals by which to assess risk. Ironically, however, compared to a system of drought exceptionalism with hairpin triggers for relief, the very uncertainty that the ad hoc approach creates might actually *increase* incentives to engage in preventive and more sustainable behavior. If the government establishes a pattern of frequent or inevitable relief, on the other hand, incentives will evaporate, even if the precise nature of the relief varies.

The system of riparian rights, which is prevalent in the eastern United States, generally assumes abundant supplies that can be divided equitably among competing users, so long as uses are reasonable and do not unduly interfere with the rights of other users.[106] Pure riparian rights systems, in theory, allocate scarce water among competing users according to equitable factors, requiring everyone to share in the risk of scarcity.[107] That system works so long as each user retains enough water to continue economically viable uses; however, if the resulting cutbacks leave all (or most) users below the minimum level necessary to remain viable, then the perverse result is all losers and no winners.[108] Even under common law administration of riparian rights, however, courts have often established de facto preferences among users, but without statutory guidance on how to make such choices and with an apparent preference for large water users.[109] Moreover, especially under

106. *See* Joseph W. Dellapenna, *The Right to Consume Water Under "Pure" Riparian Rights*, *in* 1 WATERS AND WATER RIGHTS § 7.02(c) (Robert E. Beck ed., 1991).

107. *See* RESTATEMENT (SECOND) OF TORTS § 850A (1979); Adler, *supra* note 17, at 19; Dellapenna, *supra* note 105, § 7.02(d)(3).

108. *See* Adler, *supra* note 17, at 19.

109. *See* Joseph W. Dellapenna, *The Law of Water Allocation in the Southeastern States at the Opening of the Twenty-First Century*, 25 U. ARK. LITTLE ROCK L. REV. 9, 14–16 (2002) (illustrating how courts may account for economic impacts when deciding water rights cases).

emergency conditions, it is extremely inefficient to address shortages via case-by-case litigation. The uncertainty and instability inherent in such case-specific allocation leaves large water users, who typically receive greater judicial protection, with little or no incentive to engage in more sustainable practices. Under more recent statutory and administrative systems of riparian rights, statutory preferences operate much as they might in prior appropriation states, with the same weak incentives for conservation.[110] The administrative process, however, allows allocation decisions to be made more efficiently and before use, rather than in a post hoc dispute.[111] An administrative system also allows agencies to impose efficiency requirements as a condition of water use permits.

Under the prior appropriation doctrine, which prevails in the arid western United States, rights are assigned according to priority of use.[112] Thus, because senior appropriators are entitled to their full apportionment before junior appropriators receive any water, the system avoids the "everyone loses" problem.[113] Under this system, however, the "winners" still have little incentive to conserve until water is so scarce that they, too, face shortages. In theory, prior appropriation incorporates a prohibition against waste and limits water rights to "beneficial use," defined in part by reference to the amount of water reasonably necessary to support the intended use.[114] In practice, however, those tenets of prior appropriation law have been enforced weakly (at best).[115] Moreover, although prior appropriation may allocate scarce water more efficiently in drought than is true under riparian rights, it does so in ways that tend to embed historic uses at the expense of economic efficiency or other societal preferences. Impediments to water marketing have limited its effectiveness in reallocating scarce water to uses that are either economically or environmentally more valuable.[116] Finally, because abundant storage and conveyance systems have buffered arid western states from significant problems of scarcity thus far, the prior appropriation system has not yet been tested

110. *See* Joseph W. Dellapenna, *Regulated Riparianism*, *in* 1 WATERS AND WATER RIGHTS § 9.01 (Robert E. Beck ed., 1991); Dellapenna, *supra* note 102, at 586–88.

111. *See* Klein et al., *supra* note 103, at 411.

112. *See* Robert E. Beck, *Prevalence and Definition*, *in* 2 WATERS AND WATER RIGHTS § 12.03(b), (c) (Robert E. Beck ed., 1991).

113. *See* Adler, *supra* note 17, at 24; Joseph W. Dellapenna, *Adapting the Law of Water Management to Global Climate Change and Other Hydropolitical Stresses*, 35 J. AM. WATER RESOURCES ASS'N. 1301, 1305 (1999); Trelease, *supra* note 102, at 72.

114. *See* Beck, *supra* note 112, § 12.03(c)(2).

115. *See* Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919, 975 (1998).

116. *See supra* note 104 and accompanying text; Adler, *supra* note 17, at 25–26.

extensively in times of extreme drought.[117]

Neither riparian rights nor prior appropriation, therefore, provide significant incentives for efficiency improvements designed to reduce drought vulnerability. The next question is whether states have modified those legal regimes in ways that do so, or whether they focus more on short-term relief.

2. State Drought Law and Policy

In many state water law systems, drought is not addressed as a distinct concept—the drought-neutrality approach. Professor Robert Beck's classic two-volume treatise on water law addresses the topic of drought only rarely, and even then as an adjunct to other topics.[118] State water law is not, however, entirely drought-neutral. There are notable exceptions in the law of some states in which water rights and obligations can be modified in the event of drought, or which provide for other responses to drought conditions.[119]

The closest thing to a universal state response to drought is contingency planning, sometimes done as a requirement of state law.[120] Although comprehensive state drought planning is a relatively recent phenomenon,[121] to the extent that drought plans identify response

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117. *See* Tarlock, *supra* note 102, at 175–76.

118. *See* Robert E. Beck, *The Uses of and Demands for Water*, *in* 1 WATERS AND WATER RIGHTS § 2.01 (Robert E. Beck ed., 1991) (discussing the failure of the 1961 Senate Select Committee's attempts to plan for water shortages and the National Water Commission's later view that such planning was not of significant concern). Ironically, the authors of that treatise discuss efforts by riparian states, as opposed to the more arid prior appropriation states, to plan for shortages via regulated riparianism, *see* Joseph W. Dellapenna, *Regulated Riparianism*, *in* 1 WATERS AND WATER RIGHTS § 9.05(d), *supra*, and discuss and critique the fact that many states address drought only through contingency emergency planning rather than imposing more restrictive conditions under conditions of both plenty and scarcity, Robert E. Beck, *Appropriable Waters*, *in* 2 WATERS AND WATER RIGHTS § 13.01, *supra*.

119. *See, e.g.*, Melinda Kassen, *Statutory Expansion of State Agencies' Authority to Administer and Develop Water Resources in Response to Colorado's Drought*, 7 U. DENV. WATER L. REV 47, 48–50 (2003); Neuman, *supra* note 92 (discussing how "drought is a normal and recurrent feature of the climate throughout the United States").

120. *E.g.*, N.Y. COMP. CODES R. & REGS. tit. 9, § 5.116(III) (2011) (requiring N.Y. State Drought Management Task Force to approve a State Drought Management Coordination Plan); NEB. REV. STAT. ANN. § 46-715 (LexisNexis 2010) (requiring the state and local governments to create and update, for fully appropriated basins, river basin management plans that consider, inter alia, drought conditions and water supply); 27 PA. CONS. STAT. ANN. § 3112(a)(1) (West 2009) (mandating state and regional water plans for both normal and drought conditions).

121. The first state to adopt a comprehensive drought management plan was Colorado, in 1981. Polly Ann Najarian, An Analysis of State Drought Plans: A Model Drought Plan Proposal (Dec. 2000) (unpublished M.S. thesis, University of Nebraska at Lincoln), at 5. By December, 2010, forty-four states had drought plans, one had delegated drought planning to local authorities, and three states were in the process of plan development. Drought Planning Resources, by State, NAT'L DROUGHT MITIGATION CTR., http://drought.unl.edu/Planning/

strategies and criteria in advance, the trend suggests a shift away from a purely ad hoc, reactive approach to drought response. Moreover, comprehensive drought management plans can generate objective signals by which water users might guide decisions about water use and drought risk. A series of government agencies and commissions have concluded that more comprehensive drought policies are needed to anticipate and to mitigate drought impacts.[122] In response, many states have adopted drought management plans, guided in part by the recommendations of Professor Donald Wilhite and his colleagues at the National Drought Management Center at the University of Nebraska.[123] That work recommends that drought planning focus on advance mitigation to reduce vulnerability,[124] as well as monitoring, prediction, response, and relief during droughts.[125] It also notes that providing compensation without regard to whether preventive measures had been taken disincentivizes mitigation.[126]

Drought mitigation plans alone, however, do not ensure a risk reduction approach, as opposed to one that focuses on providing relief when droughts occur. Many current state plans continue to focus largely on response; only a few have shifted to mitigation and prevention to reduce vulnerability.[127] The content of state drought response plans, of course, must reflect the relevant substantive aspects of state laws and regulations, which vary considerably in the manner in which they balance the goals of drought relief and risk reduction. There are legitimate reasons why state drought plans and legal provisions might

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PlanningInfobyState.aspx (last visited Sept. 30, 2011).

122. *See, e.g.*, WESTERN GOVERNORS' POLICY OFFICE (WESTPO), INSTITUTE FOR POLICY RESEARCH, MANAGING RESOURCE SCARCITY: LESSONS FROM THE MID-SEVENTIES DROUGHT, A REPORT FOR THE GOVERNORS ON DROUGHT MANAGEMENT 34–36 (1978) [hereinafter MANAGING RESOURCE SCARCITY]; NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at v–vii, 17–19; PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23, at v–vi, 1, 33; W. GOVERNORS' ASS'N., DROUGHT RESPONSE ACTION PLAN 1, 3 (1996).

123. *See* Donald A. Wilhite, *A Methodology for Drought Preparedness*, 13 NAT. HAZARDS 229, 231, 251 (1996) [hereinafter Wilhite, *A Methodology for Drought Preparedness*]; Donald A. Wilhite, *Drought Planning: A Process for State Government*, 27 WATER RESOURCES BULL. 29, 30 (1991) [hereinafter *Drought Planning: A Process for State Government*]; Najarian, *supra* note 121. *See generally* CODY KNUTSON ET AL., HOW TO REDUCE DROUGHT RISK (1998) (describing actions that should be taken to reduce the potential impacts from droughts before the droughts occur).

124. "Mitigation is defined as actions taken in advance of or in the early stages of drought that reduce the impacts of the event." Wilhite et al., *supra* note 23, at 118. For potential risk reduction actions listed by the Center, see CODY KNUTSON ET AL., *supra* note 123, at E-1 to E-5.

125. *See* Najarian, *supra* note 121, at 5–8, 31–34; Wilhite, *A Methodology for Drought Preparedness*, *supra* note 123, at 239–40.

126. *See* Najarian, *supra* note 121, at 9.

127. *See id.* at 5, 68–70; Donald A. Wilhite, *Drought Planning and Risk Assessment: Status and Future Directions*, 39 ANNALS ARID ZONE 211, 213–14 (2000) (singling out New Mexico, Utah, Nebraska, Texas, and Georgia as increasing their focus on mitigation and prevention).

vary due to differences in climate, hydrology, economics, population, and other variables.[128] However, certain guiding principles might help states determine appropriate policies to reduce vulnerability while still providing drought relief.

Few state statutes pay careful attention to the issue of drought definition.[129] Under many state statutes, the Governor, other state officials or agencies, or interstate bodies have authority to declare drought on an ad hoc basis, with either vague or nonexistent statutory criteria defining the conditions under which drought relief is appropriate.[130] Some states define drought by statute or regulation, but without sufficient specificity to provide a clear signal to water users or to reflect a considered policy judgment about when responses are appropriate.[131] Other states are more specific in defining drought. Kansas requires water providers to develop adequate water supplies to

128. *See* Margaret S. Hrezo et al., *Integrating Drought Planning into Water Resources Management*, 26 NAT. RESOURCES J. 141, 167 (1986) (arguing that both the content and the feasibility of state drought responses vary due to a range of physical and political factors).

129. *See supra* Section I.B (addressing the various definitions of "drought").

130. *See, e.g.*, ARIZ. REV. STAT. ANN. § 35-192 (2011) (authorizing Arizona Governor to declare an emergency due to weather conditions, implicitly including drought, and noting drought emergencies declared in 1989, 1998, and 1999); COLO. REV. STAT. ANN. § 24-32-2104 (West 2010) (authorizing the Colorado Governor to suspend laws and create new laws during declared disasters, including drought); IOWA CODE ANN. § 455B.266(1) (West 2004) (authorizing the Iowa Governor to proclaim disaster emergency "due to a drought or other event affecting water resources of the state"); 27 PA. CONS. STAT. ANN. § 3102 (West 2009) (providing for "drought or other water resource shortage declared by proclamation of the Governor"); *see also* KAN. STAT. ANN. § 82A-408 (1997) (authorizing Kansas Board of County Commissioners to declare drought emergencies); N.J. STAT. ANN. § 32:11D-16 (West 1990) (the Delaware River Basin Compact, which authorizes a commission to declare drought emergency with the consent of all parties); 4 PA. Code § 119.1 (2011) (allowing the Governor to designate any area of the Commonwealth as being in a drought); 32 PA. CONS. STAT. ANN. § 820.1 11.4(a) (West 1997) (authorizing the Susquehanna River Basin Commission to declare a drought emergency); WASH. ADMIN. CODE § 173-166-010 (2011) (authorizing the Washington Department of Ecology to declare a drought emergency).

131. *See, e.g.*, N.J. ADMIN. CODE § 7:19-1.3 (2011) (defining drought as "a condition of dryness due to lower than normal precipitation, resulting in reduced stream flows, reduced soil moisture and/or a lowering of the potentiometric surface in wells"); N.Y. EXEC. LAW § 20 (McKinney 2011) (delineating disasters, including droughts, as "occurrence or imminent threat of wide spread or severe damage, injury, or loss of life or property resulting from any natural or man-made causes"); N.Y. COMP. CODES R. & REGS. tit. 9 § 5.116(I) (2011) (providing for a sequence of "drought watch," "drought warning," "drought emergency," and "drought disaster" based on a drought-forecasting plan tied to "indicators such as precipitation deficits, surface and ground water levels, reservoir storage and soil moisture"); 4 PA. CODE § 112.3 (2011) (defining natural disasters as including drought and other catastrophes that result "in damage to property, hardship, suffering or possible loss of life"); TEX. GOV'T CODE ANN. § 418.014 (West 2005) (authorizing the Texas Governor to declare a drought disaster, but not specifying qualifying conditions for drought).

meet needs during a drought with a 2% probability of occurrence.[132] Although experts might quibble with technical aspects of this definition, and although it might have to be reevaluated if conditions change due to climate disruption, it provides at least some signal regarding the probability and severity of conditions considered to constitute drought. However, even this definition is designed for water resources management planning, not necessarily to trigger financial or other drought relief.

The absence or vagueness of statutory or regulatory triggers for drought relief and response has some advantages because it provides flexibility to address a range of different drought timing and conditions. For example, a short, intense period of low precipitation might warrant different responses than a longer, less severe reduction in precipitation. However, leaving the declaration of drought entirely to the discretion of the Governor or other state officials on an ad hoc basis can cause important decisions about when to provide drought relief or to trigger conservation or mitigation requirements to be based on political considerations, rather than on a policy determination of what will result in the most appropriate balance between short-term drought relief and long-term risk reduction.

It would be preferable for state statutes or regulations to establish explicit standards dictating when drought relief or response measures are appropriate. Such standards would signal water users about the conditions under which the state will provide relief, thus encouraging prevention-oriented risk decisions. Stricter triggers for relief will place users at greater risk of loss, but will encourage sustainable practices to reduce vulnerability. For example, states might borrow from policies adopted in Australia in 1992 to encourage agricultural practices appropriate to regional climate and hydrology.[133] Drought legislation could require farmers and other water users to plan for the "normal" range of meteorological conditions rather than provide relief whenever

132. KAN. STAT. ANN. §§ 82a-928 (1997) (municipal water supplies), 82a-1303 (state conservation storage supply). Likewise, private water rights applicants must prove capacity for beneficial use during a drought with a two percent probability of occurrence. *Id*. § 82a-1304. The statutory standard is specified by regulation as a drought having a statistical chance of occurring once every fifty years, on average, which the state assumes is equivalent to conditions measured in the drought record from 1952–1957. *See* KAN. ADMIN. REGS. §§ 98-5-1, 98-5-8 (2011).

133. Australia decided that providing relief under what might be referred to as conditions of "normal" aridity in a given region encouraged unsustainable farming practices and that relief should be provided only for conditions that a prudent farmer could not have reasonably predicted. The policy was modified over time in response to later droughts to provide relief payments in "exceptional circumstances," a standard that proved difficult and somewhat arbitrary to administer absent more precise criteria. *See* Wilhite et al., *supra* note 64, at 142–45; PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23, at 5, 24.

precipitation falls below "average." Legislators or other decisionmakers would have to make tough decisions about what range within the regional precipitation probability curve should define extraordinary conditions beyond which prudent businesses should be expected to plan. If precipitation patterns shift as much as predicted due to climate change, making those decisions will become increasingly complex. Moreover, to effectuate the desired policy goal, state legislatures and regulatory officials need to exercise restraint in the face of specific drought emergencies. Further, these decisionmakers should avoid pressure from affected interest groups to provide ad hoc financial or regulatory relief that minimizes the effectiveness of the intended incentives.

A second centerpiece of many state drought statutes is funding for drought relief. Although state drought relief funding is miniscule compared to the massive amount of federal drought relief,[134] it is the most obvious example of programs for which the balance between compassion and risk is particularly challenging. Many states provide for open-ended or vaguely defined financial relief to various categories of drought victims,[135] sometimes through tax or regulatory relief,[136] or relief from private sector economic consequences[137] rather than direct payments. Other states, however, fund projects designed to prevent or reduce drought impacts.[138] Unconditioned, easily triggered financial relief is more likely to reduce drought impacts to individuals and businesses, but provides few incentives to reduce vulnerability. Either

134. *See infra* Subsection II.B.2; PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23, at 12, 18.

135. *See, e.g.*, COLO. REV. STAT. ANN, § 24-32-2106 (West 2010) (granting general funding for community disaster recovery, including for droughts); NEB. REV. STAT. ANN. § 46-702 (LexisNexis 2010) (funding to alleviate adverse impacts of regulatory decisions necessary to protect water resources); TEX. GOV'T CODE ANN. § 418.073 (West 2005) (providing funds from disaster contingency fund if the Governor determines that the demands placed on funding normally appropriated to local and state agencies are excessively great for coping with a specific emergency); WASH. REV. CODE ANN. §§ 43.83B.415, 43.83B.430 (West 2007) (providing for grants and loans for members of the agricultural community suffering from drought).

136. *See, e.g.*, IOWA CODE ANN. § 422.5 (West 2011) (tax relief for involuntary livestock sales due to drought); KAN. ADMIN. REGS. § 5-7-1 (2011) (relief from nonuse or forfeiture provision of state water law where water is not available due to drought); TEX. AGRIC. CODE ANN. §§ 161.054, 163.066 (West 2004) (variance from restrictions on livestock movement).

137. *See, e.g.*, IOWA CODE ANN. § 570.4 (West 1992) (limitations on crop liens); IOWA CODE ANN. § 654.15 (West 2011) (deferral of foreclosure caused by drought).

138. *See, e.g.*, COLO. REV. STAT. ANN. §§ 37-60-121, 37-60-123.5 (West 2010) (funding for water conservation and stream flow restoration projects, and loans or grants to fund water augmentation projects for agrarians suffering from effects of declared droughts); KAN. STAT. ANN. §§ 19-3001, 19-3002 (2007) (allowing Kansas counties to spend funds for drought relief wells and other emergency water supply projects); WASH. ADMIN. CODE §§ 173-166-010, 173-166-090 (2011) (providing funding for projects designed to "alleviate drought conditions relating to agricultural and fisheries survival").

stingier financial relief programs, stricter (or at least clearer) definitions of drought to trigger relief, or programs conditioned on advance prevention and mitigation are more likely to promote drought risk reduction. Likewise, spending money to augment water supplies or otherwise to reduce drought severity once drought begins is likely to reduce human and economic suffering, but predrought investments to reduce water demand are more likely to reduce long-term vulnerability.

There has been some trend toward increased use of mitigation in state drought plans.[139] One mitigation strategy is temporary reallocation of water rights or suspension or limitation of withdrawal privileges during drought. Some states, for example, restrict or prohibit water withdrawals during declared droughts.[140] Others move in the opposite direction by authorizing emergency withdrawal permits or alternative supply sources to augment supplies during drought,[141] and some increase the flexibility of water users to engage in willing transfers of water rights during droughts.[142] States also vary in their philosophies about whether drought-related shortages should be borne equally among users or should reflect policy-based use priorities. Texas, for example, requires pro rata reductions during drought—that is, no preference among users.[143] Iowa, by contrast, provides a statutory hierarchy for allocating water during drought, enforced through sequential prohibitions on water uses by category,[144] while Pennsylvania has the authority to prohibit nonessential water use during droughts.[145]

The choice among different approaches to modifying water rights reflects competing policy goals, but with implications for the resulting balance between compassion and risk. For example, provisions that facilitate water transfers provide incentives to use water more efficiently

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139. *See* Najarian, *supra* note 121, at 68–71 (but noting inadequate knowledge of plan implementation).

140. *See, e.g.*, TEX. SPEC. DISTS. CODE ANN. § 8802.109 (2010). *But see id.* § 8802.110 (banning all groundwater uses during extreme droughts, but providing exception for human consumption to protect health, welfare, and safety).

141. *See* KAN. STAT. ANN. § 82a-408 (1997); WASH. ADMIN. CODE §§ 173-166-010(2), 173-166-070 (2011).

142. *See* COLO. REV. STAT. ANN. §§ 37-83-104 to -106 (West 2004); WASH. ADMIN. CODE §§ 173-166-010(2)(b), 173-166-080 (2011); WASH. REV. CODE ANN. § 43.83B.410 (West 2007).

143. *See* TEX. WATER CODE ANN. § 11.039 (West 2008).

144. *See* IOWA CODE ANN. § 455B.266(1)(c) (West 2004). Restrictions may be imposed in sequence to: (1) interstate water transfers; (2) water for primarily recreational activities; (3) irrigation water for commodity crops such as "hay, corn, soybeans, oats, grain, sorghum[,] or wheat;" (4) water for manufacturing or industrial use; (5) water used to generate electricity; (6) water for livestock production; and (7) water for various sources of human consumption. *Id.* § 455B.266(2).

145. *See* 4 PA. CODE § 119.4 (2011) (prohibiting uses such as watering outdoor landscaping, washing paved surfaces or equipment, filling swimming pools, and any other "nonessential" use).

to free up a salable commodity, while simultaneously allocating water more efficiently in times of scarcity. A drought-neutral approach in which shortages are borne pro rata operates like the traditional riparian rights system,[146] in which users presumably have an incentive to conserve if sufficient supplies remain to support uses, but with considerable uncertainty depending on the length and severity of the resulting cutbacks. Use-based reductions operate like the seniority approach in the prior appropriation system.[147] High priority users have few incentives to save because they will get their share under all but the most severe conditions, and low priority users have little incentive to save because their uses are likely to be eliminated first. Unlike the prior appropriation system, however, use priorities based on legislative judgments at least reflect a policy judgment as to which water uses are most important during drought.

A second common mitigation strategy is to require or encourage water suppliers and users to prepare and implement drought emergency plans or water conservation plans as a condition of state water rights or water use permits.[148] To some extent, such strategies shift key decisions about balancing relief and risk reduction "downstream" to water providers and users, and the nature of that balance may depend on the strategies chosen. States may require water users and providers to identify or implement water conservation or other use reduction methods,[149] or to plan for alternative or augmented water supplies.[150] Such strategies are inherently designed to reduce drought vulnerability.[151]

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146. *See supra* notes 106–11 and accompanying text.

147. *See supra* notes 112–17 and accompanying text.

148. *See* ARIZ. REV. STAT. ANN. §§ 45-342(A), 45-342(I) (2010); COLO. REV. STAT. ANN. § 37-60-126(2)(a) (West 2010) (requiring covered entities to create, publicize, and implement a plan by which to encourage customers to use water efficiently, and allowing other state or local government entities to develop and use such plans); KAN. STAT. ANN. § 82a-733(a) (1997) (authorizing the chief engineer to require water user permits to include conservation plans and practices when they will "promote public interest"); N.J. ADMIN. CODE §§ 7:19-2.14(a)(10), 7:19-6.5(a)(3), 7:19-7.3(b)(3) (2011); 4 PA. CODE §§ 118.4(a)(1), 118.5(a) (2011); TEX. WATER CODE ANN. § 36.113(c)(7) (West 2008) (allowing districts to require that a drought contingency plan be included in the permit or permit amendment application for a well); TEX. WATER CODE ANN. § 11.1272(a) (West 2008) (requiring public water suppliers and irrigation districts to have drought contingency plans consistent with regional water policies); TEX. PROP. CODE ANN. § 21.0121 (West 2004) (requiring drought contingency plan in water rights application).

149. *See* NEB. REV. STAT. ANN. §§ 46-716, 46-708 (LexisNexis 2007); N.J. ADMIN. CODE § 7:19-6.5 (2011); 4 PA. CODE § 120.4 (2011); TEX. WATER CODE ANN. § 11.1272 (West 2008).

150. *See* ARIZ. REV. STAT. ANN. § 45-342(I)(3) (2010); N.J. ADMIN. CODE § 7:19-11.2(a)(1)(i) (2011).

151. States also use a menagerie of other mitigation strategies. *See* COLO. REV. STAT. ANN. § 37-60-126.5 (West 2010) (drought mitigation planning); COLO. REV. STAT. ANN. § 24-32-2105 (West 2008) (creating the Department of Emergency Management, which is responsible for

B. *Federal Law and Policy*

1. Federal Water Law and Policy

Because water resources allocation in the United States is left largely to the states,[152] there is no single, coherent body of federal water law. There is, however, a long history of federal investment and water project construction that drives water resources development, especially in the West and the Midwest. In addition, various sources of federal law govern water rights and allocation for particular parties or in specific geographic locations. Although none of those sources of federal water law is directed at drought per se, some have drought-specific provisions, and each has varying degrees of influence on the balance between compassion and risk in federal, state, and private drought response.

a. Federal Water Resource Development

Through laws such as the Reclamation Act of 1902[153] and the Water Resources Development Act,[154] the federal government has supported a massive system of dams and other water projects built and operated by the Bureau of Reclamation and the U.S. Army Corps of Engineers, and regional entities such as the Bonneville Power Authority and the Tennessee Valley Authority. Through the Federal Power Act of 1920,[155] the Federal Energy Regulatory Commission licenses a similarly significant set of non-federal water projects.[156]

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preparing and maintaining a state disaster plan); COLO. REV. STAT. ANN. § 13-21-105(2)(a) (West 2005); *id.* § 18-13-109(2)(a) (West 2004); KAN. STAT. ANN. § 82a-1414(b) (1997) (relaxation of weather modification regulations); N.J. ADMIN. CODE § 7:19-9.3(a) (2011) (water surcharges); 3 PA. CONS. STAT. ANN. § 1109(b) (West 2008); 35 PA. STAT. ANN. § 1451 (West 2003); TEX. WATER CODE ANN. § 5.509(a) (West 2008) (temporary allowance of otherwise unlawful waste discharges to augment stream flows); TEX. LOC. GOV'T CODE ANN. § 352.081(c) (West 2005) (permitting the prohibition or restriction of outdoor burning); WASH. REV. CODE ANN. § 43.83B.405 (West 2007) (public communication and education regarding drought conditions).

152. *See supra* Section II.A (outlining what modifications to state water law are warranted as a means of adaption to drought). In the eastern United States, where there is little federal land, states have always governed water rights and allocation through the common law and later statutory and regulatory versions of the riparian rights doctrine. *See* JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES, CASES AND MATERIALS 27 (4th ed. 2006). In the West, the Supreme Court recognized, through a confusing evolution of cases, that Congress severed water rights from federal land holdings through statutes such as the Mining Act of 1866, leaving water rights to allocation under state law. *See id*. at 331–35; Cal. Or. Power Co. v. Beaver Portland Cement Co., 295 U.S. 142, 162 (1935).

153. Pub. L. No. 57-161, 32 Stat. 388 (1903) (codified as amended in scattered sections of 43 U.S.C. (2006)).

154. 33 U.S.C. §§ 2201–22 (2006).

155. 16 U.S.C. §§ 791–823d (2006).

156. *See* Adler, *supra* note 97, at 1019–23.

Statutes governing federal water project construction or licensing do not establish federal drought policy per se. At most, they articulate general principles of water resource management,[157] with delegation of authority over project management to federal program officials. Moreover, Congress has consistently subjected implementation of those federal laws to applicable state water law,[158] except where state law conflicts with an express requirement of the federal statute.[159] In that sense, federal water resource development statutes could be viewed as drought-neutral: the federal role is simply to provide or facilitate water infrastructure, with key decisions about water and drought left to state law.

However, federal decisions about project funding, approval, and operation can significantly influence drought management and impacts. Federally built or licensed water projects provide significant storage capacity that helps buffer regions from the effects of meteorological drought, thus reducing vulnerability. On the other hand, that infrastructure arguably stimulates water use in regions with limited water supply, particularly when federal subsidies distort decisions about the economic benefits and risks of water use.[160] Irrigation confers significant benefits in terms of food production,[161] and water storage and conveyance support urban growth and development in regions where many people want to live.[162] However, artificially high water use can increase vulnerability if reservoir storage runs short during a protracted drought, especially if climate disruption reduces precipitation beyond the range assumed when projects were built, for example, in the Colorado River Basin.[163] Decisions about additional storage capacity to

157. *See, e.g.*, 43 U.S.C. §§ 390b, 411, 485h (2006) (providing for use of Reclamation Act project water for utilitarian uses, such as irrigation, municipal and industrial water supply, electric power, navigation, and flood control); *id*. § 372 (providing for beneficial use as the "basis, the measure, and the limit" to the right to Reclamation Act project water); 16 U.S.C. § 803(a) (2006) (providing for Federal Power Act licensing of water projects that are "best adapted to a comprehensive plan for improving or developing a waterway").

158. *See* Reclamation Act, 43 U.S.C. § 383 (2006); Federal Power Act, 16 U.S.C. § 821 (2006).

159. *See* California v. United States, 438 U.S. 645, 647, 675–79 (1978) (upholding state conditions if consistent with provisions in federal act). *But see* First Iowa Hydro-Electric Coop. v. Fed. Power Comm'n, 328 U.S. 152, 170–71 (1946) (holding that state water permit is not needed as prerequisite to Federal Power Act license, so long as water is returned to stream without harmful diminution).

160. *See generally* RICHARD W. WAHL, MARKETS FOR FEDERAL WATER: SUBSIDIES, PROPERTY RIGHTS, AND THE BUREAU OF RECLAMATION (1989) (discussing the inefficient use of federal water use subsidies); Mark Kanazawa, *Pricing Subsidies and Economic Efficiency: The U.S. Bureau of Reclamation*, 36 J.L. & ECON. 205 (1993) (same).

161. *See* PEREIRA ET AL., *supra* note 7, at 18 (noting that irrigated agriculture consumes about one-sixth of all arable land but produces 40% of the world's crops).

162. *See, e.g.*, ADLER, *supra* note 88, at 5.

163. *See* Martin Hoerling & Jon Eischeid, *Past Peak Water in the Southwest*, SW.

deal with future drought will either be made by federal agencies, or will be subject to federal licensing or permitting.[164] Moreover, the federal role does not end once water projects are built. Despite the fact that federal water project operation is typically subject to state water law and therefore requires acquisition of state water rights,[165] federal officials make key decisions about use and allocation of federal project water,[166] including during droughts.[167]

Federal decisions regarding water project construction and operation are also subject to federal environmental statutes, which may also play a role in drought policy. For example, federal decisions about dam construction, operation, and management may be subject to the National Environmental Policy Act (NEPA).[168] If an environmental impact statement (EIS) is required, the agency must study and reveal reasonably foreseeable environmental project impacts, alternatives to the action and comparative impacts, and potential mitigation.[169] The Endangered Species Act (ESA)[170] may have an even greater impact on drought response where Section 7 consultation[171] requires water from

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HYDROLOGY, Jan.–Feb. 2007, at 18; N. Christensen & D.P. Lettenmaier, *A Multimodel Ensemble Approach to Assessment of Climate Change Impacts on the Hydrology of the Colorado River Basin*, 3 HYDROLOGY & EARTH SYS. SCI. DISCUSSIONS 3727, 3748–49 (2006); Gregory J. McCabe & David M. Wolock, *Warming May Create Substantial Water Supply Shortages in the Colorado River Basin*, GEOPHYSICAL RESEARCH LETTERS (Nov. 27, 2007), at 1, 3–4, *available at* http://www.agu.org/pubs/crossref/2007/2007GL031764.shtml; Richard Seager et al., *Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America*, 316 SCIENCE 1181, 1181–84 (2007).

164. *See* James City Cnty., Va. v. EPA, 12 F.3d 1330, 1331–32, 1339 (4th Cir. 1993) (upholding EPA veto of county water supply project on environmental grounds); Adler, *supra* note 17, at 55–57.

165. *See supra* note 158 and accompanying text.

166. *See, e.g.*, North Carolina v. Hudson, 731 F. Supp. 1261, 1263–64, 1273 (E.D.N.C. 1990) (reviewing Army Corps of Engineers' decision to allow pipeline diverting water from Corps reservoir for municipal water supply).

167. *See, e.g.*, 43 U.S.C. § 2212 (2006) (authorizing temporary water supplies from federal reclamation projects to alleviate water shortages during drought, free from regular ownership, acreage, or pricing restrictions of Reclamation Act); South Dakota v. Ubbelohde, 330 F.3d 1014, 1019 (8th Cir. 2003) (upholding Army Corps of Engineers' decisions regarding reservoir releases during period of drought).

168. 42 U.S.C. §§ 4321–70f (2006). NEPA is almost invariably triggered by federal decisions regarding water project construction, funding, licensing, or permitting. *See* SAX ET AL., *supra* note 152, at 668 (commenting that virtually all federal water projects will constitute major federal action subject to NEPA).

169. *See generally* 42 U.S.C. § 4332(2)(C) (2006) (discussing the situations in which an EIS is necessary); 40 C.F.R. §§ 1502.12–1502.16 (2010) (setting forth EIS requirements).

170. 16 U.S.C. § 1531–1544 (2006).

171. *See id.* § 1536 (requiring federal agencies to consult with the Secretary of the Interior (or the Secretary of Commerce for marine species) to ensure that federal action does not jeopardize the continued existence of any listed threatened or endangered species, or destroy or adversely modify habitat critical to the support of those species). ESA consultation requirements

federal projects to be devoted to species and habitat protection rather than irrigation, municipal or industrial water supply, or other off stream human uses during drought.[172]

Because federal water project decisions are subject to discretion by different agencies within highly variable contexts, it is difficult to discern a uniform "policy" as to how they affect drought management. However, both NEPA and the ESA require agencies to evaluate alternatives that might minimize impacts on the environment or on threatened or endangered species and their habitat.[173] That analysis provides the informational framework and legal support for agencies to choose between competing drought management strategies and goals. Stored federal project water might be used to provide drought relief to users who might otherwise have to curtail their uses and activities, potentially encouraging inefficiency in the long run. Alternatively, agencies might reduce vulnerability by conditioning water availability on the implementation of water efficiency measures.[174] An oft-overlooked requirement of NEPA is that agencies must consider "the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity."[175] An approach that exalts short-term uses might focus on immediate drought relief, whereas one that focuses more on long-term productivity might promote efforts to reduce vulnerability.

One example is the Bureau of Reclamation's guidelines governing operation of the Glen Canyon and Hoover Dams given current and

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may also be triggered by ongoing operational decisions. *See, e.g.*, Natural Res. Def. Council v. Houston, 146 F.3d 1118, 1125, 1133 (9th Cir. 1998) (requiring ESA consultation for water contract renewals); Pac. Coast Fed'n of Fishermen's Ass'ns v. U.S. Bureau of Reclamation, 138 F. Supp. 2d 1228, 1233, 1251 (N.D. Cal. 2001) (requiring ESA consultation for annual operating plan).

172. *See* Pac. Coast Fed'n of Fishermen's Ass'ns v. U.S. Bureau of Reclamation, 426 F.3d 1082, 1084–85, 1095 (9th Cir. 2005) (invalidating ESA action for insufficient flows for endangered fish); Kandra v. United States, 145 F. Supp. 2d 1192, 1195–96, 1211 (D. Or. 2001) (upholding operating plan as necessary to protect fish); Reed D. Benson, *Giving Suckers (and Salmon) an Even Break: Klamath Basin Water and the Endangered Species Act*, 15 TUL. ENVTL. L.J. 197, 212–14 (2002) (describing Section 7 duties); Holly Doremus & A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 ECOLOGY L.Q. 279, 283–84 (2003) (discussing the closing of the Klamath Project headgates, which halted irrigation deliveries in an effort to protect endangered fish).

173. *See* 42 U.S.C. § 4332(2)(C)(iii) (2006) (requiring agencies to evaluate in an EIS alternatives to the proposed action); 40 C.F.R. § 1502.14 (2010) (same); 16 U.S.C. § 1536(b)(3)(A) (2006) (requiring consideration of "reasonable and prudent alternatives" that would not jeopardize species and their habitats).

174. *See* 40 C.F.R. § 1502.16(f) (2010) (requiring an EIS to consider "[n]atural or depletable resource requirements and conservation potential of various alternatives and mitigation measures").

175. 42 U.S.C. § 4332(2)(C)(iv) (2006).

predicted shortages in the Colorado River Basin.[176] Guided by an EIS process[177] and a negotiated agreement by the Colorado River Basin States,[178] the "interim" guidelines[179] specify reservoir elevations for Lake Powell and Lake Mead that dictate prescribed water delivery reductions.[180] However, the guidelines also encourage water conservation and allow storage of the resulting savings in the reservoirs free from the "use it or lose it" provisions of prior appropriation.[181] Two aspects of the guidelines stand out as mechanisms that can motivate risk reduction while still providing for some relief in the event of severe drought. First, by providing quantitative clarity regarding reservoir levels at which specified reductions will occur,[182] the guidelines establish clear signals by which water users can make decisions about water use and efficiency. Second, rather than simply providing free water from federal storage in the event of drought, the provisions tie drought relief to earlier efforts to generate surplus through conservation or augmentation of water supplies.[183]

b. Federal Law Governing Water Rights and Allocation

There is also no integrated body of federal law governing water rights and allocation by which to guide federal drought policy. However, several sources of federal law affect water rights in specific applications. Those sources include the federal reserved water rights doctrine governing Indian reservations and other reserved federal lands,[184] federal statutes,[185] congressionally approved interstate

176. U.S. DEP'T OF THE INTERIOR, COLORADO RIVER INTERIM GUIDELINES FOR LOWER BASIN SHORTAGES AND THE COORDINATED OPERATIONS FOR LAKE POWELL AND LAKE MEAD 1, 2 (2007) [hereinafter COLORADO RIVER INTERIM SHORTAGE GUIDELINES], *available at* www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.

177. U.S. DEP'T OF THE INTERIOR, BUREAU OF RECLAMATION, FINAL ENVIRONMENTAL IMPACT STATEMENT: COLORADO RIVER INTERIM GUIDELINES FOR LOWER BASIN SHORTAGES AND COORDINATED OPERATIONS FOR LAKE POWELL AND LAKE MEAD, at ES-1 (2007), *available at* http://www.usbr.gov/lc/region/programs/strategies/FEIS/index.html (explaining the EIS process and guidelines).

178. *Law of the River*, CENTRAL ARIZONA PROJECT, http://www.cap-az.com/AboutUs/LawOfTheRiver.aspx (last visited Sept. 30, 2011) (stating that the Basin States signed an agreement concerning the Colorado river management and operations on April 23, 2007).

179. Although the guidelines are not permanent, they are designed to remain in effect until 2025 for water supply decisions and 2026 for reservoir operating decisions, a relatively long time for such policies. *See* COLORADO RIVER INTERIM SHORTAGE GUIDELINES, *supra* note 176, at 4.

180. *See* COLORADO RIVER INTERIM SHORTAGE GUIDELINES, *supra* note 176, at 33–59.

181. The specific mechanism is called "Intentionally Created Surplus." *See id.*

182. *Id.* at 33–59 (detailing the process for providing drought relief to the Colorado River Basin Area).

183. *See id.* at 38–39 (describing categories of ICS).

184. *See* United States v. New Mexico, 438 U.S. 696, 707 (1978) (national forests);

compacts,[186] and Supreme Court decisions and decrees[187] governing allocation of specific interstate waters.[188] By and large, federal law either protects federal property or resource interests, or fulfills the federal role in resolving interstate water disputes. To the extent that these goals are independent of drought policy, this piecemeal body of federal water law is drought-neutral. However, given that federal intervention into state water allocation decisions has the greatest significance during times of scarcity,[189] federal water law can affect the balance between relief-based and risk-reduction approaches to drought.

i. Federal Reserved Water Rights

The federal reserved water rights doctrine casts a "cloud" over the state prior appropriation doctrine,[190] with an uncertain impact on the manner in which other water users perceive and respond to drought risk. Federal reserved water rights consist of water that the federal government, pursuant to its authority under the Commerce Clause[191] and the Property Clause,[192] impliedly reserved to support the uses for which particular federal lands were set aside from the general public

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Cappaert v. United States, 426 U.S. 128, 131, 147 (1976) (national monuments); Arizona v. California, 373 U.S. 546, 601 (1963) (Indian reservations, national recreation areas, national forests, and national wildlife refuges); Winters v. United States, 207 U.S. 564, 565–66 (1908) (Indian reservations).

185. *E.g.*, Boulder Canyon Project Act, 43 U.S.C. §§ 617–17t (2006) (allocating lower Colorado River among states in the lower Colorado River Basin, as determined in *Arizona v. California*, 373 U.S. at 564–65).

186. *E.g.*, Colorado River Compact, 70 Cong. Rec. 324, 324 (1928), *available at* http://www.usbr.gov/lc/region/g1000/pdfiles/crcompct.pdf; *see also* UTAH CODE ANN. § 73-12a-2 (West 2011); COLO. REV. STAT. ANN. § 37-61-101 (West 2011); Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961); Susquehanna River Basin Compact, Pub. L. No. 91-575, 84 Stat. 1509 (1970).

187. *E.g.*, Arizona v. California, 373 U.S. 546, 551, 589–90 (1963) (referring to the Colorado River); Kansas v. Colorado, 206 U.S. 46, 117 (1907) (referring to the Arkansas River).

188. The federal government also plays an obvious role in international water disputes, but this analysis is limited to domestic law.

189. *See supra* note 103 and accompanying text.

190. *See* SAX ET AL., *supra* note 152, at 941. The federal reserved water rights doctrine has far more impact on prior appropriation states because the vast majority of federal land holdings are in the West. *See* United States v. New Mexico, 438 U.S. 696, 699 n.3 (1978). *But see* Hope M. Babcock, *Reserved Indian Water Rights in Riparian Jurisdictions: Water, Water Everywhere, Perhaps Some Drops for Us*, 91 CORNELL L. REV. 1203 (2006) (arguing for tribes in the East to receive same riparian rights as those in the West); Jeremy N. Jungreis, *"Permit" Me Another Drink: A Proposal for Safeguarding the Water Rights of Federal Lands in the Regulated Riparian East*, 29 HARV. ENVTL. L. REV. 369 (2005) (claiming that consumption in the East has also increased as water supplies decrease).

191. U.S. CONST. art. I, § 8.

192. *Id*. art. IV, § 3.

domain.[193] Because the priority date for federal reserved rights is based on the date the reservation was established,[194] in many cases those rights have priority over other uses under the "first in time, first in right" tenet of the prior appropriation doctrine.[195] Moreover, federal reserved rights are not subject to the "use it or lose it" requirement of prior appropriation law.[196] Many federal reserved rights have not been quantified; they might be quite substantial relative to other uses and water rights, or they may not be in actual use or might consist of instream uses that are not transparent to other users absent a legal claim of priority.

In theory, uncertainties in federal reserved rights could cause other water users to exercise caution about inefficient water use for fear that those uses would be reduced or eliminated by senior reserved rights during a drought. In reality, however, this potential efficiency incentive is counterbalanced by incentives in the prior appropriation doctrine. Given the tendency toward complacency during times of plenty, water users are more likely to use as much of the resource as they can absent an actual challenge. Moreover, because users are subject to statutory forfeiture or common law abandonment if they do not use their full appropriative rights,[197] and because the prohibition against waste is enforced ineffectively at best,[198] prior appropriation doctrine prevents the latent pendency of federal reserved rights from serving as a significant incentive for efficiency. This dynamic might shift if the federal and state governments improved or expedited efforts to quantify federal reserved water rights through general stream adjudications,[199] statutory settlements, or otherwise. Although the "use it or lose it" mentality of nonfederal water users would likely persist even in the face of quantification when resources are sufficient, at least those users would be on notice of the risks they face when supplies diminish during drought.

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193. *See* Cappaert v. United States, 426 U.S. 128, 138 (1976).

194. *See id. But see* United States v. Adair, 723 F.2d 1394, 1414 (9th Cir. 1983) (holding that the priority date for Indian reserved right was "time immemorial" based on aboriginal water rights).

195. *See supra* notes 112–17 and accompanying text.

196. *See* Arizona v. California, 373 U.S. 546, 600, 601 (holding that reserved rights are intended to meet both present and future needs).

197. *See* SAX ET AL., *supra* note 152, at 247–64.

198. *See supra* notes 114–15 and accompanying text.

199. *See* 43 U.S.C. § 666 (1970) (subjecting United States to jurisdiction of state court in adjudications of rights to stream systems). For examples of such adjudications, see *In re* Gen. Adjudication of All Rights to Use Water in the Gila River System and Source, 989 P.2d 739, 744 (Ariz. 1999); *In re* Gen. Adjudication of All Rights to Use Water in the Big Horn River System, 753 P.2d 76, 84–86 (Wyo. 1988).

Federal reserved water rights also provide mixed incentives for risk reduction by federal water users. Federal reserved rights are quantified relative to the amount of water necessary to fulfill the primary purpose of the reservation.[200] Quantification based entirely on demand, rather than a balancing of supply and demand under a range of hydrological circumstances, provides incentives for federal users to overstate their needs in order to maximize their quantified water rights. However, the Supreme Court has somewhat curtailed this tendency by clarifying that the doctrine "reserves *only* that amount of water necessary to fulfill the purpose of the reservation, no more."[201] Nonfederal water users might argue that this standard demands that federal users base their claims on efficient methods of water use. Ironically, however, it is difficult for non-federal users to argue that federal claimants must be more efficient than they are. Efforts to reconcile inchoate federal reserved rights with existing water rights and uses could force all users to evaluate efficiency improvements that might reduce drought vulnerability.

ii. Federal Resolution of Interstate Water Disputes

A range of legal tools is used to resolve interstate water conflicts by varying institutions at different times and to address different issues. Therefore, these legal tools are not likely to reflect a coherent or consistent drought policy. Resolutions are likely to be drought-neutral if they simply allocate water among competing users regardless of hydrological conditions. However, federal intervention in interstate water disputes can provide positive or negative incentives for reducing drought vulnerability.

The law of equitable apportionment, under which the Supreme Court resolves interstate water disputes[202] absent a compact or other direct agreement, has the *potential* to stimulate efforts to reduce drought vulnerability, but the Court's infrequent and tepid application of this doctrine has minimized that potential thus far. In deciding apportionment among states, the Court considers, among other factors, "the practical effect of wasteful uses on downstream areas."[203] Moreover, while priority is the "guiding principle" in interstate allocation disputes between two prior appropriation states, the Court considers other factors, such as available conservation methods and the balance of harms between states.[204] In theory, judicial inquiry into the

200. *See* United States v. New Mexico, 438 U.S. 696, 701–02 (1978).

201. Cappaert v. United States, 426 U.S. 128, 141 (1976).

202. The Supreme Court has original jurisdiction over cases and controversies between states. U.S. CONST. art. III, § 2, cl. 1; *see also* Missouri v. Illinois, 200 U.S. 496, 518 (1906).

203. Nebraska v. Wyoming, 325 U.S. 589, 618 (1945).

204. Colorado v. New Mexico (I), 459 U.S. 176, 183–84, 188 (1982) (quoting *Nebraska v. Wyoming*, 325 U.S. at 618) (internal quotation marks omitted).

efficiency of water use by competing states should provide incentives for efforts to improve efficiency and hence to reduce drought vulnerability.

Unfortunately, two aspects of the Court's equitable-apportionment jurisprudence have limited the effectiveness of this incentive. First, the Court has declined to resolve interstate water disputes absent interstate impacts of a "serious magnitude."[205] This tendency reflects, in part, the Court's reluctance to interfere with state control over water resources and perhaps an intentional judicial incentive for states to resolve water disputes through negotiation rather than litigation. However, the effect is to defer key decisions until impacts have already occurred, rather than adopting or requiring preventive measures to reduce risk. Second, the Court declined to provide relief in *Colorado v. New Mexico*—the most significant equitable-apportionment case in which the Court actually examined water efficiency. Overruling findings by a Special Master, the Court held that Colorado did not meet a strict "clear and convincing evidence" standard to prove inefficient water use in New Mexico.[206] Arguably, the Court simply followed the reluctance of western states to curtail traditional existing water uses in determining waste or inefficiency. But the Court's weak scrutiny provides little incentive for states to promote sustainable water use and management to reduce drought vulnerability for themselves and neighboring states.[207]

Interstate water compacts are not likely to reflect a considered federal drought policy because, despite requiring congressional approval,[208] the compacts more likely reflect interstate negotiation than federal policy. Congress has no incentive to disturb those judgments absent an inappropriate impact on non-signatory states or countervailing federal interests.[209]

Some interstate water compacts reflect a largely drought-neutral approach, that is, they might envision drought and even allocate the risk of drought among the party states, but then leave decisions about resulting shortages either to individual states within the apportionments

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205. *See* Kansas v. Colorado, 206 U.S. 46, 117 (1907) (stating that although Colorado had diminished the flow of water into Kansas, Kansas had not made out a case entitling it to a decree for relief; such relief could come at a time in the future when an equitable division of benefits no longer existed); *see also* SAX ET AL., *supra* note 152, at 868–71 (noting that the Supreme Court has only actually issued apportionment decrees in three cases).

206. Colorado v. New Mexico (II), 467 U.S. 310, 312, 316–20 (1984).

207. *See id.* at 333 (Stevens, J., dissenting) (arguing that the majority opinion provided little incentive for states to improve efficiency of water use and management to accommodate uses in neighboring states).

208. U.S. CONST. art. I, § 10, cl. 3 (prohibiting states from entering into compacts "without the Consent of Congress").

209. *See* Virginia v. Tennessee, 148 U.S. 503, 518–21 (1893) (requiring congressional consent when a compact might increase state power at the expense of the federal government).

negotiated in the agreement or to future resolution. The Colorado River Compact, for example, assigns the risk of drought to the Upper Basin.[210] Although it apportions fixed rights to beneficial consumptive use between the Upper and Lower Basins,[211] the Compact prohibits the states primarily situated in the Upper Basin (or the "Upper Division"[212]) from causing flows at Lee Ferry to fall below levels necessary to meet the Lower Basin's full apportionment on a ten-year rolling average,[213] thus placing any risk of loss on the Upper Basin. This allocation of drought risk reflected a quid pro quo, in return for which the Upper Division states were freed from enforcement of the prior appropriation doctrine given far more rapid growth in the Lower Basin, especially in California.[214] The potentially perverse result is that the Upper Division states would have far greater incentives than the Lower Division states to reduce drought vulnerability. On the other hand, the tension created within the Compact, and perhaps the aversion to expensive and protracted litigation that would be required for the Lower Division to enforce its Compact rights against the Upper Division, generated sufficient incentives for the states and the federal government to negotiate the interim shortage guidelines discussed earlier.[215]

Other interstate compacts, notably the Delaware River Basin Compact[216] and the Susquehanna River Basin Compact,[217] address drought management more directly but without significant guidance. The Delaware Compact establishes the interstate Delaware River Basin Commission (DRBC),[218] which has authority to allocate basin waters

210. The Compact divides the basin between lands draining into the river above and below Lee Ferry. The Upper Basin includes portions of Arizona, Colorado, New Mexico, Utah, and Wyoming; the Lower Basin includes portions of Arizona, California, Nevada, New Mexico, and Utah. Colorado River Compact, 70 Cong. Rec. 324, 325 (1928).

211. The Compact apportions 7.5 maf (million acre feet) of beneficial consumptive use annually to each basin, plus up to an additional one maf to the lower basin if available from lower basin tributaries. *Id.* at 325; *see also* Arizona v. California, 373 U.S. 546, 572–74 (interpreting the Boulder Canyon Project Act and the Compact as attributing the additional one maf to water from lower basin tributaries).

212. From a geopolitical and implementation or enforcement perspective, the Compact defines the Upper Division states as Colorado, New Mexico, Utah, and Wyoming, and the Lower Division states as Arizona, California, and Nevada. Colorado River Compact, 70 Cong. Rec. 325 (1928).

213. *Id.*

214. *See* ADLER, *supra* note 88, at 21 (describing California's growth in light of its water rights).

215. *See supra* notes 176–81 and accompanying text.

216. Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688, 700 (1961) (codified at N.J. STAT. ANN. § 32:11D (2011)); 32 PA. STAT. ANN. § 815.101 (2011).

217. Susquehanna River Basin Compact, 32 PA. STAT. ANN. § 820.1 (2011).

218. *See* N.J. STAT. ANN. § 32:11D-7 (2011).

equitably and proportionally[219] and unusually broad authority over basin water management generally.[220] As part of this authority, the Commission has the power to declare drought emergencies and accompanying increases or decreases in water allocations, diversions, or releases as necessary to address drought conditions.[221] However, aside from public hearing requirements,[222] the Compact provides no definition of what constitutes a drought or requirements regarding how the Commission's drought emergency powers should be exercised.

Some commentators argue that this bare bones approach is the Compact's strength because of its "flexible, cooperative, planning-oriented structure,"[223] while others suggest that the approach is designed to leave drought management largely to member states "as long as the state agency acts consistently with commission drought management plans."[224] An alternative view is that the states entrusted drought and water management decisions to the Commission because its composition fully represents and protects each state's interests,[225] although the process has seen controversy and threats of litigation.[226] Regardless of the explanation, the Commission has adopted risk reduction strategies for drought in two key respects. First, the Commission has defined the "drought of record" to provide notice about what will trigger a drought emergency and what should be used for dependable water supply planning,[227] as well as phased reductions tied to particular conditions and geographic areas, and accompanying priorities for use reductions.[228] Second, to reduce drought vulnerability

219. *See id*. § 32:11D-16.

220. *See* Joseph W. Dellapenna, *Interstate Struggles Over Rivers: The Southeastern States and the Struggle Over the Hooch*, 12 N.Y.U. ENVTL. L.J. 828, 844 (2005) (stating that the Compact confers an unusually expansive water management authority to the Delaware River Basin Commission); *see also* SAX ET AL., *supra* note 152, at 854 (describing Delaware River Basin Commission as "one of the most powerful regional agencies ever created," with "broad powers to control all water uses in the basin").

221. N.J. STAT. ANN. § 32:11D-16 (2011).

222. *See id.* § 32:11D-54.

223. Josh Clemons, *Interstate Water Disputes: A Road Map for States*, 12 SOUTHEASTERN ENVTL. L.J. 115, 134 (2004).

224. Steven T. Miano & Michael T. Crane, *Eastern Water Law: Historical Perspectives and Emerging Trends*, 18 NAT. RESOURCES & ENV'T 14, 18 (2003).

225. The Commission includes one representative from each of the four basin states and one U.S. commissioner appointed by the President. Delaware River Basin Compact, N.J. STAT. ANN. § 32:11D-8. A majority vote is needed to change water allocation, ensuring that all states are protected fully under drought and other conditions. *Id.* § 32:11D-11.

226. *See* SAX ET AL., *supra* note 152, at 854–55 (describing actions by New York to defy Supreme Court decree during 1960s drought and Pennsylvania threat of renewed Supreme Court litigation during early 1980s drought).

227. The Commission identified the drought of record by reference to the 1961–67 drought. *See* N.Y. COMP. CODES R. & REGS. tit. 21 §§ 890.85–90.86 (2011).

228. *See id.* §§ 890.8–90.12.

in advance, the Commission requires water users to maximize efficiency and to adopt and implement water conservation and contingency plans in order to further reduce freshwater use during droughts.[229]

The comprehensive, interstate commission approach to water management in the Delaware and Susquehanna River Basin Compacts reflects a rare application of regional, watershed-based river and water management that was advocated for many years in the United States and manifested most clearly in the Water Resources Planning Act of 1965,[230] but that has been abandoned as a nationwide initiative.[231] The Delaware River Basin experience and the Colorado River drought shortage guidelines suggest that cooperative approaches to resolving interstate water disputes provide opportunities to reduce drought vulnerability through advance planning and management. By comparison, resolving disputes through litigation or otherwise, once drought has already occurred, is likely to generate reactive rather than preventive drought policies. It would be wise to develop similar comprehensive commissions like those established by the Compacts in other parts of the country that are likely to face increased drought risk due to climate disruption.

2. Federal Drought and Agricultural Law and Policy

Just as states have adopted drought legislation to augment state water law, the federal government has adopted drought laws and policies independent of or integrated into federal water law and policy only to a limited degree. Conversely, federal drought law and policy is linked very closely to U.S. agricultural law and policy. Therefore, the manner in which the federal government has addressed tradeoffs between drought relief and risk reduction can best be understood in the context of the historical co-evolution of federal drought and agricultural law.

a. Federal *Laissez-Faire* Policy Before the New Deal

Until the 1930s, drought and other disaster relief was left largely to nongovernmental organizations; those who made unsound risk decisions that could not be remedied through the private market went bankrupt and moved to other places in search of new livelihoods.[232] In 1887, President Grover Cleveland vetoed federal legislation appropriating $10,000 to provide seeds to drought-stricken Texas as unconstitutional, asserting: "Though the people support the government, the government

229. *See id.* §§ 833.5-A(a), 890.4
230. Pub. L. No. 89-80, 79 Stat. 244 (1965) (codified as amended at 42 U.S.C. § 1962).
231. *See* Adler, *supra* note 97, at 1012–13 (noting that the Act was defunded in the 1980s).
232. *See* THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 2–6.

should not support the people."[233] Under this *laissez-faire* philosophy, only farmers who made sound risk decisions (as to what crops to plant, when, and where, and how much to borrow for mortgages, equipment, and supplies) continued to operate. However, this approach resulted in significant human suffering and economic dislocation, due to extremely high bankruptcy and foreclosure rates in the Great Plains and elsewhere.[234] Farmers who settled areas with unpredictable weather took enormous risks to feed and clothe the nation but also bore the full consequences of those risks when the weather and economy turned bad.[235]

The first significant federal drought relief came during World War I, but remained focused on self-sufficiency. During 1918 and 1919, President Woodrow Wilson authorized $5 million per year for seed loans to farmers who lost two successive crops to drought and winter frosts.[236] Although farm organizations sought more significant federal assistance during the 1920s, legislation either failed in Congress or was vetoed.[237] President Herbert Hoover first sought relief from private organizations,[238] and in 1930, he approved federal aid of a "self-help" variety, such as crop production and feed-and-seed loans secured only

233. *Id.* at 4; H.W. BRANDS, TRAITOR TO HIS CLASS: THE PRIVILEGED LIFE AND RADICAL PRESIDENCY OF FRANKLIN DELANO ROOSEVELT 237 (2008); LOWELL K. DYSON, HISTORY OF FEDERAL DROUGHT RELIEF PROGRAMS 1 (1988). The Texas Legislature, however, appropriated $100,000 that year for drought relief in the form of food and seed grain. *See* THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 4. Other states, such as Kansas and Nebraska, also spent small amounts on drought relief during this period, but the Governor of Colorado vetoed drought relief in 1894. *See id.* Of course, at least since the Reclamation Act of 1902, Pub. L. No. 57-161, 32 Stat. 388 (1902) (codified as amended in scattered sections of 43 U.S.C.), the U.S. government has provided subsidized water for irrigation and other uses, but to promote development rather than relieve drought. *See supra* note 160; Adler, *supra* note 97, at 1015–19 (discussing the Reclamation Act of 1902); U.S. CONGRESS, CONG. BUDGET OFFICE, HOW FEDERAL POLICIES AFFECT THE ALLOCATION OF WATER 11 (2006) [hereinafter HOW FEDERAL POLICIES AFFECT THE ALLOCATION OF WATER] (calculating the magnitude of federal water subsidies). Of course, additional storage capacity can help buffer the effects of drought, especially in arid regions. *See* GLEICK & NASH, *supra* note 21, at 5.

234. *See supra* Subsection I.C.1.

235. *Id.*

236. *See* DYSON, *supra* note 233, at 1. The federal government authorized similarly modest amounts for regional drought relief through the early 1920s. *See id.* (describing appropriations for seed loans to farmers in the west).

237. *See* U.S. DEP'T OF AGRICULTURE, ECONOMIC RESEARCH SERVICE, AGRICULTURE INFORMATION BULLETIN NO. 485: HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, 1933–84, at 1–3 (1984) [hereinafter HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS].

238. Even the Red Cross had to amend its charter to provide drought relief. Previously, the Red Cross could only respond to an "Act of God," which it did not define to include drought. *See* THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 5.

by a first lien on the crops produced.[239] Although the Secretary of Agriculture had sole discretion to determine when drought relief was warranted, funding was so low that farmer risk decisions could be subsidized only in extreme situations. Moreover, the 1930 Act provided loans, rather than grants or relief payments. While helpful to farmers who lacked sufficient capital reserves when revenues from drought-stricken crops fell, repayment requirements still required farmers to internalize the risk of planting a new crop if drought conditions remained. However, the federal government subsidized those risk decisions by limiting the required loan security to a first lien on the crops grown. Drought exacerbated but was not the only source of volatility in production and prices in an inherently risky sector of the economy. Perhaps as a result, the "'self-help' approach used by the Hoover administration represents the last attempt by a U.S. [P]resident to address drought relief problems through voluntary measures."[240]

b. The New Deal Legacy of Compassion and Risk-Spreading

As the drought and depression intensified, and prompted by the substantially different philosophy of the Franklin Delano Roosevelt Administration, the United States abandoned its *laissez-faire* approach to drought. Instead, the federal government distributed the risk of drought across society through programs designed to provide emergency response and relief.[241] Those measures included government funding or other assistance for supplemental water supply, subsidized feed or other agricultural inputs, subsidized crop insurance, and direct relief payments.[242]

New Deal agricultural policies also responded to underlying problems in agricultural markets, which were exacerbated but not caused by drought. During World War I, the government encouraged farmers to produce as much as possible to meet international market demand generated by reduced production in war-torn regions.[243] When those markets declined after the war, U.S. farmers continued to produce in record quantities, resulting in surpluses, plummeting market prices,

239. *See* S.J. Res. 211, 71st Cong. (1930) (authorizing $45 million for loans to farmers in areas affected by drought, storms, or hail, upon a finding of emergency conditions by the Secretary of Agriculture, to purchase seed, fertilizer, feed, or fuel necessary to continue crop production); THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 5–6.

240. THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 6; DYSON, *supra* note 233, at 2 (commenting that drought relief programs were almost always "inextricably mixed" with programs for political reform and overall economic recovery).

241. *See* THE HISTORY OF DROUGHT RESPONSE, *supra* note 76, at 4, 7–20.

242. *See id.*

243. *See* JOHNSON, *supra* note 11, at 109–11; THE FUTURE OF THE GREAT PLAINS, *supra* note 11, at 41.

and insufficient farm revenues to meet debt service and other needs.[244] The main purpose of the Agricultural Adjustment Act of 1933[245] was to restore balance between agricultural supply and demand, and to establish sufficient prices to reinstate the purchasing power of producers of agricultural commodities[246] relative to a base period immediately prior to World War I.[247] To balance supply and demand, the federal government paid farmers to produce less and used proceeds from commodity processing taxes to maintain prices and to purchase surplus commodities in order to control supply.[248] This reduced incentives for debt-laden farmers to till more acreage, potentially on marginal soils, to maximize revenue despite unfavorable conditions.[249] However, guaranteed federal payments also reduced the incentive for farmers to reevaluate the risk of continuing production in drought-stricken regions.

Congress did not originally intend for this unprecedented federal intervention into agricultural markets to continue beyond the Great Depression.[250] But as the drought of the 1930s intensified,[251] leading to

244. *See* JOHNSON, *supra* note 11, at 122–26; HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 1.

245. Agricultural Adjustment Act of 1933, Pub. L. No. 73-10, 48 Stat. 31 (1933) [hereinafter 1933 Act]. Portions of this legislation were declared unconstitutional by the Supreme Court in *United States v. Butler*, 297 U.S. 1, 68 (1936), but were largely replaced by the Agricultural Adjustment Act of 1938, Pub. L. No. 75-430, 52 Stat. 31 (1938).

246. The 1933 Act defined "basic agricultural commodity" to include wheat, cotton, field corn, hogs, rice, tobacco, and milk and milk products. 1933 Act, § 11. In 1934, Congress added beef and dairy cattle, peanuts, rye, flax, barley, and grain sorghums. Pub. L. No. 73-142, 48 Stat. 528 (1934).

247. 1933 Act, § 2(1). The base period was defined as August 1909 to July 1914 for all crops except tobacco, and the decade immediately following the war (August 1919 to July 1929) for tobacco. *Id*. This concept later became known as "parity," and the base period against which commodity prices are measured remains essentially the same today. 7 U.S.C. § 1301 (2011) (baseline period for parity calculation of January 1910 to December 1914 for everything but tobacco and a baseline period of August 1919 to July 1929 for tobacco); *see* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 3.

248. 1933 Act, § 8(1). The Act provided for similar agreements with processors, handlers, and others involved in the marketing or distribution of agricultural commodities. *Id.* § 8(2). The core provisions of the 1933 Act authorized the Secretary of Agriculture to enter into production agreements in which the federal government would make "rental or benefit payments" to commodity producers in return for their agreement to reduce acreage planted, production, or both, and accompanying authority to levy (or rebate) processing taxes on the first level of commodity processing, tied to amounts determined to match the market price for the commodity to the purchasing power for that commodity during the (Pre-World War I) parity period. *Id.* §§ 8–9.

249. Voluntary efforts by farm organizations to control production in order to stabilize prices has been unsuccessful since the 1920s. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 1.

250. The 1933 Act included a sunset provision triggered "whenever the President finds and proclaims that the national economic emergency in relation to agriculture has been ended . . . ." 1933 Act, § 13.

the intense human suffering of the Dust Bowl,[252] Congress continued to respond with massive emergency funding for disaster loans and other relief programs.[253] Following the 1936 Supreme Court decision in *United States v. Butler*, which invalidated the tax provisions of the 1933 Act,[254] Congress modified its intervention into the agricultural economy in the Soil Conservation and Domestic Allotment Act of 1936.[255] The 1936 Act established a precedent for using agricultural law to protect soil, water, and other environmental resources while also continuing efforts to control excess production by removing acreage from production.[256] Unlike its initial, temporary intervention into the agricultural economy, however, Congress established long-term institutions to implement the 1936 Act[257] and linked the soil conservation program to the Agricultural Adjustment Act.[258] Moreover, the soil conservation law directed the Secretary of Agriculture to expand domestic and foreign markets and to dispose of surplus commodities.[259] These linkages made it difficult to decouple federal agricultural and conservation policy.

The Soil Conservation Act failed to curtail production sufficiently to maintain prices,[260] leading Congress to pass the Agricultural

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251. "In 1934 . . . 1,457 counties in every State west of the Mississippi, except Washington, plus Wisconsin, Illinois, Indiana, and Michigan, were designated as drought-stricken." DYSON, *supra* note 233, at 2; *see also* DROUGHT OF 1936, *supra* note 11 (describing extent and severity of drought from 1930–36).

252. *See generally* JOHNSON, *supra* note 11 (detailing the plight of the farmer during the Dust Bowl); THE FUTURE OF THE GREAT PLAINS, *supra* note 11 (same).

253. *See, e.g.*, Emergency Appropriations Act of 1934, Pub. L. No. 73-412, 48 Stat. 1021, 1056 (1934) (appropriating $525 million for emergency loans to farmers for seed, feed, freight, fallowing and similar purposes). Congress also expanded the Act to include other agricultural products. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 4–10 (describing a variety of relief efforts).

254. United States v. Butler, 297 U.S. 1, 62–78 (1936).

255. Pub. L. No. 74-461, 49 Stat. 1148, 1148–52 (1936).

256. *See id.* § 7(a) (establishing a policy to preserve and improve soil fertility, to promote the economic use and conservation of land, to reduce the waste of national soil resources, and to protect rivers and harbors from soil erosion in order to protect navigability and to prevent floods); *id.* §§ 8(b)–(c), 15 (authorizing up to $500 million a year for aid to farmers engaged in approved soil conservation and restoration, erosion control, and similar practices).

257. *See id.* § 7(b)–(g) (establishing a system of cooperative federalism in which the Secretary of Agriculture would approve and issue grants to eligible state programs to administer the program).

258. *See id.* § 7(a) (referring to a goal of "maintenance of a continuous and stable supply of agricultural commodities adequate to meet consumer demand at prices fair to both producers and consumers").

259. *Id.* § 12.

260. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 11.

Adjustment Act of 1938.[261] The 1938 Act blended the loan-based parity concept of the 1933 Act with the direct grant approach in the 1936 Act[262] and added what would become a longstanding program of federal crop insurance.[263] The new law employed marketing quotas and commodity reserve storage to help achieve supply and parity price goals.[264] Along with the Agricultural Act of 1949,[265] the 1938 Act remains the "default" policy absent periodic agricultural legislation ("farm bills") that override those provisions during specific periods.[266] Several aspects of these new laws affect the balance between drought relief and risk reduction.

The 1938 Act provided that soil conservation grants in "arid or semiarid" regions (a term not defined in the statute) may include "water conservation and the beneficial use of water on individual farms . . . ."[267] Although designed to promote efficient water use, these grants facilitated investment in water storage and irrigation to develop agriculture in regions that otherwise could not support it. Although consistent with the Reclamation Act philosophy, this sent mixed signals about the risks of operating in arid regions. Congress also directed the Secretary of Agriculture to apportion funds based on acreage planted over the preceding decade, adjusted for "abnormal weather conditions and trends in acreage during the applicable period."[268] This method of apportionment provided incentives to plant during unfavorable weather. Payments were allotted based on the history of acreage seeded rather than crop yield, making productivity less relevant than total acreage for purposes of grant payments, and hence decisions about planting risk in dry years. Similarly, because base production was adjusted to account for abnormal weather, farmers could continue to plant in dry years without fear of reduced future payments.[269]

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261. Pub. L. No. 75-430, 52 Stat. 31 (1938).

262. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 12–15 (discussing the Act and its effects).

263. Pub. L. No. 75-430, §§ 501–18, 52 Stat. 31 (1938).

264. *Id.* §§ 311–56.

265. Pub. L. No. 81-439, 63 Stat. 1051 (1949).

266. *See* Kwan, *supra* note 99, at 577–79 (describing the 1938 Act and the 1949 Act as the two key "[p]ermanent [p]rovisions" of U.S. agricultural law).

267. Pub. L. No. 75-430, § 101, 52 Stat. 31 (1938) (amending Soil Conservation and Domestic Allotment Act § 8(b)).

268. *Id.* (amending Soil Conservation and Domestic Allotment Act § 8(c)(1)). Apportionment was based on the "acreage seeded for the production of the commodity during the ten calendar years immediately preceding the calendar year in which the national acreage allotment is determined . . . ." *Id.*

269. The Agricultural Adjustment Act of 1938 amended the Soil Conservation and Domestic Allotment Act to account for abnormal weather as follows:

> If, on account of drought, flood, insect pests, plant disease, or other

The 1938 Act continued the parity philosophy of the 1933 Act, but through loans and direct parity payments.[270] The new Commodity Credit Corporation administered the loans that, like those adopted during the Hoover Administration, were secured entirely by the crops.[271] Those became known as "non-recourse loans" because the government had no recourse on default other than selling the crops pledged as collateral. Non-recourse loans allowed producers to sell their crops, repay their loans, and retain the difference as profit; or if market prices were low, to repay the loan with the crops pledged as collateral. Adding to that risk subsidy, the Secretary of Agriculture compensated producers for the difference between actual receipts and expected parity prices.[272] Because parity payments were "in addition to and not in substitution for any other payments authorized by law,"[273] a producer could receive, for the same crop, direct conservation grants, loans subsidized only by the crops produced, and parity payments. In the aggregate, these programs significantly lowered the risk to farmers of planting during droughts.

The Act also established an elaborate system of marketing quotas for the five major commodity crops (tobacco, corn, wheat, cotton, and rice).[274] To prevent the indiscriminate dumping of commodities on the market, which depressed prices and the agricultural economy generally, Congress directed the Secretary to set quotas when supplies exceeded prescribed amounts deemed "abnormally excessive."[275] Congress explained that government quotas were necessary given production volatility due to "natural causes" (including drought) and the inability of large numbers of diversely located farmers to organize sufficiently in order to limit production.[276] In calculating quotas, however, drought and other natural causes were taken into account in two converse ways. First, "normal yield" was adjusted to account for "abnormal weather

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> uncontrollable natural cause, the yield in any year of such ten-year period is less than 75 per centum of the average (computed without regard to such year), such year shall be eliminated in calculating the normal yield per acre.

Id. (amending Soil Conservation and Domestic Allotment Act § 8(c)(5)).

270. *Id.* §§ 302–03.

271. *See id.* § 302(h) (eliminating personal liability of producers beyond the sale of the collateral absent fraudulent representations by the producer in obtaining a loan). Loans varied depending on crops and price conditions relative to parity prices. *See id.* § 302(b)–(d). Over time, Congress would amend parity levels repeatedly, often on a highly crop-specific basis, depending on both economic conditions and shifting political factors. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 16–40.

272. Pub. L. No. 75-430, § 302, 52 Stat. 31 (1938).

273. *Id.* § 303.

274. *Id.* §§ 311–56.

275. *See id.*

276. *See id.* §§ 311, 321, 331, 341, 351.

conditions," and years in which yields were reduced significantly were deleted.[277] Second, in calculating "[r]eserve supply level[s]," increments were added to guard against shortages caused by droughts, floods, or other conditions.[278] Thus, although Congress authorized quotas to prevent a "tragedy of the commons" phenomenon in which individual farmers increased production at the expense of market balance, the effect was to reduce the degree to which farmers considered the risk of drought.

Finally, Congress established a new program of agricultural insurance, through which the government assumed risks that the private insurance market deemed imprudent.[279] The program was administered by the Federal Crop Insurance Corporation (FCIC),[280] and it authorized the FCIC to insure wheat producers[281] "against loss in yields of wheat due to unavoidable causes, including drought . . . [and other] unavoidable causes . . . ."[282] Because of federal capitalization and the lack of private shareholders, federal crop insurance conferred subsidies, as compared to the private market, if private crop insurance was available at all. Moreover, because the law did not define "drought," payments were not limited to extreme conditions, leaving the magnitude of the subsidy to FCIC discretion. However, the program required farmers to base planting decisions on drought risk in some respects. The Act prohibited coverage of "losses due to the neglect or malfeasance of the producer or to the failure of the producer to reseed in areas and under circumstances where it is customary to reseed."[283] Insurance was limited to between 50% and 75% of the average yield of wheat on the farm for a representative base period, leaving between a quarter and half of the crop either uninsured or to the private insurance market.[284] Finally, the statute required premiums to be "fair and just"[285] and mandated that the corporation's capital stock could only be restored "out of operating profits of the Corporation."[286] Presumably, then, premiums had to suffice to meet expected payout obligations.

Compassion was one justification for New Deal intervention into U.S. agricultural markets. Congress reallocated risk to society at large

277. *See id.* § 301(b)(13).

278. *See id.* § 301(b)(14).

279. *See id.* § 508.

280. *See id.* § 503.

281. Congress initially limited federal crop insurance to wheat because of widespread failures of that crop during the droughts of the 1930s, *see id.* § 502, but later added other commodities.

282. *Id.* § 508(a).

283. *Id.*

284. *Id.*

285. *Id.* § 508(b).

286. *Id.* § 504(a).

from those whose livelihoods were disrupted by factors perceived to be beyond their control (such as drought). That rationale, of course, was the premise for broader social support mechanisms adopted in the United States during the 1930s.[287]

Several related economic rationales, however, also justified drought relief and other New Deal agricultural policies. When large numbers of farms or other businesses fail or decline in profitability due to drought or other unpredictable causes, secondary economic impacts to surrounding communities can be significant.[288] Drought relief rehabilitated regional economies, not only individual farmers. Moreover, to the extent that farmers produce basic life-support products, they assume the risk of drought on behalf of society. Although all businesses incur risks, society arguably has a greater interest in ensuring the continued supply of food and other life-support products. Moreover, businesses that face climate uncertainties incur significant risk beyond what is typical for many other businesses. A *laissez-faire* approach requires farmers to internalize that risk just like any other business. But weather and climate risk may be less amenable to prediction than other forms of business risk, and that uncertainty will only increase due to climate disruption. In addition, the federal government intervened in agricultural markets because producers were not responding effectively to imbalances between supply and demand. Even in the face of declining demand and prices, individual farmers maintained or expanded production to augment earnings and to meet debt obligations.[289] Overproduction not only exacerbated the economic crisis by flooding the market when prices were already low, but it also damaged soil, water, and other resources, thus increasing vulnerability to drought.

Viewed solely from the perspective of drought policy, the New Deal programs sent mixed messages to farmers. By abandoning the *laissez-faire* approach, the new policies injected significant distortion into the agricultural economy in ways that reduced incentives to avoid farming in drought-prone regions, or to do so in sustainable ways,[290] thus

287. *See* BRANDS, *supra* note 233, at 297–98 (discussing federal measures during the opening days of Roosevelt Administration to alleviate the human consequences of bank failures, as an alternative to free market approach); Opie, *supra* note 11, at 250 (discussing the New Deal's efforts to quell the economic damage suffered by the farmers of the 1930s).

288. During the Dust Bowl, drought impacts extended far beyond the boundaries of the farm to the entire banking, real estate, and financial infrastructure of affected regions. *See supra* Subsection I.C.1.

289. *See* JOHNSON, *supra* note 11, at 167, 179, 181 (observing that farmers planted in the hope of better conditions).

290. Such practices might include planting drought-resistant crops or crop varieties, cultivating only in productive soils, using water-efficient tilling and irrigation methods,

increasing long-term drought vulnerability. To the extent that New Deal policies relied on loans that required repayment in cash or commodities, crop insurance that required payment of premiums, and conservation payments tied to planting allotments and quotas, the programs required farmers to internalize some of the risk of drought. On the other hand, producers' risk decisions were distorted by guarantees such as direct parity payments, subsidies through below-market crop insurance rates, loan liability limited to the value of the crops as collateral, and the adjustment of production levels to account for drought and other losses.

Two factors might have caused Congress to abandon price supports and production controls as the Great Depression ended. Demand for agricultural commodities skyrocketed during World War II due to production declines in the war zones, and the 1930s droughts gave way to favorable weather during the 1940s.[291] However, to encourage high wartime production and ensure that farmers shared in profits generated by the war, Congress actually *increased* loan rates and price supports during the war, as well as the number of commodities covered.[292] Although wartime programs did not alter U.S. drought and agricultural policy, they hinted that temporary programs adopted to address the drought and depression would give way to the permanent decoupling of U.S. agriculture from free market forces.

c. Postwar Drought and Agricultural Policy

U.S. drought and agricultural policies during the Cold War continued to send mixed signals about the degree to which farmers should internalize drought risk into production decisions. Despite the end of the market crisis and volatility generated by the Great Depression (crop surpluses) and World War II (crop shortages), Congress did not withdraw from wide-scale federal intervention into agricultural markets. However, with respect to drought relief specifically, the postwar period reflected a tension between the return to the free market approach during the Eisenhower Administration and the growing interest in public disaster preparedness as an overall Cold War strategy.

Beginning in the 1950s, many aspects of federal drought policy were tied to legislation governing other disaster relief.[293] This trend began in 1950 with Public Law 81-875,[294] which created the familiar process

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fallowing acreage during the worst droughts, and diversifying the farm economy rather than relying exclusively on monocultures of commodity crops.

291. *See* Opie, *supra* note 11, at 251; JOHNSON, *supra* note 11, at 267–76.

292. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 16–17.

293. *See* DYSON, *supra* note 233, at 3.

294. Pub. L. No. 81-875, 64 Stat. 1109 (1950). Dyson asserts that Congress passed this law, in part, in response to the Cold War threat of nuclear attack. DYSON, *supra* note 233, at 3.

under which state governors may request, and presidents may declare, disasters[295] "of sufficient severity and magnitude to warrant disaster assistance by the Federal Government to supplement" state and local efforts and resources.[296] Because the law provided no additional guidance on the nature, severity, geographic extent, or duration of disasters sufficient to warrant an emergency declaration, the law conferred tremendous discretion on the President to decide "how bad is bad enough" to justify federal disaster assistance.[297]

Public Law 81-875 did not provide financial payments or other monetary relief, but authorized the federal government to provide equipment, supplies, personnel, distribution of food and medicine; and to protect lives and property, make emergency repairs, and temporarily replace public facilities.[298] However, in later disaster relief statutes, Congress authorized loans and other financial relief for areas in which the President issued a disaster declaration.[299] Although these measures constituted a subsidy to the extent that they provided credit not available on the private market,[300] they did so only through loans rather than outright grants or relief payments, and with a provision specifically designed to limit assistance to operations that remained viable. This pattern continued in subsequent targeted drought and disaster relief bills through the 1970s,[301] including the Disaster Relief Act of 1974 (the

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However, the legislative history indicates that the law was designed to provide a framework for federal assistance during "a major peacetime disaster." *See* S. REP. NO. 2571 (1950), *reprinted in* 1950 U.S.C.C.A.N. 4023, 4024.

295. The statute's definition of "major disaster" includes drought as well as other weather-related disasters. *See* Pub L. No. 81-875, § 2(a), 64 Stat. 1109, 1109–10.

296. *Id*.

297. *Id.* § 5.

298. *Id.* § 3.

299. *E.g.*, Pub. L. No. 83-115, 67 Stat. 149, 149–50 (1953) (authorizing "loans to established farmers and stockmen"). In response to protracted drought in the south-central states, Congress authorized the Secretary of Agriculture to make temporary loans to farmers and stockmen in areas covered by presidential declarations of disasters, and for which commercial credit was not available. *See* H.R. REP. NO. 714 (1953), *reprinted in* 1953 U.S.C.C.A.N. 1867, 1868–69. Congress limited loans, however, to operators who had "a reasonable chance of working out of their difficulties with supplementary financing," and for feed and seed in connection with any disaster determination. *Id.* at 1867–68.

300. *See* H.R. REP. NO. 714, at 1870–71 (citing concerns when cattle price declines increase risk of loan defaults).

301. *See, e.g.*, Disaster Relief Act of 1966, Pub. L. No. 89-769, § 3, 80 Stat. 1316, 1316 (1966) (authorizing Secretary of Agriculture to adjust federal loans in areas affected by disaster declarations under Public Law 81-875); Disaster Relief Act of 1970, Pub. L. No. 91-606, §§ 231–32, 84 Stat. 1744, 1752–53 (1970) (authorizing disaster loans to small business and farmers and the cancelation or modification of loans); Emergency Livestock Credit Act of 1974, Pub. L. No. 93-357, §§ 2(a), 3(a)–(c), 88 Stat. 391, 391–92 (1974) (authorizing federal loan guarantees to "bona fide farmers and ranchers who are primarily and directly engaged in agricultural production" to support livestock operations where commercial credit is not

Stafford Act),[302] which comprehensively revised and broadened the scope of federal relief for all kinds of disasters, including drought.[303] Furthermore, the Act retained but modified the basic format of gubernatorial request and presidential declaration of disaster emergencies and major disasters.[304]

Similarly, federal agricultural policy continued to provide both incentives and disincentives to reducing drought vulnerability. Immediately after World War II, ongoing federal intervention into the agricultural economy was hardly a foregone conclusion. Just as Congress intended that the New Deal agricultural program would expire when the economic emergency subsided, it provided that wartime agricultural subsidy programs would terminate two years after the end of hostilities.[305] When the time of reckoning arrived, however, Congress determined that the absence of the wartime stimulus not only supported continuation of the program, but did so with even higher levels of subsidies.[306] With the Agricultural Act of 1949,[307] Congress reaffirmed the dual goals of production controls and parity prices. Despite ongoing structural changes in U.S. agriculture from a large number of small farms to an increasing concentration of farms and products,[308] the postwar decision to continue price supports and production controls occurred without a fundamental reconsideration of whether the agricultural sector could now self-regulate production in response to prices better than it had during previous eras.

If anything, federal agricultural programs expanded in the postwar era. The 1949 Act authorized the Secretary of Agriculture to continue agricultural price supports via loans, purchases, or other methods, with

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available, where additional financing is "absolutely essential in order for the loan applicant to remain in business," and where there is a "reasonable probability" of meeting the Act's objectives and of loan repayment).

302. Pub. L. No. 93-288, 88 Stat. 143 (1974) (codified as amended in scattered sections of 42 U.S.C.).

303. The definitions of both "emergency" and "major disaster" include drought. A "major disaster" declaration authorizes the President to provide assistance beyond emergency services. *Id.* § 102(1)–(2).

304. *See id.* § 301.

305. *See* S. REP. NO. 81-1130 (1949), *reprinted in* 1949 U.S.C.C.A.N. 2407, 2408.

306. "[I]t is imperative that the program be placed on a permanent, peacetime basis beginning in 1950 principally because the extraordinary demands for American agricultural production during the war period have largely ceased to exist." *Id.* With respect to subsidy levels, the Report also noted "the range of support levels from 52 to 75 percent of parity for the basic commodities contained in that act is much too low for effective use now." *Id.*

307. Pub. L. No. 81-439, 63 Stat. 1051 (1949).

308. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 46; CAROLYN DIMITRI, ANNE EFFLAND, & NEILSON CONKLIN, U.S. DEPT. AGRICULTURE, ECONOMIC RESEARCH SERVICE, ECON. INFO. BULL. NO. 3, THE 20TH CENTURY TRANSFORMATION OF U.S. AGRICULTURE AND FARM POLICY 2, 5 fig.3 (2005).

strong preferences to producers who cooperate with established, crop-specific marketing quotas, but with even higher minimum and maximum levels of support relative to the parity price.[309] Moreover, in addition to "basic agricultural commodities,"[310] the 1949 Act added specified "nonbasic agricultural commodities" at different support levels.[311] Otherwise, Congress largely reaffirmed the basic precepts of the existing statutes.[312]

The Cold War also increased incentives to expand international markets in friendly nations at the expense of Communist countries. In the Agricultural Trade Development and Assistance Act of 1954,[313] Congress authorized the President to negotiate agreements with "friendly nations or organizations of friendly nations"[314] to sell "surplus agricultural commodities [in return] for foreign currencies,"[315] and to use those currencies to further develop agricultural markets, among other purposes.[316] Although motivated mainly by foreign policy,[317] this

309. Agricultural Act of 1949, Pub. L. No. 81-439, § 101, 63 Stat. 1051, 1051 (1949). Within legislatively mandated ranges of price supports, the Secretary was given discretion to establish support levels based on a series of factors, including: (1) the relationship between supply and demand; (2) price supports for other commodities; (3) funding levels; (4) the perishable nature of each commodity; (5) the importance of each commodity to agriculture and the national economy; (6) marketability of stocks collected by the government; (7) needs to offset export losses; and (8) producer willingness to control supplies relative to demand. *Id.* § 401(b).

310. These now included corn, cotton, peanuts, rice, tobacco, and wheat. *See id.* § 408(c) (adding peanuts to the five commodities included in the 1938 Act).

311. These included wool, tung nuts, honey, Irish potatoes, milk, butterfat, and milk and butterfat products, at different specified prices. *See id.* §§ 201, 301–02.

312. *See, e.g.*, *id.* § 401(c) (authorizing Secretary to condition assistance on compliance with production goals and marketing quotas); *id.* § 402 (authorizing increased support when necessary to assure adequate supplies for purposes of national welfare or national security); *id.* § 405 (limiting producer liability to the value of the crops used as collateral to secure loans); *id.* § 408(h) (allowing Secretary to modify the calculation of "normal supply" due to "abnormal conditions"). High, fixed-price supports continued during the Korean War, again to stimulate wartime production. *See* HISTORY OF AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 20–21.

313. Pub. L. No. 83-480, 68 Stat. 454 (1954).

314. The Act defined "friendly nation" to mean "any country other than (1) the U.S.S.R., or (2) any nation or area dominated or controlled by the foreign government or foreign organization controlling the world Communist movement." *Id.* § 107.

315. *Id.* §§ 101–02.

316. *Id.* § 104.

317. *See id.* § 201 (authorizing the President to use surplus agricultural commodities to meet "famine or other urgent relief requirements" to "friendly peoples" or to "friendly but needy populations without regard to the friendliness of their government"); *id.* § 304 (directing the President "(1) to assist friendly nations to be independent of trade with the U.S.S.R. or nations dominated or controlled by the U.S.S.R. for food, raw materials and markets, and (2) to assure that agricultural commodities sold or transferred [under the Act] do not result in increased availability of those or like commodities to unfriendly nations"); *see also* H.R. REP. NO. 1776

strategy continued to shift the focus from curtailing agricultural production to encouraging domestic surpluses for international trade.[318]

Nevertheless, Congress continued price supports and production controls for commodity crops, but with fine-tuning through periodic "farm bills," typically in five-year intervals, which reauthorized but modified the commodity-specific "permanent provisions" of earlier law.[319] Congress continued to assert that federal price supports and production controls were essential to the national economy and that without them, increased productivity per acre would outstrip demand, causing prices to plummet, agricultural markets to collapse, and farms to fail.[320] Therefore, farm legislation during this period tried to balance the goal of matching supply and demand to maintain stable prices with the goal of expanding export markets. In the 1970 farm bill, for example, Congress maintained but specified price supports and planting limitations established in earlier law[321] and extended the export development policy.[322] Federal crop subsidies continued to offset farming risk so long as producers planted the specified amount of acreage, which was fixed based on past planting patterns rather than current conditions.[323]

Thus, despite the return to economic prosperity and more

(1954), *reprinted in* 1954 U.S.C.C.A.N. 2509, 2509 (noting that the main purpose of legislation was "to authorize the President to use agricultural commodities to improve the foreign relations"). This was not the first time agricultural price supports were used in foreign policy. During World War II, price supports supported the war effort by providing food and fiber to the United States and its allies. *See* S. REP. NO. 1130, *supra* note 304, at 2407–08.

318. H.R. REP. NO. 1776, *supra* note 316, at 2510 ("Thus, our farm productive capacity now is running in excess of current market demands. A major factor has been the reduction in exports from the postwar peak . . . . Our goal in the trade section of this legislation is to reverse this trend of restricted exports by expanding world outlets.").

319. *See* Agriculture Act of 1970, Pub. L. No. 91-524, 84 Stat. 1358; Food and Agriculture Act of 1965, Pub. L. No. 89-321, 79 Stat. 1187; Agricultural Act of 1961, Pub. L. No. 87-128, 75 Stat. 294; Agricultural Act of 1956, Pub. L. No. 84-540, 70 Stat. 188.

320. *See, e.g.*, S. REP. NO. 687 (1965), *reprinted in* 1965 U.S.C.C.A.N. 3957, 3959–60 ("Action . . . to extend and augment farm commodity programs is imperative. The entire economy as well as the farm segment will benefit from such action and would suffer for lack of it.").

321. Agriculture Act of 1970, Pub. L. No. 91-524, §§ 401–02, 84 Stat. 1358, 1362 (amending the Agriculture Act of 1949 with respect to wheat); *id.* § 501 (same, with respect to feed grains); *id.* §§ 601–02 (same, with respect to cotton).

322. *See id.* § 701.

323. *See, e.g.*, *id.* § 402 (amending section 379c of the Agricultural Adjustment Act of 1938 to exempt wheat allotment acreage not planted due to disasters or other conditions beyond producer control). The Secretary was again instructed to exclude from calculations of allotments acreage not planted due to drought and other "natural disaster" or "condition beyond the control of the producer," *see, e.g.*, *id.* (amending sections 379b and 379c of the Agricultural Adjustment Act of 1938), further minimizing the relevance of such risk factors in producer planting decisions. The 1970 law, however, limited total crop subsidies under the Act to $55,000 per person. *Id.* § 101(1).

conservative leadership after World War II, Cold War disaster-planning mentality, foreign policy motivations, and farmers' expectations of ongoing government support led Congress to perpetuate the price supports and production controls begun during the New Deal. These factors also led to a patchwork of federal disaster relief efforts relating to droughts. Drought relief continued to focus on loans, ensuring that producers continued to bear some risk of bad weather, and thus had some incentive to take drought risk into account in planting decisions. However, federal commodity programs likely overwhelmed incentives in loan-based disaster relief efforts in terms of their effect on producer planting decisions. Virtually guaranteed income, on top of additional subsidies provided by crop insurance and disaster loans, significantly reduced the need for farmers to incorporate the risk of loss into production decisions. Moreover, farm bill programs encouraged farmers to plant commodity crops at the expense of a more diverse and more drought-tolerant mix of crops.

d. The "Free Market" Evolution of U.S. Agricultural Law and Policy

U.S. agricultural laws and policies morphed during the 1970s and 1980s in ways that increased incentives for overproduction and unsustainable farming practices,[324] including expanded production in regions that face increased water scarcity. Those policies, boosted by massive federal subsidies to flood the world market with cheap commodity crops, now encourage U.S. farmers to expand production of commodity crops, even during times of plummeting global commodity prices and significant resulting reductions in net farm income.[325] In the long run, absent a shift to more sustainable practices, those incentives could render farmers in the Great Plains and other regions more vulnerable to drought, whether induced by climate disruption or otherwise, just as they were in the late 1920s and early 1930s.[326]

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324. *See* Jennifer Hoffpauir, *The Environmental Impact of Commodity Subsidies: NEPA and the Farm Bill*, 20 FORDHAM ENVTL. L. REV. 233, 234, 244–56 (2009) (evaluating adverse environmental impacts of farm subsidies); Kwan, *supra* note 99, at 571–72 (referring to 1973 changes as a "fundamental transition, shifting . . . from a loan-based system of controlling prices to a payment-based system emphasizing production"); Davidson, *supra* note 100 (discussing the detrimental farming policies creating during the 1980s); Angelo, *supra* note 100 (discussing current problematic agricultural practices, as well as the laws which seem to incentivize those practices).

325. *See* DENNIS KEENEY & LONI KEMP, A NEW AGRICULTURAL POLICY FOR THE UNITED STATES 7–11 (2003); DARYLL E. RAY ET AL., RETHINKING U.S. AGRICULTURAL POLICY: CHANGING COURSE TO SECURE FARMER LIVELIHOODS WORLDWIDE 9–14 (2003); Eubanks, *supra* note 76, at 10,496–97.

326. Those policies simultaneously increase vulnerability of farmers in developing countries, who cannot compete with the flood of cheap commodities from the United States and Europe. *See* RAY ET AL., *supra* note 325, at 11, 13.

Secretary of Agriculture Earl Butz promoted the first and most dramatic shift in U.S. agricultural law and policy during the early 1970s. Butz advocated for consolidating small farms into larger agribusinesses and planting available farmland "from fencerow to fencerow" in order to lower food prices and to further expand U.S. export markets.[327] Those arguments persuaded Congress to change the focus of U.S. farm policy in the Agriculture and Consumer Protection Act of 1973.[328] Although the 1973 Act and later farm bills established a phenomenally complex, interwoven set of programs based on a combination of economic tools, it minimized the role of parity price supports[329] in favor of a new program of target prices and deficiency payments. This new program was designed to ensure certain levels of revenue for major commodity producers, with guaranteed adjustments for drought and other disasters.[330] From the 1930s through the 1960s, Congress approved significant federal subsidies,[331] but nevertheless forced farmers to internalize at least some of the risks of planting decisions. The virtually guaranteed price subsidies in the 1973 Act further reduced incentives for planters to account for drought risk in deciding what to plant and when. Ironically, although the program was sold as a "free market" approach to agricultural policy because it allowed prices to fluctuate based on actual market supply and demand rather than government dictates,[332] it functions as anything *but* a free market from the perspective of the government's increased subsidization of U.S agriculture.

Although others have traced the complicated history of subsequent farm bills,[333] Congress has retained the direct payment approach to farm subsidies, combined with a new set of loan provisions that further reduce farmer planting risk regardless of weather or market conditions.[334] For several farm bill cycles, Congress retained the dual system of loans plus deficiency payments, with crop-specific fine-tuning based on market conditions and political pressures.[335] In the

327. *See* Kwan, *supra* note 99, at 580.

328. Pub. L. No. 93-86, 87 Stat. 221 (1973); *see id.* § 815(d) (directing Secretary of Agriculture to encourage U.S. farmers to maximize production); HISTORY OF AGRICULTURAL PRICE SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 29–31 (discussing the Act and its effects).

329. *See* § 101(1), 87 Stat. at 221 (lowering price support limit to $20,000).

330. *See, e.g.*, *id.* § 206(8)(A) (amending Act to provide for wheat deficiency payments, with disaster adjustments).

331. *See* HISTORY OF AGRICULTURAL PRICE SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at iv–v (summarizing the major agricultural legislation).

332. Pub. L. No. 93-86, 87 Stat. 221 (1973).

333. *See* Angelo, *supra* note 100, at 623–29; Kwan, *supra* note 99, at 572, 580–87.

334. *See* Hoffpauir, *supra* note 324, at 245.

335. *See* HISTORY OF AGRICULTURAL PRICE SUPPORT AND ADJUSTMENT PROGRAMS, *supra*

Food Security Act of 1985,[336] Congress added "[m]arketing loans"[337] that allow farmers to store commodities when prices are low and to repay the loans when the market improves.[338] In the Federal Agriculture Improvement and Reform Act of 1996 (FAIRA),[339] Congress replaced target prices and deficiency payments with "production flexibility contracts" in which farmers received guaranteed direct payments tied to their contract acreage. Congress later augmented FAIRA with additional emergency payments when market conditions failed to improve.[340] In the Farm Security and Rural Investment Act of 2002,[341] Congress added "counter-cyclical" payments when commodity prices fell below statutory targets based on historical averages.[342]

All of these changes since 1973 could reduce drought vulnerability in some ways while increasing it in others. Direct payments, marketing loans, and countercyclical payments offset the risk farmers take in meeting society's need for food and fiber, thus meeting Congress' long-term goal of stabilizing farm income while ensuring a sufficient and reasonably priced food supply. Moreover, by basing direct payments on historical acreage rather than actual production, Congress gave farmers the flexibility to fallow lands under poor conditions and to still receive some income for that acreage.[343] On the other hand, those guarantees have encouraged overproduction of statutory commodity crops.[344] Among other social, economic, and environmental problems caused by those incentives,[345] agricultural subsidies promote crop selection based on subsidies rather than climatic or other environmental factors, and planting decisions based on guaranteed payments rather than water supply and soil conditions.

Federal production limits and land conservation programs begun in the 1938 Soil Conservation Act provide counterincentives, through voluntary programs to protect sensitive acreage and curtail production. Those included the "Soil Bank" program established temporarily in

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note 237, at 32, 37 (describing both the Food and Agriculture Act of 1977 and the Agriculture and Food Act of 1981).

336. Pub. L. No. 99-198, 99 Stat. 1354 (1985).

337. *See* Kwan, *supra* note 99, at 582 ("Marketing loans first came into effect with the Food Secuirty Act of 1985.").

338. *See id.* §§ 308, 501, 601 (detailing this process for wheat, cotton, and rice, respectively); Kwan, *supra* note 99, at 582. Congress continued that program in the 1996 law. *See id.*

339. Pub. L. No. 104-127, 110 Stat. 888 (1996).

340. *See* Kwan, *supra* note 99, at 581–82.

341. Pub. L. No. 107-171, 116 Stat. 134 (2002).

342. *See* Hoffpauir, *supra* note 324, at 238–39; Kwan, *supra* note 99, at 583–84.

343. *See* Hoffpauir, *supra* note 324, at 238.

344. *See* Kwan, *supra* note 99, at 585.

345. *See id.* at 586 & n.112; Angelo, *supra* note 100, at 602–13.

1956[346] and a wide range of more recent programs[347] for which Congress has increased funding in recent decades.[348] Those programs could serve as tools for federal drought prevention policy by conditioning subsidies on sustainable water use. However, agricultural conservation provisions have received mixed reviews in terms of their effectiveness in protecting the environment.[349] Ultimately, the question is whether incentives to reduce drought vulnerability through conservation programs can override stronger incentives to continue excess production of commodity crops, given the vastly higher funding levels Congress has devoted to those programs[350] and ongoing efforts to expand U.S. agricultural export markets. Moreover, none of the existing conservation programs focus primarily on water use.

e. Ongoing Problems in Federal Agricultural and Drought Policy

From the perspective of reducing drought vulnerability, not much has changed in federal agricultural or drought law and policy since the 1970s. Congress largely continued the "free market" policies begun in 1973 in the most recent farm bill, the Food, Conservation, and Energy Act of 2008.[351] New incentives to grow corn for biofuels reinforce those free market policies.[352]

To the extent that Congress has adopted drought-specific legislation, it has fallen prey to the "hydro-illogical cycle"[353] and has tended to do so on an ad hoc basis in response to individual droughts, with the response proportional to the pressure from constituents for relief.[354]

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346. *See* HISTORY OF AGRICULTURAL PRICE SUPPORT AND ADJUSTMENT PROGRAMS, *supra* note 237, at 22.

347. *See* Angelo, *supra* note 100, at 629–32 (discussing various modern programs, including the 2008 Farm Bill, the Environmental Quality Incentives Program, and the Agricultural Management Assistance Program).

348. *See id.*; Davidson, *supra* note 100, at 5, 36 (noting increased funding for conservation programs in 2002 farm bill).

349. *See* Angelo, *supra* note 100, at 632 (arguing that agricultural conservation programs fail to "address the overarching environmental concerns associated with industrial commodity production"); Hoffpauir, *supra* note 324, at 245–46 (explaining problems with Conservation Reserve Program and reporting significant declines in enrolled CRP acreage between 2007 and 2010, and significant conversion of grassland to cropland).

350. *See, e.g.*, Davidson, *supra* note 100, at 37 (estimating in 2003 that only 18% of farm bill payments support conservation); Hoffpauir, *supra* note 324, at 236, 246 (reporting that, out of $92.9 billion in farm support under the 2002 Farm Bill, the vast majority ($72.9 billion) was for commodity support programs (citing RALPH M. CHITE, CRS REPORT FOR CONGRESS: FARM BILL BUDGET AND COSTS: 2002 VS. 2007, at 2 (2007), *available at* http://www.policyarchive.org/handle/10207/bitstreams/18788.pdf)).

351. Pub. L. No. 110-246, 122 Stat. 1651 (2008); *see also* Angelo, *supra* note 100, at 625.

352. *See* Angelo, *supra* note 100, at 633–37.

353. DROUGHT AND WATER CRISIS, *supra* note 23, at 54.

354. *See* NATIONAL STUDY OF WATER MANAGEMENT DURING DROUGHT, *supra* note 27, at

Drought management experts and government agencies and commissions have continued to criticize this practice as producing relief measures that are ineffective, poorly coordinated, and short-term and reactive in focus.[355] An ad hoc, emergency-oriented legislative practice also distorts whatever risk allocation principles and incentives for sustainability may be included in state or federal water law. When legislatures pass drought relief solely in response to individual crises, it is too late to adopt policies to require or encourage water users to engage in sound risk management and more sustainable practices. Especially given political pressure to help desperate constituents, emergency legislation inevitably focuses almost entirely on providing compassionate physical and financial relief.

Comprehensive federal drought legislation was proposed in Congress in 2003[356] in response to findings of the National Drought Policy Commission,[357] but has not been enacted to date. Congress has, however, adopted discrete provisions that move in the direction of a more coherent federal drought policy.[358] Legislation adopted independently of any particular drought could focus on risk reduction by promoting sustainable water use and management in advance of a crisis, in addition to addressing drought planning, forecasting, communication, and coordination. Such proactive legislation could also expressly condition drought relief on the adoption of responsible risk-reduction measures. An anticipatory approach is more objective because it separates long-term policy decisions from impacts to particular constituents. Of course, the necessary corollary would be subsequent legislative discipline—that is, Congress would need to avoid the inclination to bail out those who fail to respond to the incentives in the omnibus legislation.

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26 tbl.III (identifying major federal and state legislation passed during the late 1980s drought). *See generally* DYSON, *supra* note 230 (providing history of federal drought relief legislation).

355. *See, e.g.*, PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23; FEDERAL EFFORTS TO MONITOR AND COORDINATE RESPONSES TO DROUGHT, *supra* note 82.

356. S. 1454, 108th Cong. (2003).

357. PREPARING FOR DROUGHT IN THE 21ST CENTURY, *supra* note 23, at 35.

358. *See, e.g.*, 15 U.S.C. § 313d (2006) (authorizing the Secretary of Commerce to establish a National Integrated Drought Information System to collect and synthesize data to provide and communicate early drought warnings); 33 U.S.C. § 2267a (2006) (authorizing Secretary of the Army to assess drought and other water resource needs, and to prioritize federal projects, on a river basin or watershed basis); 42 U.S.C. § 5131 (2006) (authorizing the President to create a federal disaster preparedness plan, and to assist states, through grants and otherwise, in developing and implementing state disaster preparation plans); 42 U.S.C. § 10367 (2006) (establishing National Streamflow Information Program within U.S. Geological Survey, including goal of better understanding hydrologic extremes like droughts); 43 U.S.C. §§ 2215, 2222–23 (2006) (authorizing the Secretary of the Interior to work with state, federal, and local officials to create drought contingency plans in Reclamation Act states).

The ability of federal drought relief programs to reduce vulnerability has also been plagued by the same absence of consistent definitions characteristic of other areas of water and drought law. In response to serious droughts during the mid-1970s, for example, a federal interagency committee designated counties eligible for federal relief absent any clear legal standard or guidance.[359] Presumably in the face of political pressure, two-thirds of the Nation's counties were designated drought disaster areas, making them eligible for federal relief.[360] That unguided approach likely resulted in undeserving aid recipients and spread resources so thinly that others may not have received necessary aid.

During the 1970s, federal agencies also applied differing drought definitions to identify eligible aid recipients.[361] Although varying criteria may be appropriate for different relief, critics suggested that those differences were more ad hoc than well-considered.[362] Federal agencies continue to use different criteria for determining eligibility for drought relief or assistance.[363] On the other hand, there has been a move to systematize and coordinate dissemination of drought information through projects such as the U.S. Drought Monitor,[364] the North American Drought Monitor,[365] and the Seasonal Drought Outlook.[366] Although these efforts do not provide legally binding drought definitions, they help create common standards and nomenclature for understanding and communicating drought information.

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359. *See* MANAGING RESOURCE SCARCITY, *supra* note 122, at 20–22.

360. *See id.*; FEDERAL EFFORTS TO MONITOR AND COORDINATE RESPONSES TO DROUGHT, *supra* note 82, at 2; COMPTROLLER GEN. OF THE U.S., FEDERAL RESPONSE TO THE 1976–77 DROUGHT: WHAT SHOULD BE DONE NEXT? 2 (1979) [hereinafter FEDERAL RESPONSE TO THE 1976–77 DROUGHT].

361. *See* FEDERAL RESPONSE TO THE 1976–77 DROUGHT, *supra* note 360, at 17.

362. *See id.*

363. *See, e.g.*, 7 U.S.C. § 1531(d)(1)(B) (2006) (authorizing the Secretary of Agriculture to establish drought monitor to classify drought severity); 19 U.S.C. § 2497(d)(1)(B) (2006) (establishing drought monitor system to classify drought severity for customs purposes); 43 U.S.C. § 2214 (2006) (authorizing the Secretary of the Interior to determine eligibility for drought assistance from Bureau of Reclamation under § 2213).

364. *See* U.S. DROUGHT MONITOR, http://drought.unl.edu/dm (last visited Oct. 3, 2011). This tool is designed to provide a comprehensive assessment of drought conditions across the country at particular points in time. *See* MICHAEL J. HAYES ET AL., *Drought Monitoring: New Tools for the 21st Century*, *in* DROUGHT AND WATER CRISIS, *supra* note 23, at 53, 54, 58.

365. *See* N. Am. Drought Monitor, Nat'l Oceanic & Atmospheric Admin., *North American Drought Monitor Overview*, NOAA, http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/ (last visited Oct. 3, 2011) (describing the Monitor's success rate at "assessing and communicating the state of drought in the US [sic] on a weekly basis").

366. *See* Nat'l Weather Serv. Climate Prediction Ctr., *U.S. Seasonal Drought Outlook*, NATIONAL WEATHER SERVICE, http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html (last visited Oct. 3, 2011) (providing seasonal drought assessments).

CONCLUSION: BALANCING COMPASSION AND RISK IN A DISRUPTED CLIMATE

In a disrupted climate, agriculture and certain other economic sectors will be forced to undertake increased risks caused by other economic activities. Although agriculture contributes to climate disruption,[367] it is arguably inequitable to require one economic sector to internalize a disproportionate share of external costs of global problems generated by many others. This inequity is particularly true for an economic sector like agriculture, which provides many of society's basic necessities. Whether induced by compassion, politics, or other factors, efforts are (and will be) made to compensate those who bear an unfair burden on behalf of society at large. However, measures to spread the risk of climate disruption could have the negative effect of increasing vulnerability by subsidizing activities that will eventually increase drought and other risks. In this regard, drought and other disaster response policies that might be appropriate for occasional and difficult-to-foresee events may no longer be appropriate for conditions that will now occur with increasing frequency due to climate disruption.

One role of law is to allocate risk fairly and in a way that achieves sound public policy goals. A second role of law is to promote or require behavioral changes deemed beneficial to the community. These functions of law suggest that climate adaptation strategies should reflect a considered judgment about the appropriate balance between compensating victims of climate disruption and reducing long-term vulnerability. In the case of climate-induced changes in drought frequency, severity, and geographic scope, identifying this balance will require a serious rethinking of drought law and policy and of more fundamental aspects of water and agricultural law and policy, as well.

In establishing programs to provide drought relief, the definition of drought should be based on consistent policy decisions about how the risk of water shortages should be distributed. Declaring drought (and providing relief) too readily can discourage prevention and risk reduction, while declaring drought too late can result in significant hardship and secondary impacts. Thus, any comprehensive federal drought legislation should identify consistent *principles* governing when federal drought relief or other responses should be triggered.[368] Moreover, drought relief can be effectively balanced against risk reduction goals by providing relief only to those who take appropriate

367. *See* KEITH PAUSTIAN ET AL., AGRICULTURE'S ROLE IN GREENHOUSE GAS MITIGATION *passim* (2006); Angelo, *supra* note 100, at 612–13.

368. Given the complexity of drought monitoring and definitions, it is probably necessary to delegate the task of adopting specific numeric drought criteria to administrative agencies. Moreover, regional variation may be necessary to reflect the diversity of climatic, hydrological, and other conditions in the United States.

measures to reduce vulnerability, such as switching to low water demand crops in drought-prone regions or improving irrigation or other water-use efficiency.

However, those improvements alone, although extremely important, may be too narrow to address the increasing frequency and severity of drought that may accompany climate disruption. Underlying patterns of human land and water use will increase water demand and thus exacerbate the effects of reduced water supply.[369] The impact of use patterns on water supply suggests a need for broader changes in the laws and policies affecting the places, purposes, and efficiencies of water use. Although water law has long been criticized for protecting existing uses at the expense of efficiency and shifting societal needs and preferences,[370] changes that increase incentives to use water more sustainably and to eliminate impediments to water transfers will become even more important. Moreover, it may be preferable to adopt drought-neutral approaches to water law, or to condition any changes to water rights during drought on prior efforts to reduce drought vulnerability. Providing relief from the regular requirements of water law in the case of drought may protect existing uses in times of shortage, but it does so at the expense of long-term vulnerability.

Finally, although agriculture is just one of the many economic sectors in which water use efficiency is important to drought vulnerability and severity, it is the area of federal law that has historically been most closely associated with federal drought policy and response. In many parts of the United States, agriculture is the largest consumptive water user, and yet it is also the user most likely to be adversely affected by drought. Therefore, broader changes in agricultural law and policy are necessary to reduce drought vulnerability in the face of climate disruption. Rather than continuing to promote excess production of a predetermined set of commodity crops irrespective of climatic and other conditions, federal agricultural law should promote production of the most appropriate crops based on water supply, temperature, and other conditions in particular regions in the face of climate disruption. If federal agricultural law and policy, along with its massive historic subsidies, continues to serve as the primary factor motivating economic decisions about what crops to plant and where, changes to water and drought law and policy will play, at best, only a limited role in reducing drought vulnerability.

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369. *See* Donald A. Wilhite & Margie Buchanan-Smith, *Drought as Hazard: Understanding the Natural and Social Context*, *in* DROUGHT AND WATER CRISIS, *supra* note 23, at 10 (discussing "human-induced drought" where demand exceeds supply even during times of normal precipitation); COPING WITH WATER SCARCITY, *supra* note 7, at 8–10 (distinguishing between natural conditions leading to drought and human-induced water shortages).

370. *See* Wilkinson, *supra* note 95.

U.S. water, drought, and agricultural law provide just one example of the need to balance compassion and risk in climate adaptation policies. The same basic lesson may be appropriate to economic sectors affected by other impacts of climate disruption. Examples include real estate developers facing risks from sea level rise and electric power suppliers facing higher demand as temperatures rise. The compassionate or political impulse may be to provide subsidies or other financial relief from those impacts. But in addition to becoming increasingly and perhaps impossibly expensive, those responses may only perpetuate the very activities that increase long-term vulnerability to climate change. Rather than adopting climate adaptation policies through after-the-fact, band-aid solutions, the most effective responses should consider the basic economic drivers of activities that increase vulnerability to climate disruption.