

2016

## Keeping the Desert at Bay: Adapting California Water Management to Climate Change

Paul J. Pearah

Follow this and additional works at: [https://repository.uchastings.edu/hastings\\_environmental\\_law\\_journal](https://repository.uchastings.edu/hastings_environmental_law_journal)



Part of the [Environmental Law Commons](#)

---

### Recommended Citation

Paul J. Pearah, *Keeping the Desert at Bay: Adapting California Water Management to Climate Change*, 22 *Hastings West Northwest J. of Env'tl. L. & Pol'y* 137 (2016)

Available at: [https://repository.uchastings.edu/hastings\\_environmental\\_law\\_journal/vol22/iss2/8](https://repository.uchastings.edu/hastings_environmental_law_journal/vol22/iss2/8)

This Notes is brought to you for free and open access by the Law Journals at UC Hastings Scholarship Repository. It has been accepted for inclusion in *Hastings Environmental Law Journal* by an authorized editor of UC Hastings Scholarship Repository. For more information, please contact [wangangela@uchastings.edu](mailto:wangangela@uchastings.edu).

---

---

---

# Keeping the Desert at Bay: Adapting California Water Management to Climate Change

Paul J. Pearah<sup>\*</sup>

## Abstract

The ongoing climatological warming trend significantly exacerbates the risk of water shortage in California. Prevailing statewide drought conditions and ongoing long-term water resource depletion urgently necessitate effective adaptive measures. The fragmented framework historically used to manage surface water and groundwater basin resources has resulted in inefficiencies at odds with the constitutional doctrine of “reasonable and beneficial use [of water] . . . for the public welfare.” The extent of the authority of the State Water Resources Control Board to reallocate water rights to adapt to climate change under common law, the Reasonable Use Doctrine, Public Trust Doctrine, and the Sustainable Groundwater Management Act is examined. In addition, the circumstances under which the inevitable reallocation of water rights could be viewed as a compensable Fifth Amendment taking of private property are discussed.

## Table of Contents

- I. INTRODUCTION
- II. OVERVIEW OF CALIFORNIA WATER RIGHTS LAW
  - A. California Water Resources

---

<sup>\*</sup> Dr. Paul J. Pearah is J.D. candidate at the University of San Diego. He previously earned a B.S. in Physics and M.S. and Ph.D. degrees in Electrical Engineering from the University of Illinois at Urbana-Champaign, and holds a Patent Agent license at the US Patent and Trademark Office. Previous environmental work includes lobbying for Marine Protected Areas (MPAs) on the Northern California Coast. Dr. Pearah currently resides in Encinitas, California with his son Ethan Pearah.

---

- B. Terminology
- C. The Reasonable Use Doctrine
- D. Surface Water Rights
- E. Groundwater Rights
  - i. Overlying Rights
  - ii. Appropriative Rights
  - iii. Prescriptive Rights
- F. The Sustainable Groundwater Management Act
- III. IS SWRCB ACTION PROHIBITED, AUTHORIZED OR COMPELLED?
  - A. Is SWRCB Prohibited from Implementing Adaptive Measures?
  - B. Authority or Obligation to Reallocate Surface Water Rights
    - i. Reasonable Riparian Use
    - ii. The Public Trust Doctrine
    - iii. Summary of Surface Water Rights under Reasonable Use Doctrine
  - C. Authority or Obligation to Reallocate Groundwater Rights
    - i. Groundwater Right Prescription and Reasonable Use
    - ii. Public Trust Doctrine Applied to Groundwater
    - iii. SWRCB Authority under Sustainable Groundwater Management Act
    - iv. Summary of Groundwater Rights Authority
    - v. Summary of SWRCB Water Rights Reallocation Authority
- IV. IS SWRCB WATER RIGHT REALLOCATION A FIFTH AMENDMENT TAKING?
  - A. Fifth Amendment Taking Considerations
  - B. *Tulare Lake Basin Water Storage District v. United States*
    - i. Physical Taking Analysis
    - ii. Background Principles of State Law Barring Claim
  - C. *Casitas Water Storage District v. United States*
    - i. Federal Claims Case Before Judge Wiese
    - ii. Federal Circuit Case
  - D. The Public Trust Doctrine as a Takings Defense
- V. CONCLUSIONS AND RECOMMENDATIONS

## I. Introduction

Mounting evidence strongly suggests that climate change is already aggravating the water shortage in California, and that its contribution to increasing the likelihood and severity of drought will only continue to grow in the future. Burgeoning population<sup>1</sup> and nearly 10 million acres of irrigated agricultural land<sup>2</sup> create a demand for 43 million acre-feet of water in a typical year with agriculture accounting for approximately 80 percent.<sup>3</sup> At this juncture few practical options remain for increasing available water supply. At the time of this writing, eleven of California's twelve largest reservoirs are at less than half of their respective historical storage levels.<sup>4</sup> NASA data reveal extreme groundwater depletion of approximately 34 million acre-feet since 2011 alone, a deficit that has been growing steadily since the study began in 2002.<sup>5</sup> USGS data and land subsidence observations dating back to 1925 strongly suggest that aquifers underlying California's Central Valley have been severely overdrafted for much longer.<sup>6</sup>

Fortunately, California water resource law has evolved continuously in the face of changing and increasing pressures since the state's admission to the Union in 1850. Modern considerations may ultimately require a fundamental rethinking of the way water is managed in the state. This paper examines options for adapting to the increased threat of drought resulting from climate change within the present legal framework.

Any consideration of the legal right to water in California requires an understanding of the current legal and regulatory scheme. While a detailed discussion of the arcane and often incongruous system of California water resource law is beyond the scope of this paper, a review of basic principles will be undertaken in Section II. Fundamentally, all water rights are subject

---

1. See Cal. Dep't of Finance, E-7. *California Population Estimates, with Components of Change and Crude Rates, July 1, 1900-2014* (© 2013), <http://www.dof.ca.gov/research/demographic/reports/estimates/e-7/view.php>.

2. Cal. Dep't of Water Resources, *Agricultural Water Use* (last modified Mar. 16, 2010), <http://www.water.ca.gov/wateruseefficiency/agricultural/>.

3. *Id.*

4. Cal. Dep't of Water Resources, Cal. Data Exchange Center, *Conditions for Selected Reservoirs* (Feb. 6, 2016), <http://cdec.water.ca.gov/cdecapp/resapp/getResGraphsMain.Action>.

5. J. S. Famiglietti, *NASA Data Underscore Severity of California Drought* (Dec. 16, 2014), <http://www.jpl.nasa.gov/news/news.php?feature=4412>.

6. J. S. Famiglietti, et al., 2014 AGU Fall Meeting, Press Conference, *California's Epic Drought as Viewed from Space* (Dec. 16, 2014), <http://www.jpl.nasa.gov/images/earth/california/20141216/earth20141216.pdf>; The USGS Water Science School, *Land Subsidence* (last modified Aug. 20, 2015), <http://water.usgs.gov/edu/earthgwlandsubside.html>.

to the constitutional requirement of reasonable and beneficial use<sup>7</sup> (“Reasonable Use Doctrine”) as discussed below. As such, the pivotal definition of reasonable and beneficial water use is reexamined in the context of case law precedent and climate change considerations.

Section III evaluates the increased authority of the State Water Resources Control Board (“SWRCB”) to reallocate water rights under the Reasonable Use Doctrine in the wake of rulings regarding the Public Trust Doctrine,<sup>8</sup> as well as recent legislation explicitly expanding the role and responsibilities of the SWRCB in groundwater management.<sup>9</sup> In the face of climate change, increasing demand, and overtaxed supply, reallocation of water rights seems inevitable. However depriving certain classes of owners of part or all of their rights to water may put state law on a collision course with the U.S. Constitution.

Regardless of whether reallocation occurs by adjudication or under SWRCB authority, reducing a preexisting water right potentially raises constitutional issues. Whether and under what circumstances such a reallocation under the state constitutional Reasonable Use Doctrine might constitute a Fifth Amendment regulatory or physical taking under the U.S. Constitution is examined in Section IV in light of relevant case law and policy considerations.

Finally, a summary of conclusions and recommendations is presented.

## **II. Overview of California Water Rights Law**

### **A. California Water Resources**

From the nascent Gold Rush Era, the right to limited California water resources was as precious as the gold itself; early miners built extensive ditches and wooden flumes to divert water for hydraulic mining operations. As California’s population has increased in the intervening years, massive infrastructure projects comprising astounding feats of engineering have

---

7. Cal. Const., art. X, § 2.

8. *Marks v. Whitney*, 6 Cal. 3d 251 (1971); *Envtl. Def. Fund v. E. Bay Mun. Util. Dist.*, 26 Cal. 3d 183 (1980); *Nat’l. Audubon Soc. v. Superior Court*, 33 Cal. 3d 419 (1983); *California Trout v. State Water Res. Control Bd.*, 207 Cal.App.3d 585 (1989); *Light v. State Water Resources Control Bd.*, 226 Cal. App. 4th 1463 (2014) regarding Cal. State Water Resources Control Bd., Amendment to Division 3 of Title 23 of the California Code of Regulations, § 862 Russian River, Special (2011); *Envtl. Law Found. v. State Water Res. Control Bd.* No. 34-2010-80000583 (Cal. Super. Ct July 15, 2014; pending appeal).

9. Assem. Bill 1739, Sen. Bill 1168, Sen. Bill 1319, Reg. Sess. (Cal. 2013-2014); Sen. Bill 13, Reg. Sess. (Cal. 2014-2015).

been implemented to maximize the amount of water available. These include the Hetch Hetchy reservoir in Yosemite National Park (1923), which delivers 265,000 acre feet of water annually (“afa”) to Northern California;<sup>10</sup> various dams along the Colorado River that providing 4,400,000 afa to California;<sup>11</sup> the Central Valley Project largely constructed in the 1930s and 1940s to irrigate the San Joaquin Valley for year round agriculture and currently managing some 9,000,000 afa;<sup>12</sup> and the State Water Project that began in 1973 to deliver water from Northern California rivers to arid Southern California, which currently supplies 2,400,000 afa of drinking water to some 25 million people.<sup>13</sup> Apart from those currently designated under the 1968 National Wild and Scenic Rivers Act,<sup>14</sup> nearly all surface stream flows that are capable of economically providing useful water (and arguably many that are not) have been harnessed by well over 1,000 dams and reservoirs falling within state jurisdiction.<sup>15</sup>

In addition, utilization of California’s groundwater has increased steadily as water pumping and well drilling technology improved over the years. As a result, approximately 40 percent to 60 percent of California’s water supply comes from underground aquifers in normal and dry years, respectively.<sup>16</sup> Unfortunately the volume being pumped is difficult to

---

10. Water Education Foundation, *California Water Basics* (© 2016) <http://www.watereducation.org/photo-gallery/california-water-basics>.

11. U.S. Dep’t of the Interior, Bureau of Reclamation, Reclamation/Lower Colorado Region/Hoover Dam (last updated Mar. 12, 2015) <http://www.usbr.gov/lc/hooverdam/faqs/riverfaq.html>.

12. U.S. Dep’t of the Interior, Bureau of Reclamation, *Central Valley Project* (last updated Mar. 15, 2013), [http://www.usbr.gov/projects/Project.jsp?proj\\_Name=Central+Valley+Project](http://www.usbr.gov/projects/Project.jsp?proj_Name=Central+Valley+Project)

13. Cal. Dep’t of Water Resources, *California State Water Project at a Glance* (Apr. 2011), [http://www.water.ca.gov/recreation/brochures/pdf/swp\\_glance.pdf](http://www.water.ca.gov/recreation/brochures/pdf/swp_glance.pdf).

14. U.S. Dep’t of the Interior, Bureau of Land Management, *California Wild and Scenic Rivers* (last updated Nov. 20, 2013), [http://www.blm.gov/ca/st/en/prog/blm\\_special\\_areas/wildrivers.html](http://www.blm.gov/ca/st/en/prog/blm_special_areas/wildrivers.html).

15. Cal. Dep’t of Water Resources, *Dams within the Jurisdiction of the State of California* (2014), <http://www.water.ca.gov/damsafety/docs/Jurisdictional2014.pdf>.

16. Cal Dep’t of Water Resources, Report to the Governor’s Task Force – *Groundwater Basins with Potential Water Shortages and Gaps in Groundwater Monitoring* (Apr. 30, 2014), [http://www.water.ca.gov/waterconditions/docs/Drought\\_Response-Groundwater\\_Basins\\_April30\\_Final\\_BC.pdf](http://www.water.ca.gov/waterconditions/docs/Drought_Response-Groundwater_Basins_April30_Final_BC.pdf).

quantify due to a lack of metering and reporting requirements.<sup>17</sup> Of the more than 500 known groundwater basins, only twenty-six have been adjudicated to date<sup>18</sup> leaving the rest subject to overdraft through unregulated use for the time being. Evidence of overdraft abounds in the form of rapidly receding groundwater tables and the resultant dry wells and dramatic subsidence of overlying land in many parts of the state.<sup>19</sup>

Despite the staggering investment in infrastructure for development of surface and groundwater resources, water rights remain coveted and contentious.<sup>20</sup> The various systems in place for managing California's water resources are described in the following subsections.

### **B. Terminology**

A few basic terms should be understood at the outset (others are defined as needed). Fundamentally, all state-granted water rights are "usufructuary" in nature. The individual right consists of a right to use, as opposed to outright ownership of the water itself.<sup>21</sup> California differentiates between "surface water" and "groundwater." Surface water includes all rivers and streams, navigable or not, as well as "subterranean streams flowing through known and definite channels."<sup>22</sup> Owners of real estate abutting the natural flow of a watercourse generally enjoy "riparian rights" to divert and use that water. The term "groundwater" hereinafter refers to percolating waters in basins consisting of unconfined subterranean aquifers. Real estate located directly above groundwater is associated with "overlying rights" appurtenant to the land, which entitle the overlier to pump the underlying groundwater. An "appropriator" is one who does not enjoy

---

17. Stanford Woods Institute for the Environment, *Groundwater Data: California's Missing Metrics* (July 31, 2014), <http://waterinthewest.stanford.edu/groundwater/metrics/index.html>.

18. Assem. Bill 1739, Sen. Bill 1168, Sen. Bill 1319, Reg. Sess. (Cal. 2013-2014).

19. J. S. Famiglietti, *NASA Data Underscore Severity of California Drought* (Dec. 16, 2014), <http://www.jpl.nasa.gov/news/news.php?Feature=4412>; J. S. Famiglietti, et al., 2014 AGU Fall Meeting, Press Conference, *California's Epic Drought as Viewed from Space* (Dec. 16, 2014), <http://www.jpl.nasa.gov/images/earth/california/20141216/earth20141216.pdf>. The USGS Water Science School, *Land Subsidence* (last modified Aug. 20, 2015), <http://water.usgs.gov/edu/earthgwlandsubside.html>.

20. See NORRIS HUNDLEY JR, *THE GREAT THIRST: CALIFORNIANS AND WATER* (University of California Press 2001); DOROTHY GREEN, *MANAGING WATER: AVOIDING CRISIS IN CALIFORNIA* (University of California Press 2007).

21. Cal. Const. art. X; Cal. Water Code.

22. Cal. Water Code § 1200.

riparian or overlying rights, but rather obtains a right to use excess surface water or groundwater by diversion or pumping, respectively.

### **C. The Reasonable Use Doctrine**

Regardless of water classification or the nature of the underlying right, the Reasonable Use Doctrine articulated in the California Constitution forms the foundation of all of California's water rights laws. In 1928 the constitution was amended to render all water use subject to the paramount limitation of reasonable and beneficial use under Article X, § 2:

It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.<sup>23</sup>

The 1928 amendment goes on to explicitly protect the usufructuary water rights of riparian landowners and appropriators, but only to the extent that the use to which the water is applied is reasonable:

Riparian rights in a stream or water course attach to, but to no more than so much of the flow thereof as may be required or used consistently with this section, for the purposes for which such lands are, or may be made adaptable, in view of such reasonable and beneficial uses; provided, however, that nothing herein contained shall be construed as depriving any riparian owner of the reasonable use of water of the stream to which the owner's land is riparian under reasonable methods of diversion and use, or as depriving any appropriator of water to which the appropriator is lawfully entitled.<sup>24</sup>

According to the California Supreme Court, "It is to be noted that the new doctrine embodied in the constitutional amendment . . . not only

---

23. Cal. Const., art. X, § 2.

24. *Id.*

applies the doctrine of reasonable use as between riparian and appropriator, but also as between an overlying owner and an appropriator. [Citations omitted.] The overlying owner in this state has been held to have analogous rights to those of a riparian.”<sup>25</sup>

The salient point is that the Constitution itself describes “reasonable and beneficial use” in only the most general terms, leaving considerable latitude to courts and state agencies. The California Water Code provides somewhat more specific guidance: “It is . . . the established policy of this State that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation.”<sup>26</sup> The courts are nonetheless obliged to interpret the constitutional language in order to implement the Reasonable Use Doctrine. Consequently the definition of reasonable use has evolved with changing circumstances, and the utilitarian, dynamic, situational and fragile nature of California water rights arises largely from this interpretive latitude.

#### **D. Surface Water Rights**

Surface water rights have traditionally been regarded as rights in real property. Virtually all rights to use surface water can be classified as either riparian or appropriative. The riparian right is traced to English common law and arises from the ownership of riparian land adjacent to water. In California, early appropriative rights claimed by Gold Rush era miners diverting water for hydraulic mining gave rise to the “first in time, first in right” principle that remains relevant to this day. For instance appropriators who can demonstrate continuous diversion predating implementation of a comprehensive permit system under the Water Commission Act of 1914<sup>27</sup> enjoy “senior” appropriative rights exempt from SWRCB permitting requirements and higher in priority than post-1914 rights.

The SWRCB has authority over the issuance of, and priority among, post-1914 appropriative water rights pursuant to the Water Commission Act.<sup>28</sup> An application for appropriative rights to surface water for the purpose of diversion or storage initiates a public process requiring the applicant to demonstrate the availability of water for appropriation as well as applicant’s projected reasonable and beneficial use of the water.

It is also possible to obtain water rights through prescription, however prescriptive rights to surface water can be difficult to establish and maintain

---

25. *Tulare Dist. v. Lindsay-Strathmore Dist.*, 3 Cal. 2d 489, 524 (1935).

26. Cal. Water Code § 106.

27. Water Commission Act, California Proposition 29 (1914).

28. Cal. Water Code § 106.

in practice. Prescriptive rights tend to play a more significant role in groundwater basin right allocations.

### **E. Groundwater Rights**

Groundwater rights are divided into the categories of overlying, appropriative, and prescriptive. Basin adjudications are directed toward allocation of groundwater resources within a given basin among claimants to rights falling in any of the three categories in accordance with the Reasonable Use Doctrine. Adjudication generally includes providing a “physical solution” that resolves the competing water rights claims and provides for ongoing management of the basin.

A fundamental concept underlying the Reasonable Use Doctrine as applied to groundwater basins is that of “safe yield” (as opposed to overdraft). The California Department of Water Resources defines safe yield as the “maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect”<sup>29</sup> such as depletion or compromised water quality. Unfortunately many basins throughout the state are not currently being managed within safe yield constraints and are being depleted at various rates.<sup>30</sup>

#### **i. Overlying Rights**

Overlying water usage rights stem from the English common law doctrine of *cuius est solum ejus est usque ad coelum et ad inferos* under which a landowner’s title includes all rocks, soil, minerals, and water beneath the surface of the land including virtually limitless rights to groundwater. Analogous to riparians, California overlies within an adjudicated basin enjoy correlative rights to extraction of a reasonable share of groundwater for reasonable use within an aquifer’s safe yield,<sup>31</sup> analogous to tenants in common. However in basins having yet to be adjudicated, overlies essentially enjoy the privilege of centuries old English common law (created when groundwater access was practically limited by the depth to which a well could be sunk using manual labor and the inefficiency of primitive

---

29. California Department of Water Resources. California’s Groundwater. Bulletin 118-03 (1975) at 216.

30. J. S. Famiglietti, *NASA Data Underscore Severity of California Drought* (Dec. 16, 2014), <http://www.jpl.nasa.gov/news/news.php?feature=4412>; J. S. Famiglietti, et al., 2014 AGU Fall Meeting, Press Conference, *California’s Epic Drought as Viewed from Space* (Dec. 16, 2014), <http://www.jpl.nasa.gov/images/earth/california/20141216/earth20141216.pdf>; The USGS Water Science School, *Land Subsidence* (last modified Aug. 20, 2015), <http://water.usgs.gov/edu/earthgwlandsubside.html>.

31. *Katz v. Walkinshaw*, 141 Cal. 116, 135 (1903).

extraction methods), combined with the powerful advantage of modern drilling and pumping technologies. Even in an adjudicated basin wherein the landowner's right is curtailed by safe yield and Reasonable Use Doctrine considerations, the overlying right remains paramount against any appropriative right unless the appropriator has established prescriptive rights.<sup>32</sup>

### **ii. Appropriative Rights**

Contrary to the SWRCB-managed appropriation permit system in place for surface water, groundwater appropriation has until very recently not been subject to a statutory system of regulation. The appropriative right to groundwater is strictly usufructuary in nature and is acquired via the act of taking water for non-overlying use; only surplus groundwater in excess of the requirements of overlying rights holders is subject to appropriative rights.<sup>33</sup> This principle holds true even with respect to municipal rights; groundwater extraction for local public use is deemed appropriative.<sup>34</sup> As such, if overlying rights holders put the full safe yield of a basin to reasonable and beneficial use then there is in principle no water available for municipal use.

### **iii. Prescriptive Rights**

Prescriptive groundwater rights, however, may be acquired according to rules analogous to those applicable to rights in real property and can displace prior rights even in an overdrafted basin. If non-surplus water is appropriated in a manner that is (i) hostile and adverse to a prior right holder; (ii) actual, open, and notorious; (iii) continuous and uninterrupted for a period of five years, and (iv) under claim of right, then prescriptive rights attach. The nature of prescriptive groundwater rights under the Reasonable Use Doctrine is discussed below.

## **F. The Sustainable Groundwater Management Act**

In a striking departure from California water resource law tradition, recent legislation explicitly expands SWRCB authority to groundwater basins under certain circumstances. Responding to extreme pressures on groundwater resources occasioned by the severe multiyear drought that began in 2011, on September 16, 2014, California Governor Brown signed a significant legislative initiative intended to cure some of the more pervasive deficiencies in groundwater management. The Sustainable Groundwater

---

32. City of Barstow vs. Mojave Water Agency, 23 Cal. 4th 1224, 1241 (2000).

33. Monolith Portland Cement Co. v. Mojave Public Utility Co. 154 Cal. App. 2d 487, 154 (1947).

34. San Bernardino v. Riverside 186 Cal. 7, 25 (1921).

---

Management Act (“SGMA”) compels comprehensive long-term groundwater management schemes by local Groundwater Sustainability Agencies (“GSAs”) for significant groundwater basins statewide.<sup>35</sup> A subsequent amendment authorizes the SWRCB to intervene if a given GSA fails to create a sustainability plan for managing the basin without causing specified “undesirable results” that are “significant and unreasonable”<sup>36</sup> as discussed below.

### **III. Is SWRCB Action Prohibited, Authorized or Compelled?**

#### **A. Is SWRCB Prohibited from Implementing Adaptive Measures?**

The Reasonable Use Doctrine operates under a flexible definition of “reasonable and beneficial use” to maintain alignment of water rights allocations with “the interest of the people and for the public welfare” in diverse and dynamic situations (case law precedent for redefining reasonable use to adapt to changing circumstances will be amply considered below). Opponents of SWRCB water right reallocation under the Reasonable Use Doctrine for the purpose of adaptation to climate change, however, may object on the basis of lack of evidence linking climate change to factors influencing water resource management.

Diverse sources have concluded that anthropogenic climate warming has substantially increased the risk of drought in California. Stanford Woods Institute Senior Fellow Noah Diffenbaugh writes that climate change “has increased the probability of the co-occurring temperature and precipitation conditions that have historically led to drought in California.”<sup>37</sup> While precipitation remains the primary driving force, an article recently published in *Geophysical Research Letters* estimates that anthropogenic warming has accounted for as much as 27 percent of the observed drought in recent years.<sup>38</sup>

---

35. Assem. Bill 1739, Sen. Bill 1168, Sen. Bill 1319, Reg. Sess. (Cal. 2013-2014).

36. Sen. Bill 13, Reg. Sess. (Cal. 2014-2015).

37. Noah S. Diffenbaugh, et al., *Anthropogenic warming has increased drought risk in California*, PROC. NAT’L. ACAD. OF SCIENCES 12(13) 3931-3936 (2015).

38. A. Park Williams, et al., *Contribution of anthropogenic warming to California drought during 2012-2014*. GEOPHYSICAL RES. LETT. Vol. 42 No. 16 6819-6828. (2015).

---

Furthermore the National Oceanic and Atmospheric Administration projects that climate change is expected to result in increasingly arid conditions in North America in the coming years.<sup>39</sup>

Higher temperatures affect the water resources demand curve both in terms of supply and demand. On the supply side, even with average overall precipitation increased winter temperatures result in a shift toward rainfall rather than snowfall. The resultant reduction in snowpack decreases the spring snowmelt historically relied upon to replenish storage reservoirs. In the summer, in addition to higher evaporation rates from the reservoirs, warmer temperatures drive increased moisture loss through soil and plant evapotranspiration, which in turn intensifies demand for outdoor urban and agricultural water. When supply is further reduced by extended periods of low precipitation and groundwater depletion, severe water shortage conditions can result.

The current California drought presents a prime example of just such a concurrence. The fourth consecutive year of scant precipitation combined with above average temperatures has resulted in a progressive multiyear drought<sup>40</sup> creating an unprecedented water emergency.<sup>41</sup> Throughout 2015, extreme to exceptional drought conditions have prevailed throughout most of the state as shown in the NOAA/NWS/NCEP/CPC figure below.<sup>42</sup>

---

39. Richard Seager, et al., National Oceanic and Atmospheric Administration (NOAA), Assessment Report: *Causes and Predictability of the 2011-14 California Drought*. (2014), [http://cpo.noaa.gov/sites/cpo/MAPP/Task%20Forces/DTF/californiadrought/california\\_drought\\_report.pdf](http://cpo.noaa.gov/sites/cpo/MAPP/Task%20Forces/DTF/californiadrought/california_drought_report.pdf).

40. *Id.*

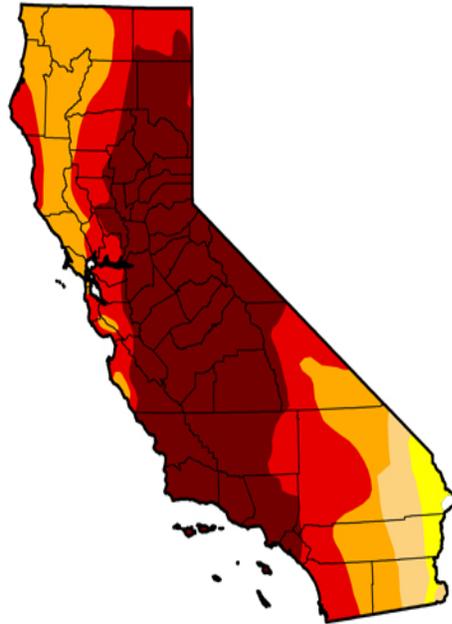
41. Edgar B. Washburn, *California's Efforts to Solve Its Water Shortage: Can They Succeed?* ENVTL. LAW NEWS 24(1), 3-10 (2015).

42. Miskus, D., *California Drought Monitor and National Drought Summary* (Oct. 13, 2015), [http://droughtmonitor.unl.edu/data/jpg/20151013/20151013\\_CA\\_trd.jpg](http://droughtmonitor.unl.edu/data/jpg/20151013/20151013_CA_trd.jpg).

---

**U.S. Drought Monitor  
California**

**October 13, 2015**  
(Released Thursday, Oct. 15, 2015)  
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	0.14	99.86	97.33	92.36	71.08	46.00
<b>Last Week</b> 10/6/2015	0.14	99.86	97.33	92.36	71.08	46.00
<b>3 Months Ago</b> 7/14/2015	0.14	99.86	98.71	94.59	71.08	46.00
<b>Start of Calendar Year</b> 12/30/2014	0.00	100.00	98.12	94.34	77.94	32.21
<b>Start of Water Year</b> 9/29/2015	0.14	99.86	97.33	92.36	71.08	46.00
<b>One Year Ago</b> 10/14/2014	0.00	100.00	100.00	95.04	81.92	58.41

**Intensity:**  
■ D0 Abnormally Dry      ■ D3 Extreme Drought  
■ D1 Moderate Drought      ■ D4 Exceptional Drought  
■ D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

**Author:**  
David Miskus  
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

On January 17, 2014, long before the drought had progressed to the level of severity shown in the above figure, Governor Brown proclaimed a drought State of Emergency and called for voluntary reductions in water consumption; by April of 2015 the magnitude of the reductions was increased and they were mandated.<sup>43</sup> Currently roughly 38,000,000 people, or about one in eight Americans, live in California,<sup>44</sup> and that number is projected to grow significantly in coming decades. Given the magnitude of the water crisis facing the state, it is clear that future water resource management will entail significant, if not transformative, adaptation of the current system to new and evolving circumstances driven at least in part by

43. CA.gov, Office of Governor Edmund G. Brown, Jr., *Governor Brown Directs First Ever Statewide Mandatory Water Reductions* (Apr. 1, 2015), <https://www.gov.ca.gov/news.php?id=18913>.

44. Cal. Dep't of Finance, E-7. *California Population Estimates, with Components of Change and Crude Rates, July 1, 1900-2014* (©2013), <http://www.dof.ca.gov/research/demographic/reports/estimates/e-7/view.php>.

climate change. Because current water resources are over tapped and there is little potential for economical new sources of water, the implementation must proceed via reduction and reallocation of existing water rights. The acute and ongoing need for adaptive water rights management raises questions as to the extent of the authority of the SWRCB to reallocate surface and groundwater rights, and the ramifications of doing so.

**B. Authority or Obligation to Reallocate Surface Water Rights**

The Reasonable Use Doctrine applies comprehensively to all aspects of California water resource management. As UC Hastings Emeritus Professor of Law Brian E. Gray has pointed out, case law establishes that the definition of reasonable and beneficial use and the rights derived therefrom are utilitarian, dynamic, situational and fragile.<sup>45</sup> Courts have held that the SWRCB possesses the authority to reallocate water rights, and sometimes must do so in order to comply with the Public Trust Doctrine. A few representative cases are considered below.

**i. Reasonable Riparian Use**

A case foreshadowing the 1928 enactment of Article X, § 2 outlined factors bearing on reasonable riparian apportionment. In 1916 the California Supreme Court held in *Half Moon Bay Land Co. v. Cowell*, “The length of the stream, the volume of water in it, the extent of each ownership along the banks, the character of the soil owned by each contestant, the area sought to be irrigated by each—all these, and many other considerations, must enter into the solution of the problem.”<sup>46</sup> The foregoing factors were set forth to be used in determining the correlative rights to a riparian stream wherein the demand for water among the riparians exceeded the available supply.

In holding for correlative rights, the court settled the dispute by imposing a solution that was responsive to the needs of each riparian based on factors aimed at fairness and optimal economic value. In so doing, the court effectively eroded the property rights of the upstream riparians, who were thereafter obliged to share the water resource with the downstream riparians according to the reasonable riparian apportionment factors rather than simply take all they wanted based on a pure property right. The holding of *Half Moon Bay* was consistent with statewide public interest insofar as it yielded more efficient use of land and greater overall economic benefit for the state.

---

45. BRAIN E. GRAY, SUSTAINABLE WATER: CHALLENGES AND SOLUTIONS FROM CALIFORNIA (Allison Lassiter ed., University of California Press) (2015).

46. *Half Moon Bay Land Co. v. Cowell*, 173 Cal. 543, 549 (1916).

---

Reasonable use was more explicitly defined in a case decided in 1944 after the enactment of the constitutional amendment setting forth the Reasonable Use Doctrine. The *Prather v. Hoberg* ruling states, *inter alia*,

A riparian owner has no right to any mathematical or specific amount of the water of a stream as against other like owners. He has only a right in common with the owners to take a proportional share from the stream—a correlative right which he shares reciprocally with the other riparian owners. No mathematical rule has been formulated to determine such a right, for what is a reasonable amount varies not only with the circumstances of each case but also varies from year to year and season to season. . . . The apportionment should be measured in the ‘manner best calculated to a reasonable result,’ and the court may adopt any standard of measurement ‘that is reasonable on the facts to secure equality.’<sup>47</sup>

The above ruling is similar to that of *Half Moon Bay* except that the *Prather* court explicitly stated that “what is a reasonable amount . . . varies from year to year and from season to season” thereby establishing in common law not only the utilitarian and situational nature of water rights derived under the Reasonable Use Doctrine, but also their dynamic and fragile aspects. Note that annual and seasonal variations in the “reasonable amount” apportioned for correlative use depend on factors affecting water supply and demand including weather and climate. Therefore what constitutes reasonable use can vary over time as a result of climate change.

The California Supreme Court held in the 1967 *Joslin v. Marin Municipal Water District* case that the use of a riparian flow for transporting sand and gravel which had supported an established business with tangible economic value to the riparian landowner had become unreasonable in view of competing appropriative demands on the water resource. In a stark example of application of the Reasonable Use Doctrine to reallocate water rights, this landmark ruling flies in the face of the traditional priority of riparian over appropriative rights, instead prioritizing “the interests of the people and the public welfare.”<sup>48</sup> The *Joslin* ruling states, “[W]hat is a reasonable use of water depends on the circumstances of each case, such an inquiry cannot be resolved *in vacuo* isolated from statewide considerations of transcendent importance.”<sup>49</sup> The court’s holding underlines the utilitarian, situational, and dynamic nature of the definition of reasonable use. Saliently, the plaintiffs in *Joslin* received no compensation for the loss of their economically beneficial, but ultimately fragile, riparian right.

---

47. *Prather v. Hoberg*, 24 Cal. 2d 549, 560 (1944).

48. Cal. Const., art. X, § 2.

49. *Joslin v. Marin Mun. Water Dist.*, 67 Cal. 2d 132, 140 (1967).

---

In light of prevailing drought conditions, the SWRCB recently exercised its authority to curtail water rights predating the 1914 Water Commission Act.<sup>50</sup> More than 100 riparians who formerly enjoyed rights with a priority date of 1903 or later, and 11 with rights dating back as far as 1858, have been ordered to halt diversions subject to fines and prosecution. In so doing, the SWRCB stated

In times of drought and limited supply, the most recent (“junior”) right holder must be the first to discontinue use. Even more senior water right holders, such as some riparian and pre-1914 water right holders may also receive a notice to stop diverting water if their diversions are downstream of reservoirs releasing stored water and there is no natural flow available for diversion.<sup>51</sup>

Note that well over 100 senior riparians lost their right to divert water, at least temporarily and without compensation, as a direct result of the SWRCB reallocating rights in accordance with the Reasonable Use Doctrine.

An interesting question arises as to the priority of an unexercised riparian right. At one time such rights were held to be senior to all appropriative rights, but the 1979 ruling of *in re Long Valley Creek Stream System* once again reallocated the priority of rights, establishing that a dormant riparian right may be relegated in priority to all existing appropriative rights. The court held that the priority of rights in the Long Valley Creek Stream System is (1) riparians; (2) senior appropriators; (3) junior appropriators; and finally (4) dormant riparians.<sup>52</sup> The holding may also apply to the analogous case of dormant overlying rights held by non-pumping overlayers in groundwater basins.

## **ii. The Public Trust Doctrine**

The Public Trust Doctrine is deeply rooted in Roman and English law<sup>53</sup> and obligates the government to protect and preserve navigable waterways for public uses including navigation, recreation, and fishing. In California the Public Trust Doctrine was expanded in 1971 to encompass dynamic

---

50. Water Commission Act, California Proposition 29 (1914).

51. Cal. Water Bds., Water Rights News (June 12, 2015); Cal State Water Resources Control Bd., *Notices of Water Availability*, (Nov. 6, 2015), [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/water\\_availability.shtml](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/water_availability.shtml).

52. *In re Waters of Long Valley Creek Stream System*, 25 Cal. 3d 339, 358-59 (1979).

53. WILLIAM WARWICK BUCKLAND, *A TEXTBOOK OF ROMAN LAW FROM AUGUSTUS TO JUSTINIAN 182-85* (Cambridge University Press, 2ed 1932).

---

requirements for the preservation of natural resources and environmental protection when the *Whitney* court held that the doctrine is “sufficiently flexible to encompass changing public needs.”<sup>54</sup>

The ruling was amplified in the *East Bay Municipal Utility District* (EBMUD) case in which a diversion point was moved downstream to maintain American River flows for scenic and recreation purposes. The EBMUD court stated, “In assessing appropriation values versus public trust values, it is impossible to avoid a balancing analysis,”<sup>55</sup> invoking *Joslin*: “What constitutes reasonable water use is dependent upon not only the entire circumstances presented but varies as the current situation changes.”<sup>56</sup> The EBMUD court further held that SWRCB and the superior courts have concurrent original jurisdiction to enforce the self-executing provisions of Article X, § 2 of the California Constitution, except where overriding considerations exist, such as those presented by health and safety dangers, in which case “legislatively established administrative agencies” such as the SWRCB should have exclusive original jurisdiction.<sup>57</sup>

The *Whitney* and EBMUD rulings laid the foundation for extending the Public Trust Doctrine to nonnavigable waters in the 1983 *National Audubon Society v. Superior Court* case in which appropriative rights to four streams feeding Mono Lake were effectively revoked.<sup>58</sup> Under *Audubon*, (1) the Public Trust Doctrine protects navigable waters from harm caused by diversion of non-navigable tributaries, and (2) the SWRCB gained explicit authority to revoke any rights previously granted in the system when the public trust is threatened. Ecological values (in this instance, the preservation of brine shrimp as a food source for migratory birds) are “among the purposes of the public trust.”<sup>59</sup> Subsequently *California Trout v. SWRCB* set minimum Mono Lake tributary flows and held that the applicable Fish and Game Code sections requiring that a dam owner allow sufficient water to pass to keep fish in good condition below the dam do not violate the Reasonable Use Doctrine by forcing waste or unreasonable diversion or use of water.<sup>60</sup>

The SWRCB has at times fallen short of its obligation enforce the Reasonable Use Doctrine. In the lengthy and complex 1986 *Racanelli* decision regarding a water quality control plan for the San Francisco Bay Delta estuary, the court admonished the SWRCB for overlooking its

---

54. *Whitney*, 6 Cal. 3d 251, 259 (1971).

55. Statement of Decision, *Envtl. Def. Fund v. E. Bay Mun. Util. Dist.*, No. 425955 (Alameda County Superior Court, filed Jan. 2, 1990), at 29.

56. *Envtl. Def. Fund v. E. Bay Mun. Util. Dist.*, 26 Cal. 3d 183, 194 (1980).

57. *Id.* at 200.

58. *Nat'l. Audubon Soc.*, 33 Cal. 3d 419, 449 (1983).

59. *Id.* at 435.

60. *California Trout*, 207 Cal.App.3d 585, 625 (1989).

“statutory commitment to establish objectives assuring the ‘reasonable protection of beneficial uses,’” which “grants the Board broad discretion to establish reasonable standards consistent with overall statewide standards.”<sup>61</sup> The court held that the Public Trust Doctrine authorized the SWRCB to reconsider past water allocation decisions and it should reallocate water rights as needed to protect fish and wildlife.

### **iii. Summary of Surface Water Rights under Reasonable Use Doctrine**

In summary, a review of representative case law pertaining to the application of the Reasonable Use Doctrine to surface water management highlights the flexibility in interpreting the doctrine and defining reasonable and beneficial use to fit the facts and circumstances of a given situation. Factors bearing on correlative apportionment among riparians include annual and seasonal variations linked to weather and climate (*Prather*). The very same use that was once a reasonable and established riparian right can become unreasonable in the face of changing circumstances and competing uses, and the riparian right can thereby be extinguished in favor of a competing appropriative right without compensation (*Joslin*). Failure to exercise a riparian right can result in a reallocation such that all appropriative rights in the same watercourse receive higher priority than the dormant riparian right (*Long Valley*). Under the Reasonable Use Doctrine, the Public Trust Doctrine has been expanded beyond its traditional scope of navigation, recreation, and fishing to encompass preservation of natural resources and environmental protection (*Whitney*, EBMUD) and to include non-navigable tributaries to navigable waters (*Audubon*, *California Trout*). Furthermore the SWRCB has authority to enforce the situational and dynamic Reasonable Use Doctrine (EBMUD) and has an obligation to reallocate water rights when necessary in order to protect the public trust (*Racanelli*).

### **C. Authority or Obligation to Reallocate Groundwater Rights**

During the current drought most of California’s water is being provided by groundwater basins,<sup>62</sup> many of which are in an unsustainable and/or unregulated state of overdraft that could ultimately lead to their depletion

---

61. *United States v. State Water Res. Control Bd.*, 182 Cal.App.3d 82, 116 (1986).

62. Edmund G. Brown, State of California, The Resources Agency, Department of Water Resources, *Public Update for Drought Response Groundwater Basins with Potential Water Shortages and Gaps in Groundwater Monitoring* (Apr. 30, 2015).

---

in a tragedy of the commons.<sup>63</sup> Consequently, despite SWRCB's historically limited authority over groundwater, the resource cannot be ignored when redefining the constitutionally mandated reasonable and beneficial use of water in the interest of the people and for the public welfare.

The Reasonable Use Doctrine has been held applicable to groundwater almost since its enshrinement in the California Constitution in 1928. The California Supreme Court ruled in 1935,

It is to be noted that the new doctrine embodied in the constitutional amendment . . . not only applies the doctrine of reasonable use as between riparian and appropriator, but also as between an overlying owner and an appropriator. [Citations omitted] The overlying owner in this state has been held to have analogous rights to those of a riparian.<sup>64</sup>

This subsection examines relevant case law and SWRCB authority to act in light of recent legislation expanding the agency's authority to enforce reasonable use of groundwater.

#### **i. Groundwater Right Prescription and Reasonable Use**

The evolution of prescriptive groundwater rights provides further insight into the application of the Reasonable Use Doctrine. For instance, when a municipality pumps groundwater for a period of many years from a basin in which overdraft conditions have long been evident, a prescriptive municipal appropriative right can be established as it was in the Raymond Basin.<sup>65</sup> In the landmark *Pasadena v. Alhambra* case yielding the first California basin adjudication in 1949, rather than allocate the safe yield according to priority of rights between overlying and appropriative users, or by "first in time, first in right" among appropriative users, the court ruled that all parties had acquired rights against one another by "mutual prescription" and consequently shared the same priority.<sup>66</sup> Accordingly all overlying rights holders and appropriators received a reduced *pro rata* share of the safe yield based on their historical use. No compensation was offered for the reduced allocations.

While courts have subsequently moved away from the mutual prescription doctrine articulated in *Pasadena*, the principle that groundwater rights in an overdrafted basin can be adjudicatively reapportioned under the

---

63. Cf. Garrett Hardin, *The Tragedy of the Commons*, SCIENCE Vol. 162 (3859) pp. 1243-1248 (1968).

64. *Tulare*, 3 Cal. 2d 489, 525.

65. *Pasadena v. Alhambra* 33 Cal. 2d 908, 933 (1949).

66. *Id.* at 928-33.

Reasonable Use Doctrine between overlayers and appropriators in such a manner as to conform overall with the safe yield of the aquifer has been upheld. Basing allocations purely on past use, however, potentially gives rise to outcomes at odds with present and future reasonable use. The foregoing assertion is consistent with the *Joslin* court's holding that the same use that was at one time reasonable could subsequently become entirely unreasonable. Furthermore a rule designating historical use as the sole basis for determining future apportionments in basins having yet to be adjudicated can create a perverse incentive for users to pump as much water as possible and with the earliest priority date, in order to maximize the quantity and economic value of their future water rights. Clearly both (1) fixed rights allocations ignoring that reasonable and beneficial water use priorities are subject to change over time and, (2) creating a "race to the pump house," run counter to the Reasonable Use Doctrine.

By 1975 the mutual prescription doctrine had been modified to take other considerations into account in groundwater adjudications. Allocating each user a *pro rata* share of past use in an overdrafted basin regardless of type of use or nature of right was found to be too simplistic. The *City of Los Angeles v. City of Fernando* court found that

the allocation of water in accordance with prescriptive rights mechanically based on the amounts beneficially used by each party for a continuous five-year period after commencement of the prescriptive period and before the filing of the complaint, does not necessarily result in the most equitable apportionment of water according to need. A true equitable apportionment would take into account many more factors.<sup>67</sup>

The same court also held that surface water rights could extend to hydrologically connected groundwater.<sup>68</sup>

Consistent with *Fernando* and in the same year, the California Court of Appeal held in the 1975 *Tehachapi-Cummings County Water District v. Armstrong* decision that overlying owners' water rights are to be quantified on the basis of current, reasonable and beneficial need, not past use; there are no senior overlying users who gain priority by being first to pump. By analogy to riparian rights cases such as *Half Moon Bay* and *Joslin*, factors to be considered include the amount of water available, the extent of ownership in the basin, and the nature of projected use.<sup>69</sup>

---

67. *City of Los Angeles v. City of Fernando*, 14 Cal. 3d 199, 265 (1975).

68. *Id.* at 251.

69. *Tehachapi-Cummings County Water District v. Armstrong*, 49 Cal. App. 3d 992, 1001 (1975).

---

**ii. Public Trust Doctrine Applied to Groundwater**

While the Public Trust Doctrine pertains primarily to surface waters, recent holdings establish that it also touches on groundwater connected thereto. In 2014 the California Court of Appeal reversed a lower court decision granting plaintiff water users a preliminary injunction and a writ of mandate invalidating an SWRCB water use regulation designating Russian River diversion for the purpose of providing frost protection as unreasonable use when it jeopardizes salmon.<sup>70</sup> The upheld regulation includes in its prohibition any “diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater.”<sup>71</sup>

The Sacramento Superior court was even more explicit in the *Scott River* decision. The court applied the rule of *Audubon*<sup>72</sup> extending the public trust to nonnavigable tributaries of navigable waters to groundwater, holding that groundwater pumping may not harm nearby rivers: “The court thus finds the Reasonable Use Doctrine protects navigable waters from harm caused by extraction of groundwater, where the groundwater is so connected to the navigable water that its extraction adversely affects public trust uses.”<sup>73</sup> That ruling is pending appeal.

**iii. SWRCB Authority under the Sustainable Groundwater Management Act**

The Sustainable Groundwater Management Act begins with the following bold and radical assertion:<sup>74</sup>

(a) The Legislature finds and declares as follows:

(1) The people of the state have a primary interest in the protection, management, and reasonable beneficial use of the water resources of the state, both surface and underground, and that the integrated management of the state’s water resources is essential to meeting its water management goals.

---

70. *Light v. State Water Resources Control Bd.*, 226 Cal. App. 4th 1463, 1472-73 (2014).

71. Cal. State Water Resources Control Bd., Amendment to Division 3 of Title 23 of the California Code of Regulations, § 862 Russian River, Special (2011).

72. *Nat’l. Audubon Soc.*, 33 Cal. 3d 419, 449.

73. *Env’tl. Law Found. v. State Water Res. Control Bd.* No. 34-2010-80000583 (Cal. Super. Ct July 15, 2014).

74. Assem. Bill 1739, Sen. Bill 1168, Sen. Bill 1319, Reg. Sess. (Cal. 2013-2014).

---

The explicit purpose of integration of surface and groundwater resource management is a revolutionary departure from the historical California water resource law paradigm with far-reaching implications. In furtherance of the stated objective, SGMA and the amendment thereto combine to bestow unprecedented authority on the SWRCB over groundwater management.<sup>75,76</sup> The state agency is specifically authorized to intervene when local Groundwater Sustainability Agencies (GSAs) fail to act within specified timeframes to create and implement groundwater management plans for 127 basins designated as medium or high priority and accounting for approximately 96 percent of groundwater use in California,<sup>77</sup> or when those plans cause undesirable results as defined in the Water Code:<sup>78</sup>

“Undesirable result” means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

(2) Significant and unreasonable reduction of groundwater storage.

(3) Significant and unreasonable seawater intrusion.

(4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

(5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Note that (1) and (2) essentially authorize the SWRCB to ensure that the basins are managed subject to safe yield considerations, whereas (3) – (6) extend the agency’s authority to the effects of extraction on water quality within the basin, on overlying land, and on surface water. Effects (3) – (6) are currently being observed in groundwater basins to varying degrees. For

---

75. *Id.*

76. Sen. Bill 13, Reg. Sess. (Cal. 2014-2015).

77. Cal. Dep’t of Water Resources, *Initial Groundwater Basin Prioritization under the Sustainable Groundwater Management (SGM) Act* (Dec. 15, 2014), [http://www.water.ca.gov/groundwater/Sustainable\\_GW\\_Management/SGM\\_BasinPriority.cfm](http://www.water.ca.gov/groundwater/Sustainable_GW_Management/SGM_BasinPriority.cfm).

78. Cal. Water Code § 10721.

---

instance, land is subsiding at a rate of two inches per month in parts of the Central Valley.<sup>79</sup> The SWRCB's authority to prevent the above "undesirable results" is in addition to its newly acquired authority to reallocate groundwater rights under the Reasonable Use Doctrine based for instance on considerations such as the *Tehachapi-Cummings* factors,<sup>80</sup> Public Trust Doctrine, and climate change, when GSAs fail to form or act as required by SGMA.

#### **iv. Summary of Groundwater Rights Authority**

The apportionment of rights in groundwater basins was historically accomplished piecemeal through local adjudications often requiring a decade or more, and only when competing rights holders initiated legal action. The guiding adjudicative principles were to reallocate water rights under the Reasonable Use Doctrine and manage the basin within the long-term safe yield of the aquifer (taking into account Public Trust Doctrine considerations where applicable). Severe statewide drought and chronic overdraft conditions in many basins recently combined to motivate legislation mandating local GSAs to create and implement plans to allocate water rights and manage basins of medium or high priority. When GSAs fail to form or act by specified deadlines, the SWRCB has been granted authority to intervene to create and implement rights allocation and basin management plans.

#### **v. Summary of SWRCB Water Rights Reallocation Authority**

In summary, the SWRCB has been vested with considerable authority to reallocate water rights under the Reasonable Use Doctrine, the Public Trust Doctrine, and SGMA.

With respect to surface water rights, a system has evolved under the Reasonable Use Doctrine whereby water rights allocation decisions are influenced by myriad factors such as population and demographics; agricultural practices; weather, climate, and sea level; the economy and industrial trends and practices; past use of resources (particularly as reflected in current storage reserves and capacity); public trust and ecological concerns; and private property rights. The relative importance of these factors varies not only over time but also from one situation to another. When granting or modifying appropriation permits, the SWRCB has virtually unfettered authority to balance these and other competing

---

79. Alan Buis, NASA: *California Drought Causing Valley Land to Sink*. (Aug. 19, 2015), <http://www.jpl.nasa.gov/news/news.php?feature=4693>.

80. *Tehachapi-Cummings County Water District v. Armstrong*, 49 Cal. App. 3d 992, 1001 (1975).

---

concerns in the public interest such that statewide use of water resources is reasonable and beneficial overall. However public trust considerations bear so directly on the constitutional requirement of acting “in the interest of the people and for the public welfare”<sup>81</sup> that protecting the public trust can be obligatory under some circumstances. The Public Trust Doctrine may extend to any groundwater that is hydrologically connected to surface water.

In the realm of groundwater rights, SGMA vests the SWRCB with groundbreaking authority to intervene to create and implement mandatory groundwater basin rights allocation and management plans where local agencies fail to form or act in a timely or effective manner. As with all California water rights issues, the governing principle is the Reasonable Use Doctrine. Additional guidance is found in the Water Code designating domestic and irrigation as first and second priorities among reasonable and beneficial water uses.<sup>82</sup>

Irrespective of the extent of involvement of the SWRCB, sustainable management of California’s water resources in the face of reduced water supply due to significant factors including drought, climate change, and the SGMA mandate to manage aquifers within safe yield constraints will require reallocation of water rights in many instances. The next section examines whether and under what circumstances a reduction water rights could be construed as a Fifth Amendment taking.

#### **IV. Is SWRCB Water Right Reallocation a Fifth Amendment Taking?**

##### **A. Fifth Amendment Taking Considerations**

The foregoing analysis exposes a tension between the property right in water and the Reasonable Use Doctrine, specifically the potential for conflict between individual property rights guaranteed by the United States Constitution and the requirement in the California Constitution to manage limited state water resources in the interest of all of the people. The Fifth Amendment Takings Clause requires that private property not “be taken for public use, without just compensation.”<sup>83</sup> That mandate also applies to the States through the Due Process Clause of the Fourteenth Amendment.<sup>84</sup> The compensability of state-imposed water rights reductions depends on whether or not the curtailment falls within the legal definition of a taking.

Almost a century ago the Supreme Court expanded scope of the Takings Clause to include onerous governmental regulation, opining, “[I]f

---

81. Cal. Const. art. X, § 2.

82. Cal. Water Code § 106.

83. U.S. Const. amend. V.

84. Chicago, B. & Q.R. Co. v. City of Chicago, 166 U.S. 226, 236-39 (1897).

---

regulation goes too far it will be recognized as a taking”<sup>85</sup> but also acknowledging that “Government hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general law.”<sup>86</sup> The two twenty-first century cases considered in this section illustrate the modern evolution of the applicability of the Takings Clause to California water rights controversies.

**B. Tulare Lake Basin Water Storage District v. United States**

The *Tulare Lake* court held in 2001 that federally imposed water use restrictions to protect wildlife under the 1973 Endangered Species Act (ESA)<sup>87</sup> were a compensable Fifth Amendment Taking.<sup>88</sup> Under that precedent, the SWRCB could engage in a taking even when it is compelled under the Public Trust Doctrine and *Racanelli* ruling<sup>89</sup> to reallocate water rights as necessary to protect fish and wildlife. However, this holding seems anomalous and inconsistent with other rulings. There are strong arguments that the Court erred on several points.<sup>90</sup>

**i. Physical Taking Analysis**

The *Tulare Lake* case came before the Federal Claims Court when the federal government acted under ESA to protect Chinook salmon and delta smelt by withholding agricultural water contractually allocated to the Central Valley.<sup>91</sup> Courts have traditionally divided their analysis of Fifth Amendment takings into two categories: physical takings and regulatory takings.<sup>92</sup> In holding for the plaintiff, Judge Wiese adopted the unprecedented premise that such an action under ESA is tantamount to a physical taking of private property under the Fifth Amendment, stating, “A physical taking occurs when the government’s action amounts to a physical

---

85. *Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 415 (1922).

86. *Id.* at 413.

87. 16 U.S.C. § 1531 et seq.

88. *Tulare Lake Basin Water Storage District v. United States*, 49 Fed.Cl. 313, 319 (2001).

89. *United States v. State Water Res. Control Bd.*, 182 Cal.App.3d 82, 106 (1986).

90. John D. Echeverria, *Why Tulare Lake Was Incorrectly Decided*, Fall Meeting of the Section on Environment, Energy, and Resources, American Bar Ass’n., (Sept. 12-15, 2005).

91. *Tulare Lake*, 49 Fed.Cl. 313, 314.

92. *Id.* at 318.

---

occupation or invasion of the property, including the functional equivalent of a “practical ouster of [the owner’s] possession.”<sup>93</sup>

The *Tulare Lake* opinion relied on the 1992 Rehnquist Supreme Court holding in *Lucas* wherein the South Carolina legislature’s Beachfront Management Act effectively precluded Lucas from building homes on his property:<sup>94</sup>

We have, however, described at least two discrete categories of regulatory action as compensable without case-specific inquiry into the public interest advanced in support of the restraint. The first encompasses regulations that compel the property owner to suffer a physical “invasion” of his property. In general (at least with regard to permanent invasions), no matter how minute the intrusion, and no matter how weighty the public purpose behind it, we have required compensation.<sup>95</sup>

The court further defined the extent of the regulatory occupation or invasion required to invoke the above per se rule of *Lucas* as follows:

When the owner of real property has been called on to sacrifice all economically beneficial use of property in the name of common good, that is, to leave his property economically idle, he has suffered a “taking” within the meaning of the Fifth Amendment.<sup>96</sup>

Fundamentally, the *Tulare Lake* Court treated restrictions on water deliveries to protect fish under ESA as a physical, rather than regulatory, taking and analyzed under the per se rule of *Lucas* applicable to instances of physical occupation where it is impossible to impinge on any portion of the property right without depriving the property owner of the right as a whole. As such, its application to the partial reduction of a usufructuary water right that leaves the remaining portion fully intact seems contrived, particularly when the court acknowledged that the economic loss was “de minimus.”<sup>97</sup> Such water rights are not subject to “physical occupation or invasion”<sup>98</sup> in any meaningful sense. Furthermore if a riparian or overlying property owner is deprived of only a portion of the water rights appurtenant to the property because of a reduction in his allocation due to a government regulation

---

93. *Id.* at 319.

94. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1006 (1992).

95. *Id.* at 1015.

96. *Id.* at 1003.

97. *Tulare Lake*, 49 Fed.Cl. 313, 318-19.

98. *Id.*

mandating the reallocation, and the property thereby retains at least some economically beneficial or productive use, then a Fifth Amendment taking has not been suffered under *Lucas*.

In the alternative to physical taking analysis, regulatory taking analysis proceeds under the “parcel as a whole” rule as defined by the 1993 Supreme Court.<sup>99</sup> Under that ruling compensation is available only for the portion of the property taken, which presumably would be negligible in the instance of a de minimus taking as in *Tulare Lake*:

[A] claimant’s parcel of property [cannot] first be divided into what was taken and what was left for the purpose of demonstrating the taking of the former to be complete and hence compensable. To the extent that any portion of property is taken, that portion is always taken in its entirety; the relevant question, however, is whether the property taken is all, or only a portion of, the parcel in question.<sup>100</sup>

#### **ii. Background Principles of State Law Barring Claim**

Saliently, the *Lucas* Court also held that state law may bar a takings claim where “background principles of [state] law . . . prohibit the uses he now intends in the circumstances in which the property is presently found.”<sup>101</sup> The background principles are “the logically antecedent inquiry”<sup>102</sup> in a takings challenge. Consequently, if background principles restricted the use of a claimant’s property at the time of purchase, a regulatory prohibition of that use could not produce a constitutional taking.

As such, Fifth Amendment takings claims arising from reallocation of water rights associated with property purchased at least since the 1928 California Constitutional amendment<sup>103</sup> should be barred under the Reasonable Use Doctrine contained therein, which unambiguously qualifies as a background principle of state water law. Takings claims are inconsistent with the California Constitution and state law at least because the Reasonable Use Doctrine prohibits unreasonable use of water and authorizes the courts and the SWRCB to determine which uses are reasonable and which are unreasonable, for instance as in the 1967 *Joslin* ruling depriving landowners of their economically valuable riparian water rights,<sup>104</sup> the 1980 *Audubon* holding revoking a municipality’s historic right to

---

99. *Concrete Pipe and Products of California, Inc. v. Construction Laborers Pension Trust for Southern California*, 113 S.Ct. 2264, 2290 (1993).

100. *Id.*

101. *Lucas*, 505 U.S. 1003, 1004.

102. *Id.* at 1029.

103. Cal. Const., art. X, § 2.

104. *Joslin*, 67 Cal. 2d 132, 143-44.

divert water in favor of the public trust,<sup>105</sup> and the 2015 curtailment of pre-1914 senior riparian rights by the SWRCB,<sup>106</sup> none of which resulted in compensation to the party whose rights were reduced or extinguished.

The foregoing rationale applies to overlying users in a groundwater basin because they enjoy rights analogous to those of riparians.<sup>107</sup> All other property rights in water are at most equal to those of riparians and overlies. Therefore the Reasonable Use Doctrine, a foundational background principle of California state water law, prohibits any use of the property right to water that the state courts or agencies determine to be unreasonable. Accordingly even if an owner of riparian or overlying real estate is deprived of all water rights appurtenant thereto, a Fifth Amendment takings claim could be barred under *Lucas*.

But the foregoing analysis puts the cart before the horse in that it presupposes that the appropriative water right holder had a vested property right in water to begin with. The state grants no such vested right to surface water appropriators. The SWRCB merely grants revocable use rights permits for a finite amount of water. Its authority to do so is subject to the Reasonable Use Doctrine, a doctrine that state law interprets as allowing or even requiring the board to revoke or reallocate such rights when necessary to protect fish and wildlife in consideration of changing public needs.<sup>108</sup> To apply California law in a federal court differently than the same law would be applied in a California court as was done in *Tulare Lake* could run afoul of the Erie doctrine requiring that, except in matters governed by the Constitution or Acts of Congress, the state law must be applied by federal courts.<sup>109</sup>

Had the usufructuary right been properly regarded as defined by the state law of California as a limited and temporary right under the Reasonable Use Doctrine, as opposed to a fixed property right in perpetuity, the *Tulare Lake* claim would have failed. However subsequent case law advises against applying the *Lucas* per se rule for physical takings to such a fact pattern in the first place.

---

105. *Nat'l. Audubon Soc.*, 33 Cal. 3d 419, 449.

106. Cal. Water Bds., Water Rights News (June 12, 2015); Cal State Water Resources Control Bd., *Notices of Water Availability*, (Nov. 6, 2015), [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/water\\_availability.shtml](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/water_availability.shtml).

107. *Tulare*, 3 Cal. 2d 489, 525.

108. *United States v. State Water Res. Control Bd.*, 182 Cal.App.3d 82, 106 (1986).

109. *Erie Railroad v. Tompkins*, 304 U.S. 64, 78 (1938).

---

**C. Casitas Municipal Water District v. United States**

Casitas Municipal Water District brought cases before the federal claims court<sup>110</sup> and the Federal Circuit court.<sup>111</sup> The cases were argued differently and each is illustrative in its own right, so they are discussed separately below.

**i. Federal Claims Case Before Judge Wiese**

Similar to the preceding case, *Casitas* involved a takings claim based on a governmental requirement under ESA to leave enough water below a dam to support an endangered species of trout.<sup>112</sup> The same judge who decided *Tulare Lake* based on a physical taking analysis ruled that a regulatory taking analysis should apply instead in *Casitas*,<sup>113</sup> and the plaintiff's case evaporated upon consideration of the *Penn Central* factors.<sup>114</sup> Judge Wiese substantiated his change in position based on the intervening holding of *Tahoe-Sierra* wherein the Supreme Court explicitly held:

This longstanding distinction between acquisitions of property for public use, on the one hand, and regulations prohibiting private uses, on the other, makes it inappropriate to treat cases involving physical takings as controlling precedents for the evaluation of a claim that there has been a "regulatory taking," and vice versa.<sup>115</sup>

The *Tahoe-Sierra* ruling clearly distinguishes between (i) physical takings subject to a per se treatment and (ii) cases appropriate for regulatory takings analysis under *Penn Central* and the "parcel as a whole" rule. As such, the Wiese court found itself compelled

to respect the distinction between a government takeover of property (either by physical invasion or by directing the property's use to its own needs) and government restraints on an owner's use of that property. Although from the property owner's standpoint there may be

---

110. *Casitas Municipal Water District v. United States*, 76 Fed. Cl. 100 (2007).

111. *Casitas Municipal Water District v. United States*, 708 F.3d 1340 (2013).

112. *Casitas*, 76 Fed. Cl. 100.

113. *Id.* at 104-06.

114. *Penn Central Transportation Co v. City of New York*, 98 S.Ct. 2646, 2649-50 (1978).

115. *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency*, 122 S.Ct. 1465, 1479 (2002).

---

no practical difference between the two, *Tahoe-Sierra* admonishes that only the government's active hand in the redirection of a property's use may be treated as a per se taking.<sup>116</sup>

Because the court had decided that the requirement of sufficient flow below the dam was a use restriction rather than a physical invasion or redirection, plaintiff declined to argue a regulatory taking under the *Penn Central* factors: (1) the economic impact of the regulation on the claimant, (2) the extent to which the regulation interferes with distinct investment-backed expectations, and (3) the character of the government's action<sup>117</sup> (e.g. whether the taking can be characterized as a physical invasion by government). Plaintiff's case collapsed because *Casitas'* reduction in water right to maintain river flow for the public welfare was not a Fifth Amendment taking when the proper analysis was applied.

Note that once a California water rights reallocation is classified as regulatory, a strong argument analogous to that advanced under the *Lucas* background principles of state law doctrine emerges. There can be no reasonable investment-backed expectation per *Penn Central* factor (2)<sup>118</sup> of a fixed perpetual right in water appurtenant to any California property, or at least any property purchased after a given date, in light of the 1928 constitutional enactment of the Reasonable Use Doctrine,<sup>119</sup> subsequent cases of uncompensated water rights curtailments including *Joslin*<sup>120</sup> and *Audubon*,<sup>121</sup> and the SGMA requirement to manage groundwater basins, many of which are currently overdrafted, sustainably within safe yield constraints.<sup>122</sup>

## ii. Federal Circuit Case

The *Casitas* case before the 2013 federal circuit differed from the preceding federal claims court case in that *Casitas* argued that the regulation went beyond the a restriction on private use requiring plaintiff to leave water in the river, and instead involved "acquisitions of property for public use"<sup>123</sup> by virtue of specific requirements of construction of a fish

---

116. *Casitas*, 76 Fed. Cl. 106.

117. *Penn Central*, 98 S.Ct. 2646, 2649-50.

118. *Id.*

119. Cal. Const., art. X, § 2.

120. *Joslin*, 67 Cal. 2d 132, 143-44.

121. *Nat'l. Audubon Soc.*, 33 Cal. 3d 419, 449.

122. Assem. Bill 1739, Sen. Bill 1168, Sen. Bill 1319, Reg. Sess. (Cal. 2013-2014).

123. *Penn Central*, 98 S.Ct. 2646, 2649-50.

---

ladder and fish screen in addition to increased dam bypass flows during trout migration periods.<sup>124</sup> The federal circuit court therefore recognized a physical takings claim, but only in the amount of water that plaintiff could demonstrate that it would have otherwise put to beneficial use per the Reasonable Use Doctrine. Since the reduction in the amount of water Casitas was allowed to divert was only a small fraction of its previous allocation, plaintiff was unable to demonstrate that the water would have been otherwise been put to beneficial use. As such, the claim was found not to be ripe and was dismissed.<sup>125</sup> The court seems to reach the correct result despite flawed analysis.

The court's restriction of the extent of the taking to foregone reasonable use shows at least some cognizance of state law, however it fails to recognize the inherently unvested nature of water rights based on the state's constitutional and statutory authority to redefine reasonable use within its borders under California law as described in the foregoing *Tulare Lake* and *Casitas* claims court analyses, and as such would seem to fail to comport with the Erie doctrine.<sup>126</sup>

#### **D. The Public Trust as a Takings Defense**

Another policy underlying state law is the Public Trust Doctrine prohibiting uses that harm navigation, recreation, fishing, natural resources or the environment. As with the Reasonable Use Doctrine, it can be argued under *Lucas* that any SWRCB rights reallocation based at least in part on the Public Trust Doctrine is barred from a takings claim because that background principle of state law prohibits the intended use under the circumstances in which the property is presently found. Precedents discussed above amply demonstrate that California courts have long upheld water rights reallocation in the name of the Public Trust Doctrine.<sup>127</sup> The California Superior Court held that the public trust extends to groundwater hydrologically connected to surface water.<sup>128</sup> Pending appeal, that ruling may provide a defense against takings lawsuits even for governmental agencies implementing SGMA for groundwater under some circumstances.

---

124. *Casitas Municipal Water District v. United States*, 708 F.3d 1340, 1344 (2013).

125. *Id.* at 1358-60.

126. *Erie*, 304 U.S. 64, 78.

127. *Whitney*, 6 Cal. 3d 251 (1971); *Envtl. Def. Fund v. E. Bay Mun. Util. Dist.*, 26 Cal. 3d 183 (1980); *Nat'l. Audubon Soc.*, 33 Cal. 3d 419 (1983); *California Trout*, 207 Cal.App.3d 585 (1989); *Light*, 226 Cal. App. 4th 1463 (2014).

128. *Envtl. Law Found. v. State Water Res. Control Bd.* No. 34-2010-80000583 (Cal. Super. Ct July 15, 2014).

---

## **V. Conclusions and Recommendations**

The authority of the SWRCB to reallocate water rights has been examined. The agency possesses considerable authority to reallocate surface water rights based on a significant body of historical case law precedent. The SWRCB may include considerations of weather and climate as well as the Public Trust Doctrine in its determinations of Reasonable Use. Said authority extends beyond merely granting and reallocating appropriative rights under the permitting process to reducing or extinguishing riparian rights that were once permissible but have become unreasonable under the Reasonable Use Doctrine owing to changing circumstances such as drought related to anthropogenic climate warming. Under conditions of severe shortage, the SWRCB has acted to curtail the most senior pre-1914 riparian rights without compensation.<sup>129</sup>

Recent developments have dramatically increased the scope of SWRCB authority to administer groundwater basins. SGMA has extended SWRCB management authority to sustainable management of the vast majority of California's groundwater with the explicit legislative goal of integrated management of the state's water resources. Pending appeal, the board may wield statutory authority to engage in integrated surface and groundwater rights administration in the Scott River system under the Public Trust Doctrine, wherein the SWRCB can conduct an adjudication of all water rights including "ground water supplies which are interconnected with the Scott River."<sup>130</sup> These unprecedented strides in integrating surface and groundwater rights management forge a path toward credible means for meeting the state's water management objectives.

Considering potential avenues for the SWRCB to conserve significant quantities of water, approximately eighty percent of California's water use is agricultural.<sup>131</sup> The SWRCB would therefore seem to have greatest authority for the most immediate impact in agricultural use of surface water supplied primarily by the Central Valley Project or the State Water Project. Heavily weighting Reasonable Use determination factors such as per-acre or per-unit-value water requirements of various crops while also considering other factors including economic and nutritional value, the availability of viable alternative farming locations for a given crop, and the contribution of the farming method and location to soil salinity, the SWRCB could reward

---

129. Cal. Water Bds., *Water Rights News* (June 12, 2015); Cal State Water Resources Control Bd., *Notices of Water Availability*, (Nov. 6, 2015), [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/water\\_availability.shtml](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/water_availability.shtml).

130. Cal. Water Code § 2500.5.

131. Cal. Dep't of Water Resources, *Agricultural Water Use* (last modified Mar. 16, 2010), <http://www.water.ca.gov/wateruseefficiency/agricultural/>.

agricultural appropriators who choose efficient, valuable and low-impact crops with a larger apportionment of available water rights.

There is the possibility that those receiving a reduced apportionment will simply compensate by pumping more groundwater. SGMA phases in over a period of decades; plans must be adopted by 2022 but sustainability isn't required until 2042. Consequently, unsustainable groundwater extraction may remain a viable option for many farmers for the next twenty-seven years. However, as an increasing proportion of medium and high priority basins become subject to sustainable management, over time agricultural pumpers will be forced to use water more efficiently whether or not the SWRCB intervenes in a given basin.

The Water Code endows the SWRCB with authority to approve transfers of post-1914 appropriative water rights.<sup>132</sup> The prospect of water transfers may provide incentive for appropriators to use water more efficiently in order to create a surplus available for sale. However water transfers are not a panacea; several looming issues threaten California's future water management. First, silting behind dams reduces the storage capacity of reservoirs on an ongoing basis. Second, long-term irrigation in areas with poor drainage tends to increase soil salinity, threatening the viability of farmland in areas like the Central Valley. Third, overdrafting of groundwater aquifers depletes the water resource currently supplying about half of California's water, and contributes to desertification. Addressing each of these problems will require significant planning, resources and expense. Unless new, more efficient technologies drastically reduce the cost of desalination, California's future overall water use may be permanently curtailed by practical economic considerations.

As the SWRCB exercises its expanding rights reallocation authority to align actual water usage with the Reasonable Use Doctrine in response to evolving considerations including climate change, recent court decisions raise concerns regarding the threat of compensable Fifth Amendment takings claims. However these rulings seem inconsistent with earlier Supreme Court rulings including previous takings rulings and the Erie doctrine. The current rapid evolutionary pace of California water resource law should render the unvested nature of water rights under the Reasonable Use Doctrine self-evident, and emerging defenses including the Public Trust Doctrine should serve to further insulate against takings claims. Regardless, the state would seem to have no choice but to act responsibly to protect the precious and dwindling water supply for future generations of Californians.

---

132. Cal. Water Code §§ 1020, 1435, 1700, 1707, 1725, and 1735.

---