Ocean and Coastal Law Journal

Volume 22 | Number 2 Article 11

May 2017

Prospects and Pitfalls of Desalination Development: Insights From Three States

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PROSPECTS AND PITFALLS OF DESALINATION DEVELOPMENT: INSIGHTS FROM THREE STATES

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"Water, water, everywhere…"[2]

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[2] SAMUEL TAYLOR COLERIDGE, THE RIME OF THE ANCIENT MARINER (1834). For those who did not endure an English class in which the poem is assigned, the oft-quoted line "*Water, water everywhere, nor any a drop to drink*" reflects the agony of a sailor surrounded by ocean water but facing death for lack of freshwater.

I. INTRODUCTION

Like Coleridge's sailor in the *Rime of the Ancient Mariner*, burgeoning coastal communities in the United States have long lamented the fact that while situated by vast expanses of ocean water, they could not slake their growing thirst with it. Increasing populations, steady demand, and declining freshwater sources have amplified the problem across the U.S., particularly in the country's three most populous states: California, Texas, and Florida.[3]

This paper examines efforts in three states to bring desalination plants online to transform saline water into a secure water supply. Part one provides the context that prompted the states to embark upon their efforts to augment their water supply with desalination plants. It highlights the increasing demands in growing states, dwindling freshwater sources, and advances in desalination technology that pointed to an attractive solution. Part two sets forth the approach employed to examine each of three states on the forefront of bringing desalination plants online. Part three assesses the emergence of desalination law in each state outlining the impetus leading to an articulated objective to bring large-scale desalination plants online, the legal and policy apparatus employed to do so, and the status of each state's efforts to date. This phase-oriented approach highlights decisive policy-making moments. In so doing, the assessment depicts not only the entrance of desalination onto the water supply landscape but the evolution of law necessary to accommodate that new reality. Part four concludes with a summary of insights and suggestions for future research on the emergence and evolution of desalination-oriented laws.

II. CONTEXT: DESALINATION AS WATER SUPPLY SOLUTION AND LEGAL CONUNDRUM

The United States uses over 305 billion gallons of freshwater every day and California, Texas, and Florida constitute three of the top four freshwater consuming states.[4] Each of those states has endured water shortages in recent years, yet each state sits by the sea where ninety-seven percent of the world's water resides in the form of our oceans.[5] In recent years, these three states have each embarked on efforts to tap into the ocean to solve their water shortage problems.

While every state in the U.S. has at least one desalination plant[6] and the nation as a whole boasts thousands of plants installed or under construction,[7] their combined output of roughly 50 billion gallons per day is still a small share of the nationwide water demand.[8] Recent reports reflect the fact that while there are thousands of plants operating in the U.S., most are considered

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[3] *Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2016*, U.S. CENSUS BUREAU, https://www.census.gov/data/tables/2016/demo/popest/state-total (last visited Feb. 3, 2017) (according to Census data, California (39,250,017); Texas (27, 862,596); and Florida (20,612,439) top the list of US states by population.).

[4] MOLLY A. MAUPIN ET AL., U.S. DEP'T OF THE INTERIOR, ESTIMATED USE OF WATER IN THE UNITED STATES IN 2010 1, 9 tbl.1 (2014), https://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf.

[5] *Id.* at 4; Nat'l Ocean Serv., *Where is All of the Earth's Water?*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., *available at* http://oceanservice.noaa.gov/facts/wherewater.

[6] *See generally* GLOBAL WATER INTELLIGENCE, IDA DESALINATION YEARBOOK 2006–2007 (2007).

[7] *Id.*

[8] *See* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-430, FRESHWATER SUPPLY CONCERNS CONTINUE AND UNCERTAINTIES COMPLICATE PLANNING 19 (2014) [hereinafter GAO 2014 FRESHWATER REPORT]; Maupin, *supra* note 4, at 1. US freshwater demand exceeds 355 billion gallons per day.

'modest' capacity, i.e., less than 0.3 million gallons daily (MGD) produced.[9] However, desalination is ramping up; between 2003 and 2013 the number of states employing desalination on a substantial basis doubled from nine to eighteen.[10] In addition, the three largest states examined in this assessment – California, Florida and Texas – account for more roughly two thirds of the plants producing desalinated water.[11]

In 2015, the largest desalination plant in the western hemisphere, the Carlsbad Desalination Plant opened in Southern California.[12] The facility is designed to provide water to hundreds of thousands of people and comes with implications beyond its billion dollar price tag.[13] Desalination is energy intensive, putting high demand on burdened energy distribution systems. The process of turning saline water into drinking water also incurs significant environmental impacts.

As a result, the costs and benefits regarding whether or not, and under what circumstances, desalination makes sense are debated on a regular basis. The various costs along with uncertainty surrounding water access and the permitting process pose challenges to the integration of desalinated water into water resource portfolios at the state scale.[14]

At the same time, these debates and challenges are playing out on shifting legal landscapes.[15] This paper examines how the prospect of desalination is beginning to reshape water management legal regimes in California, Texas, and Florida.

As states move to employ desalinated water to respond to surging demand amidst droughts and other factors leading to inconsistent supplies, the state of the law merits examination. Some state, federal, and regional entities have developed approaches to, not only the technical, but also the legal mechanisms of integrating desalination facilities into water management systems.[16] Scant attention has been paid to how laws are emerging to address these new realities.[17]

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[9] *See* GLOBAL WATER INTELLIGENCE, *supra* note 6. In 2007, there were 1,877 installed desalination plants and the majority of these plants had capacity of less than 0.3 MGD.

[10] GAO 2014 FRESHWATER REPORT, *supra* note 8, at 40 tbl.2.

[11] Mike Mickley, *US Municipal Plants: Number, Types, Locations, Sizes, and Concentrate Management Practices*, 4 IDA J. DESALINATION & WATER REUSE 44, 46 (2012).

[12] SAN DIEGO CNTY. WATER AUTH., SEAWATER DESALINATION: THE CLAUDE "BUD" LEWIS DESALINATION PLANT AND RELATED FACILITIES 1 (2016), *available at* http://www.sdcwa.org/sites/default/files/desal-carlsbad-fs-single.pdf.

[13] *Id.*

[14] *See, e.g.*, JORGE ARROYO & SAQIB SHIRAZI, TEX. WATER DEV. BD., COST OF BRACKISH GROUNDWATER DESALINATION IN TEXAS 1-2 (2012), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/Cost_of_Desalination_in_Texas.pdf (citing that the total production costs range from $1.09 to $2.40 per thousand gallons).

[15] *See, e.g.*, Graeme K. Pearce, *Desalination vs. Water Reuse: An energy analysis illustrated by case studies in Los Angeles and London, in* WATER-ENERGY INTERACTIONS IN WATER REUSE, 257, (Valentina Lazarova et al. ed. 2012).

[16] *See generally* IAN C. WATSON, O. J. MORIN & LISA HENTHORNE, DESALTING HANDBOOK FOR PLANNERS (3d ed. 2003), *available at* http://www.usbr.gov/research/AWT/reportpdfs/report072.pdf ; CAL. STATE UNIV., CTR. FOR COLLABORATIVE POLICY, CALIFORNIA DESALINATION PLANNING HANDBOOK (2008), *available at* http://www.water.ca.gov/desalination/docs/Desal_Handbook.pdf; DEPARTMENT OF WATER RESOURCES, WATER DESALINATION FINDINGS AND RECOMMENDATIONS (2003), http://www.water.ca.gov/desalination/docs/Findings-Recommendations.pdf; CAL. COASTAL COMM'N, SEAWATER DESALINATION AND THE CALIFORNIA COASTAL ACT (2004), http://www.lbwater.org/sites/default/files/reports/14a-3-2004-desalination.pdf; R.W. BECK INC., APPLICABLE RULES AND REGULATIONS FOR SEAWATER DEMINERALIZATION–TASK B. 6. FOR THE SEAWATER DEMINERALIZATION FEASIBILITY INVESTIGATION (2002) (identifies the federal, state, regional, local, and other entities and the applicable rules, regulations, and permits that apply to the construction and operation of a desalination facilities within the state

III. APPROACH

This paper employs a comparative analysis of desalination policy development in the three most populous US states which hold the distinction of also being the loci of most of the desalination capacity in the United States: California, Florida, and Texas.[18] These three states also number among the handful of states that have passed laws regarding desalination specifically.[19] The approach is designed to identify how legal and regulatory regimes are emerging and evolving in light of the employment of desalination technology to augment state water supplies.

As outlined below, the three states represent a complex and diverse set of water resource challenges at the state and municipal levels, each of which have integrated seawater desalination into water resource policy and have actively supported desalination technology via the policy making process. For each state, we examine the particular policy-chronology phases:

(1) impetus (driving forces prompting the articulation of desalination planning and development);

(2) apparatus (legal mechanisms employed to support that advancement); and,

(3) status (a snapshot of where the state stands today).

This approach in turn helps us identify whether and how the legal landscape is adapting to accommodate desalination development in each state.

IV. DESALINATION LAW IN CALIFORNIA, TEXAS, AND FLORIDA

Before examining the three states at the heart of this assessment, a brief overview of the drive for desalination in the US at large merits mention. Fresh water in the United States is a limited resource and water shortages are recurring at an increasing rate. A 2013 survey conducted by the US Government Accountability Office found that 40 of 50 state water managers in the United States expected their states would face water shortages in the succeeding decade.[20] That number is up from 36 states addressing the same question a decade earlier.[21]

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of Florida); FLA. DEP'T OF ENVTL. PROT., DIV OF WATER RES. MGT., DESALINATION IN FLORIDA: TECHNOLOGY, IMPLEMENTATION, AND ENVIRONMENTAL ISSUES (2010), *available at* http://www.dep.state.fl.us/water/docs/desalination-in-florida-report.pdf [hereinafter DESALINATION IN FLORIDA REPORT]; R.W. BECK INC., GUIDANCE MANUAL FOR PERMITTING REQUIREMENTS IN TEXAS FOR DESALINATION FACILITIES USING REVERSE OSMOSIS (2004), *available at* http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/2003483509.pdf; *see also*, HOWARD E. STEIMAN, PERMITTING ROADMAP FOR SEAWATER DESALINATION FACILITIES IN TEXAS USING REVERSE OSMOSIS PROCESSES (2004), *available at* http://www.twdb.texas.gov/publications/reports/numbered_reports/doc/R363/C12.pdf.

[17] Michael Pappas, *Unnatural Resource Law: Situating Desalination in Coastal Resource and Water Law Doctrines*, 86 TUL. L. REV. 81, 83 (2011) (examining the ways in which desalination fit into existing property, water law, and coastal resource regimes, and pointing to a need for federal level legislation to clarify the role of desalination in the context of policy and common law doctrines); *see also*, COMM. ON ADVANCING DESALINATION TECHNOLOGY, NAT'L RESEARCH COUNCIL, DESALINATION: A NATIONAL PERSPECTIVE (2008) (noting lack of streamlined desalination research funding among federal agencies)).

[18] DESALINATION IN FLORIDA REPORT, *supra* note 16, at 5 (citing GLOBAL WATER INTELLIGENCE, DESALINATION MARKETS 2007: A GLOBAL FORECAST (2006)).

[19] California, Florida, New York, North Carolina and Texas each have laws explicitly referring to desalination.

[20] GAO 2014 FRESHWATER REPORT, *supra* note 8, at 28.

Water scarcity and the prospect of desalination as a solution found its way into the 2016 presidential campaign as a national security and infrastructure priority issue.[22]

For each state, we examine and relate three policy-chronology phases: 1) impetus; 2) apparatus; and, 3) status.[23] This approach in turn helps us identify whether and how the legal landscape is emerging/evolving to accommodate desalination development in each state.

A. *California Water History*

With just under 40 million inhabitants, California is the most populous state in the United States.[24] California continues to grow, with a projected population of over 46 million by 2030.[25] It also has a growing thirst. As early as 1998, the California Department of Water Resources (DWR) estimated that water shortages would be a problem in both drought and non-drought years.[26]

1. Impetus for California desalination policy

While water shortages have long been part of California's history, severe droughts over the course of the last ten years have exacerbated periodic deficits. To ensure adequate drinking water for current and future populations and to reduce the distance over which water was transported to areas in need, California integrated desalination development into its water supply policy.

California has a diverse geography and a dynamic history regarding water access and use. The result has been a history of politics, legal battles, and both state and federal efforts (and failures) to meet water needs statewide.[27]

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[21] GOV'T ACCOUNTABILITY OFFICE, GAO-03-514, FRESHWATER SUPPLY STATES' VIEWS OF HOW FEDERAL AGENCIES COULD HELP THEM MEET THE CHALLENGES OF EXPECTED SHORTAGES, 5 (2003) [hereinafter GAO 2003 FRESHWATER REPORT].

[22] Jennifer Yachnin, *Trump embraces desalination as possible fix for water woes*, E & E NEWS (Sept. 14, 2016), http://www.eenews.net/eedaily/stories/1060042796 (last visited May 4, 2017) ("[P]residential nominee Donald Trump asserted that the long-term security of fresh water could be 'the most important issue' the nation will face and called for new investments to make desalination more affordable."*); see also*, Lynn Horsley et al., *Trump team compiles infrastructure priority list*, MCCLATCHY DC BUREAU, Jan. 24, 2017, http://www.mcclatchydc.com/news/politics-government/white-house/article128492164.html (last visited May 4, 2017) (Huntington Beach, California desalination plant was listed as among fifty priority infrastructure projects.).

[23] We understand well that the policy cycle is often noted as being anywhere from a four to eight to an indefinitely phased chronological process. We hope to capture the relevant and variously familiar policy steps in this simplified three step approach.

[24] *QuickFacts: California*, U.S. CENSUS BUREAU (2016), https://www.census.gov/quickfacts/map/PST045216/06,00. California's population was estimated to be 39,250,017 in 2016.

[25] *2005 Interim State Population Projections, tbl. 1*, U.S. CENSUS BUREAU (2005), https://www.census.gov/population/projections/data/state/projectionsagesex.html.

[26] CAL. DEP'T OF WATER RES., CALIFORNIA WATER PLAN UPDATE BULLETIN 160-98 (1998), *available at* http://www.water.ca.gov/pubs/planning/california_water_plan_1998_update__bulletin_160-98_/b16098_vol1.pdf (last visited Aug. 26, 2016); CAL. DEP'T OF WATER RES., URBAN WATER USE IN CALIFORNIA BULLETIN 166-4 (1994), *available at* http://www.water.ca.gov/historicaldocs/irwm/b166-1994/uwundx.html (last visited Aug. 26, 2016); *see also, Land & Water Use*, CAL. DEP'T OF WATER RES., *available at* http://www.water.ca.gov/landwateruse/.

[27] *See generally* Norris Hundley Jr., THE GREAT THIRST: CALIFORNIANS AND WATER--A HISTORY (2d ed. 2001); *see also*, William L. Kahrl, *The Politics of California Water: Owens Valley and the Los Angeles Aqueduct, 1900-1927*,

Water redistribution in the state began in the late nineteenth century and culminated in a thorough water resource assessment in 1919.[28] The result of that assessment reflects a set of four priorities: (1) making real estate development possible; (2) irrigating farmland; (3) producing hydroelectric power; and (4) supporting urban populations in southern California.[29] The author of the 1919 assessment, Colonel Robert B. Marshall, bemoaned the vast quantity of rainwater flowing into the sea, where it was lost forever.[30]

Population pressures in the 1940s, culminating in widespread concerns over groundwater, land use limitations, and the water needs associated with rapid urbanization, led to the passage of the State Water Resource Act in 1945.[31] In addition to transferring water from the north to the south, the Central Valley Project included a series of dams that would address four main issues: (1) flood controls; (2) salt water intrusion; (3) navigation on the lower Sacramento River; and (4) irrigation.[32]

2. Apparatus for a California Desalination Policy

By the 1950s, the state embarked on efforts to capture the freshwater before it made its way to the sea and ultimately turned their attention to the ocean as a complementary source of water. In 1957, the state assembly authorized a desalination program, followed by the passage of major desalination legislation in 1965, the Cobey-Porter Saline Water Conservation Law.[33] The Cobey-Porter law was designed to employ desalination technology to capture water from the sea, and in so doing, eliminate costly transport of freshwater over long distances.

The laws that emerged in the 1950s and 1960s authorized the California Department of Water Resources (DWR) to examine the prospects of increased seawater desalination efforts and provide technical assistance to desalination facility proponents.[34] The new legislation provided a guide to finance, construct, and operate desalination facilities,[35] and

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55 CAL. HIST. Q. 1, 2-25 (Spring, 1976) (it is notable that the history of water resource policy also includes some exaggeration on the part of politicians, such as Mullholond who in exaggerated historical drought figures in order to persuade voters of the importance of funding an aqueduct that would bring water from the Owens Valley to Los Angeles, 240 miles away.); Lawrence B. Lee, *California Water Politics: Opposition to the CVP, 1944-1980*, 54 Agric. Hist., 3 (Jul., 1980), 402-23.

[28] *See* ROBERT B. MARSHALL, CAL. STATE IRRIGATION ASSOC., IRRIGATION OF TWELVE MILLION ACRES IN THE VALLEY OF CALIFORNIA, (1919).

[29] *Id*. at 7.

[30] *Id.*

[31] *See* CAL. DEP'T OF WATER RES., DESALTING STATE OF THE ART BULLETIN 134-69 (1969) [hereinafter CAL. CDWR BULLETIN 134-69] (providing a historical description from the 1950s and 1960s on the state's executive and legislative involvement in desalination including work with the federal government and nuclear powered facilities); CAL. DEP'T OF WATER RES., WATER BULLETIN 151-65, at 15 (1965) [hereinafter CAL. CDWR BULLETIN 151-65]; *California State Water Project Overview* , CAL. DEP'T OF WATER RES. (Aug. 11, 2010), *available at* www.water.ca.gov/swp/index.cfm [hereinafter CAL. CDWR 2010 Overview] ("The California State Water Project is a water storage and delivery system of reservoirs, aqueducts, powerplants and pumping plants. Its main purpose is to store water and distribute it to 29 urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California.").

[32] Lee, *supra* note 28, at 402; Jedidiah Brewer et al., *Law and the New Institutional Economics: Water Markets and Legal Change in California, 1987–2005*, 26 WASH. U. J.L. & POL'Y 183, 187 (2008).

[33] CAL. WATER CODE §§12945-12949 (2016).

[34] CAL. WATER CODE §12948.1 (2016).

[35] CAL. WATER CODE §12949 (2016).

the DWR identified real potential benefits for increasing water supplies and reducing transport costs. Despite this, the technology to bring new facilities online was still in limited use in the 1960s.[36]

In 1982, the state attempted to decentralize water transfer processes by providing local authorities with power to sell water outside their boundaries.[37] A 2009 report points to such boundary-spanning transfers, highlighting the fact that San Francisco imported 70% of its water.[38] Southern California communities imported water from beyond their boundaries as well.[39] A series of droughts from 1987 to 1992 set the stage for the construction and opening of the Santa Barbara Desalination Facility in 1992. The plant had a capacity to produce 6.7 MGD but it operated for just two years before being decommissioned.[40] The city closed the plant after the severe droughts subsided and the anticipated short-term demand looking forward would come with a price tag including maintenance costs of approximately $500,000 per year.[41]

However, drought conditions returned and the state assembly updated the Cobey-Porter Law in 2002 to require the DWR to set up a Water Desalination Task Force, consisting of representatives from state agencies and the voluntary participation of the U.S. Department of the Interior.[42] The law prompted the Task Force to review current desalination-related laws and recommend changes that would support desalination efforts. The Task Force issued its findings and recommendations in 2003 supporting the desalination development, while at the same time acknowledging significant energy costs and regulatory procedures that such development would incur.[43]

In 2003 and 2004, the state assembly responded by passing laws to identify opportunities for the development of desalination technology and establishing funding for the employment of desalination technologies in water resource planning activity. [44] Citizens got into the desalination

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[36] CAL. CDWR BULLETIN 134-69, *supra* note 32; CAL. CDWR BULLETIN 152-65, *supra* note 32, at 15; CAL. CDWR 2010 Overview, *supra* note 32.

[37] CAL. WATER CODE § 380 (2016).

[38] CAL. DEP'T OF WATER RES., CALIFORNIA WATER PLAN UPDATE VOLUME 3: REGIONAL REPORTS, SAN FRANCISCO BAY HYDROLOGIC REGION BULLETIN 160-09, at SF-14 (2009), *available at* http://www.water.ca.gov/waterplan/docs/cwpu2009/0310final/v3_sanfrancisco_cwp2009.pdf.

[39] *Id.* at SF-15.

[40] CAL. DEP'T OF WATER RES., THE CALIFORNIA WATER PLAN UPDATE: BULLETIN 160-98, at ES3-9 (1998).

[41] CITY OF SANTA BARBARA, WATER RES. DIV., PUBLIC WORKS DEP'T, CONTRACT FOR PRELIMINARY DESIGN SERVICES FOR RECOMMISSIONING THE CHARLES E. MEYER DESALINATION FACILITY (2014), *available at* https://www.santabarbaraca.gov/SBdocuments/Advisory_Groups/Water_Commission/Archive/CY_2014_Archives/03_Staff_Reports/2014_04_14_April_14_2014_Item_8_CAR_Desa_%20Prelim_Design_Services.pdf.

[42] CAL. WATER CODE § 12949.6(b), (c)(1) (2016).

[43] CAL. DEP'T OF WATER RES., WATER DESALINATION, FINDINGS AND RECOMMENDATIONS 2, 5-6, (2003), *available at* http://www.water.ca.gov/desalination/docs/Findings-Recommendations.pdf. The report includes recommendations to study the energy intensity and rates for different water sources, to study the potential for developing renewable energy systems in coordination with desalination implementation, as well as recommendations to co-locate desalination plants with coastal power plants in order to take advantage of existing seawater intake systems that have already gone through the environmental permitting process, and to collocate with wastewater discharge facilities. *Id*. at 8.

[44] *See* Assem. B. 314, 2003-2004, Reg. Sess. (Cal. 2003), *available at* www.leginfo.ca.gov/pub/03-04/bill/asm/ab_0301-0350/ab_314_bill_20030207_introduced.pdf; Assem. B. 314 Report, 2003-2004, Reg. Sess. (Cal. 2003), *available at* www.leginfo.ca.gov/pub/03-04/bill/asm/ab_0301-0350/ab_314_cfa_20030718_103133_asm_floor.html (Code includes the conditional requirement that the use of desalination technology be "consistent with" existing state environmental policies.); *see also*, CAL. WATER CODE §§

policy process as well. Voters utilized the initiative process to pass Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002.[45] The initiative called for fifty million dollars in matching funds or services for desalination projects.[46]

In 2009, the state assembly increased its efforts by appropriating $1 billion for grants and loans for water projects, including seawater desalination projects.[47] Voters stayed in the game as well, passing Proposition 1 in 2014, which provided more funding for water recycling and alternative treatments, including $100 million for desalination projects.[48]

In recent years, the Governor of California has declared numerous "States of Emergency" due to drought-induced water shortages. Those declarations were accompanied by significant restrictions on water use throughout the state.

Over the course of the last decade, numerous desalination projects have begun including two ten-MGD projects for potable drinking water, as well as a 1.5 MGD project to supply potable cooling water for a food processing plant.[49] Most projects have been concentrated along the coast in central and southern California. While the term desalination refers to the processing of saltwater, brackish water, and recycled graywater, ocean and brackish water desalination plants remained a fraction of the annual capacity of total desalination operations in California.[50]

Though much of California's potable water demand is predictable based on population and usage factors, the degree and less predictable frequency of demand prompted the state to consider the development of mobile processing capacity in addition to stationary facilities. For example, in 2009 the DWR recommended integrating mobile desalination units into water use portfolios in order to respond to emergency drought conditions.[51]

10610 – 10656 (2016); CAL. WATER CODE §10631(h) (by law, urban water suppliers must prepare and adopt UWMPs, and update these plans every five years. must include "a description of the opportunities for development of desalinated water, including but not limited to, ocean water, brackish water, & groundwater, as a long-term supply.").

[45] CAL.WATER CODE § 79500, *et seq* (2016).

[46] CAL.WATER CODE § 79545(a) (2016). (The project released funds in 2005, 2006, 2014 and 2016.); *see also*, CAL. WATER CODE § 79547.2(a)-(b) (2016) (setting standards for eligible desalination projects which must be based on "demonstrated need for new or alternative water supplies, project readiness, and the degree to which the project avoids or mitigates adverse environmental impacts" and capping grants at five million dollars).

[47] CAL. WATER CODE § 79780 (b) (2014).

[48] CAL. WATER CODE § 79765(a)-(b), (d)-(e) (2016).

[49] CAL. STATE UNIV., CTR. FOR COLLABORATIVE POLICY, *supra* note 16, at 75-77.

[50] CAL. DEPT'T OF WATER RES., CALIFORNIA WATER PLAN UPDATE 2013, VOLUME 3: RESOURCES MANAGEMENT STRATEGIES, CHAPTER 10: DESALINATION (BRACKISH AND SEA WATER), 10-23, 10-27 (2013), *available at* http://www.water.ca.gov/waterplan/docs/cwpu2013/Final/Vol3_Ch10_Desalination.pdf As of 2013, there were twenty-three brackish water desalination plants with a capacity of 139,627 gallons per year whereas there were only three ocean water desalination plants operating with a capacity of 562 gallons per year. *Id*. at 27. However, one additional ocean water plant was in design and construction and fifteen ocean water plants were planned or projected. *Id*.

[51] FETHI BENJEMAA, CAL. DEPT'T OF WATER RES., LOGISTICS FOR DEPLOYING MOBILE WATER DESALINATION UNITS 7 (2009), *available at* http://www.water.ca.gov/desalination/docs/Mobile_Desalination.pdf (mobile units depend on existing feedwater and electrical infrastructure, but can produce freshwater from seawater, brackish groundwater, or contaminated water sources.); *see also*, CAL. DEPT'T OF WATER RES., CALIFORNIA DROUGHT CONTINGENCY PLAN 22 (2010), *available at* http://www.water.ca.gov/pubs/drought/california_drought_contingency_plan/final_ca_drought_contingency_plan-11-18-2010a.pdf.

3. Status of California Desalination Policy

A variety of laws and policies that now exist in California suggest that the state has laid the groundwork for substantial desalination-oriented laws. Today, water management planning processes in California are required to include information on desalination opportunities.[52] In 2001, the statewide California Water Plan began assessing regional and local water projects, including for "desalting brackish groundwater and ocean water."[53] While California now boasts a staffed desalination section within the Water Use and Efficiency Branch of the DWR, [54] the Desalination Task Force's 2003 recommendation for a discrete administrative office devoted to desalination has not yet been established.[55]

Since 2004, Urban Water Management Plans (UWMPs)[56] must now include "[a] description of the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply."[57]

Proposals for new desalination facilities along the California coast are in abundance.[58] While the legal landscape certainly seems solicitous of more desalination, the laws that would facilitate this development exist in tandem with an evolving body of law regarding environmental impacts on coastal waters, mitigation obligations, and monitoring protocols.[59]

On May 6, 2015, the State Water Resources Control Board adopted an amendment to the California Ocean Plan[60] that addressed impacts of desalination intakes and discharges.[61] Among

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[52] *See, e.g.*, CAL. WATER CODE §10631 (2016); *see also*, CAL. WATER CODE §10644(b) (2016); Dave Todd, CAL.DEPT'T OF WATER RES., SUMMARY OF THE STATUS OF 2005 URBAN WATER MANAGEMENT PLANS at B-1 (2006), *available at* http://www.water.ca.gov/pubs/conservation/urban_water_management_plans_summary_of_the_status__2005_/uwmp-legreport-060607.pdf (reporting on the percentage of urban water management plans that lacked information on desalination options in 2005 (24%)); *2010 Urban Water management Plans*, CAL. DEPT'T OF WATER RES. (OCT 15, 2015), *available at* http://www.water.ca.gov/urbanwatermanagement/UWMP2010.cfm. UWMPs are required to include information about desalination under CAL. WATER CODE §10631.

[53] CAL. WATER CODE §10013 (2016).

[54] *Water Use and Efficiency Branch: Contacts*, CAL. DEP'T. OF WATER RES. (2016), *available at* http://www.water.ca.gov/wateruseefficiency/Contacts/.

[55] CHARLES F. KEENE, CAL. DEP'T. OF WATER RES., WATER DESALINATION: FINDINGS AND RECOMMENDATIONS 16-17 (2003), *available at* http://www.water.ca.gov/desalination/docs/Findings-Recommendations.pdf.

[56] CAL. WATER CODE §§10610 – 10656 (by law, urban water suppliers must prepare and adopt UWMPs, and update these plans every five years).

[57] CAL. WATER CODE § 10631.

[58] Watson, *supra* note 16.

[59] SCOTT JENKINS, ET AL., S. CAL. COASTAL WATER RESEARCH PROJECT, MANAGEMENT OF BRINE DISCHARGES TO COASTAL WATERS, RECOMMENDATIONS OF A SCIENCE ADVISORY PANEL, TECHNICAL REPORT 694, (March 2012), *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/dpr051812.pdf.

[60] STATE WATER RES. CONTROL BD., CALIFORNIA OCEAN PLAN: 2015 at iii, *available at* http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/cop2015.pdf (The California Ocean Plan was adopted by the State Water Resources Control Board in 1972, and amended in 1978, 1983, 1988, 1990, 1997, 2001, 2005, 2010, 2013, and 2016) ("In furtherance of legislative policy set forth in Section 13000 of Division 7 of the California Water Code (CWC) (Stats. 1969, Chap. 482) pursuant to the authority contained in Section 13170 and 13170.2 (Stats. 1971, Chap. 1288) the State Water Resources Control Board hereby finds and declares that protection of the quality of the ocean waters for use and enjoyment by the people of the State requires control of the discharge of waste to ocean waters in accordance with the provisions contained herein. The Board finds further that this plan shall be reviewed at least every three years to guarantee that the current standards are adequate and are not allowing degradation to marine species or posing a threat to public health.").

other things, the desalination amendment provides a statewide approach to minimizing intake and mortality of marine life, protecting water quality near desalination facilities, and implementing permitting, monitoring, and reporting requirements regarding desalination facilities.[62]

In addition to statewide desalination policy, regional and county level desalination policy has also developed via authority conveyed by both state and federal legislation. The San Francisco Bay Conservation and Development Commission (BCDC)[63] requires stringent environmental impact analysis and includes a litany of prescriptions and proscriptions.[64]

While states hold primary sway over their water resource and planning laws, California's locus as the site of the Monterey Bay National Marine Sanctuary[65] invokes federal law that includes a Desalination Action Plan[66] with a five part framework: (1) develop and implement regional desalination program; (2) employ facility siting guidelines; (3) identify environmental standards for desalination facilities; (4) develop modeling and monitoring program; and (5) conduct outreach and information exchange. [67]

In addition to state and federal policies outlined above, some counties have also developed desalination policies. For example, in 1989, Monterey County approved an ordinance requiring "that each [desalination] facility will be owned and operated by a public entity."[68] However, the extent of county control over such efforts may be limited by state authority.[69]

4. Reflections on California's Desalination Legal Landscape

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[61] STATE WATER RES. CONTROL BD., FINAL STAFF REPORT INCLUDING THE FINAL SUBSTITUTE ENVIRONMENTAL DOCUMENTATION AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA ADDRESSING DESALINATION FACILITY INTAKES, BRINE DISCHARGES, AND THE OTHER NON-SUBSTANTIVE CHANGES (May 6, 2015), *available at* http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0033_sr_apx.pdf.

[62] STATE OF CAL.: OFFICE OF ADMIN. LAW, NOTICE OF APPROVAL OF REGULATORY ACTION (Jan. 28, 2016), *available at* http://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/desal_oal_approval.pdf.

[63] CAL. GOV'T CODE §§66650-66661 (2016).

[64] *San Francisco Bay Plan*, BAY CONSERVATION AND DEV. COMM'N (May 16, 2013), *available at* http://www.bcdc.ca.gov/plans/sfbay_plan#2. For example, the plan requires that "1) desalination projects should avoid or minimize impacts on aquatic life, ensure discharge is diluted and dispersed, and complies with discharge standards generated by the Regional Water Quality Control Board; and 2) (a) no Bay fill should be approved for desalination plants except for a minor amount of fill needed for pipelines, fish screening devices, and other directly related facilities that provide Bay water to a plant and discharge diluted brine from the plant back into the Bay; and (b) maximum feasible public access consistent with the project should be included as part of any desalination project that uses Bay waters." *Id*.

[65] 57 F.R. § 43310 (1992); 15 C.F.R. § 922 Subpart M; Act of Nov. 7 1988 Pub.L. 100-627, Title II, §205(a)(3), 1988 (102 Stat. 3217); Act of Sept. 23 1992 Pub.L. 102-368, Title I, §102, 1992 (106 Stat. 1119); Act of Nov. 4 1992 Pub.L. 102-587, Title II, §2203,,1992 (106 Stat. 5048).

[66] MONTEREY BAY NATIONAL MARINE SANCTUARY, FINAL MANAGEMENT PLAN, SECTION II – COASTAL DEVELOPMENT. DESALINATION ACTION PLAN (2008), *available at* http://montereybay.noaa.gov/intro/mp/fmp/02coastal_dev_mp.pdf.

[67] NOAA'S MONTEREY BAY NAT'L MARINE SANCTUARY AND NAT'L MARINE FISHERIES SERVICE, GUIDELINES FOR DESALINATION PLANTS IN THE MONTEREY BAY NATIONAL MARINE SANCTUARY (May 2010), *available at* montereybay.noaa.gov/resourcepro/resmanissues/pdf/050610desal.pdf.

[68] MONTEREY CNTY. CODE, tit. 10 ch. 10.72.030(B) (1989).

[69] *See* Public Utilities Commission, Memo, Re: Monterey County Ordinance 10.72.030(B) (April 18, 2012) (claiming that a local ordinance was preempted by the Water Commission's statewide regulation); CAL. PUBLIC UTIL. Decision 12-10-030 (Oct. 25, 2012) (finding the local ordinance preempted.).

The history of water demand, location and transport in California has prompted the development of a water resource infrastructure that continues to provide relatively cheap water by means of movement over long distances. That history and infrastructure continues to place desalination technology, and its associated costs, at a disadvantage.[70]

While California's recurring legislative approach suggests a future for desalination, the legal mechanisms for planning, siting, and monitoring constitute more of a patchwork than a standardized comprehensive regime that might enhance predictability for investments in building desalination infrastructure. The lack of a portfolio requirement for desalinated water leaves prospective producers in a murky situation. The state's call for evaluation of desalination opportunities is laudable, but laws regarding the evaluation of such prospects might be improved by requiring comprehensive updates.

A statewide examination of the prospect of multiple desalination plants coming online in a single evaluable time frame might produce comprehensive analysis and planning. Coordination among relevant state, municipal, and federal authorities could reduce friction and the prospect of pre-emption litigation.

There are clear indications that the governor, the state legislature and even the citizens themselves have an interest and inclination to employ desalination technologies into the state's water planning and management frameworks. The legal framework to facilitate those efforts is developing, yet it may be burdened by the weight of the various ad hoc elements that emerge. While states may bristle at the suggestion of employing an approach with federal moniker, the Monterey Bay National Marine Sanctuary framework regarding desalination may serve as a sound approach to comprehensive, integrated planning. Skeptics might take comfort in recalling that the sanctuary itself is a creature of collaborative federal, state, and municipal planning.

B. *Texas Water History*

With over twenty-seven million inhabitants, Texas claims second place among U.S. states in terms of population.[71] The increased severity of droughts in Texas and projected drinking water shortages led to executive and legislative action related to the promotion of desalination technology to help meet water supply needs.

Texas sits above a substantial network of aquifers.[72] Its surface veined by thousands of miles of rivers.[73] The state's history as a short-lived republic ultimately entering the United States, together with its history of synthesizing water laws and property rights, makes water a formidable feature. Significant development and settlement began along its coast in the late nineteenth century at which point the state provided counties with authority to develop drainage

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[70] HEATHER COOLEY & NEWSHA AJAMI, PACIFIC INSTITUTE, KEY ISSUES FOR DESALINATION IN CALIFORNIA: COST AND FINANCING (2012), *available at* http://pacinst.org/app/uploads/2013/02/financing_final_report3.pdf.

[71] *QuickFacts: Texas*, U.S. CENSUS BUREAU (2016), https://www.census.gov/quickfacts/map/PST045216/48,00 (Texas's population was estimated to be 27,862,596 in 2016).

[72] TEX. WATER DEV. BD., MAJOR AQUIFERS OF TEXAS (2014), *available at* http://www.twdb.texas.gov/mapping/doc/maps/Major_Aquifers_8x11.pdf.

[73] TEX. WATER DEV. BD., MAJOR SURFACE GROUNDWATER RESOURCES (2014), *available at* http://www.twdb.texas.gov/mapping/doc/maps/Major_Texas_Water_Resources_36x36.pdf.

projects to deal with flooding problems.[74] New farms began appearing along the Texas and Pacific Railroad in the late 1800s, and a drought lasting from 1886-87 prompted the exploration of well drilling.[75] To accommodate the new irrigation needs, the Legislature passed an Act in 1889 grafting a prior appropriation system (beneficial use/permit system) onto an existing variation of a riparian rights system.

Severe flooding in 1913 prompted the state to create the Texas Reclamation Department to address those issues in a more comprehensive manner. A 1917 amendment to the state constitution set the stage for an early water conservation policy. More flooding in the 1920s prompted the state to implement a watershed approach to water conservation and management through the creation of water districts that followed the natural contours of the resources they were authorized to manage.[76]

During a decade-long drought that spanned the years 1946-1956, the legislature attempted but failed to pass legislation to reconcile differences between prior appropriation and riparian rights doctrines, in addition to uncertainties about whether groundwater was subject to those laws.[77] Groundwater had been considered a feature of private property, though the legislature made efforts to regulate its use.[78]

1. Impetus for Texas Desalination Policy

While Texas had long been subject to periodic droughts of varying degree and duration, a severe drought in 1996 cost the state billions of dollars and resulted in municipal water rationing, initiating a move to develop regional water supply planning.[79] Even in non-drought years, the state's water supply has struggled to keep pace with population growth and demand. Per capita reservoir storage capacity began discernibly declining in 1980 and continues to challenge the state.[80] Given the recurring droughts, the federal and state government initiated a series of reservoir projects in the mid twentieth century, increasing the number of major water supply reservoirs from 53 in 1950 to 188 in 2012, and the 2012 State Water Plan recommends an additional 26 reservoirs.[81] The state is also looking to the sea.

2. Apparatus for a Texas Desalination Policy

Historically, water supply planning in Texas focused on groundwater, surface water, and water conservation.[82] In 1961, Dow Chemical built one of the first seawater desalination pilot

[74] John T. Thompson, *Governmental Responses to the Challenges of Water Resources in Texas*, 70 THE SW. HIST. Q. 44, 48 (1966).
[75] *Id*. at 53.
[76] *Id*. at 50.
[77] Id. at 55.
[78] *Id*. at 58 (citing efforts to enact laws governing groundwater in 1937, 1939, 1941, and 1947).
[79] TEX. WATER DEV. BD., WATER FOR TEXAS 2012 STATE WATER PLAN 19 (2012), *available at* https://www.twdb.texas.gov/publications/state_water_plan/2012/2012_SWP.pdf.
[80] *Id*. at 18.
[81] *Id.*
[82] *See, e.g.*, *State Water Plans 1961-2017*, TEX. WATER DEV. BD., *available at* https://www.twdb.texas.gov/waterplanning/swp/.

projects in the U.S. in Freeport, Texas.[83] In 1985, the state amended its Texas Water Assistance Program statute to encourage a wide variety of water quality and enhancement projects including desalination.[84] In 1997, a feasibility study for the Laguna Madre area noted that seawater desalination as a "viable alternative" in the future to supplement surface water supplies to the region.[85] A subsequent feasibility report evaluated alternatives to seawater desalination on South Padre Island.[86]

As the state added substance and direction to its desalination efforts, it also revised the hierarchy within which water planning takes place. Texas created sixteen Regional Water Planning Areas (RWPA) in 1997 with an eye toward finer scale planning. [87] The Texas coast alone includes seven planning areas.[88] Desalination efforts began appearing in those plans immediately.[89]

In 2001, the Texas Water Assistance Program began providing grant-funding opportunities for desalination projects.[90] Desalination evaluation became a required element of local planning efforts.[91] Tax exemptions for desalination plant equipment constitute an additional incentive.[92]

By 2002 the Texas Water Development Board (TWDB) called for increased desalination capacity to augment traditional water sources.[93] In 2002, the Governor directed the TWDB to develop a plan for a demonstration seawater desalination facility to spur development and use of the technology, with an eye toward meeting future demand.[94] In the following year the

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[83] SAQIB SHIRAZI & JORGE ARROYO, TEX. WATER DEV. BD., DESALINATION DATABASE UPDATES FOR TEXAS, INNOVATIVE WATER TECHNOLOGIES (2011), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2011_03_desaldb_whitepaper.pdf.

[84] TEX. WATER CODE ANN. § 15.002(a) (WEST, 1985) (amended 1995).

[85] NRS CONSULTING ENGINEERS, INC., TEX. WATER DEV. BD., SEAWATER DESALINATION FEASIBILITY STUDY IN THE LAGUNA MADRE AREA. FINAL REPORT, 1–3, (Dec. 1997), *available at* http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/97483202.pdf.

[86] NRS CONSULTING ENGINEERS, INC., LAGUNA MADRE WATER DIST., FEASIBILITY AND PILOT STUDY, SOUTH PADRE ISLAND SEAWATER DESALINATION PROJECT, FINAL REPORT, (Aug. 2010), *available at* http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/0604830628_SPI_SeawaterStudy.pdf.

[87] TEX. WATER DEV. BD., WATER FOR TEXAS REGIONAL WATER PLANNING IN TEXAS (Aug. 2016), *available at* https://www.twdb.texas.gov/publications/shells/RegionalWaterPlanning.pdf.

[88] *Regional Planning Areas*, TEX. WATER DEV. BD., *available at* https://www.twdb.texas.gov/waterplanning/rwp/regions/.

[89] TEX. WATER DEV. BD., 1997 STATE WATER PLAN: CHAPTER 2 (1997), 2–34, *available at* *https://www.twdb.texas.gov/publications/State_Water_Plan/1997/Ch_2.pdf* (noting that desalination be considered as part of the regional plan for the upper and lower Rio Grande regions, now RWPA "L")..

[90] TEX. WATER CODE ANN. § 15.102 (West 2001) (amended 2007); TEX. WATER CODE ANN. § 15.994 (WEST, 2001) (amended 2013) (list of approved uses of funds for rural political subdivisions).

[91] TEX. WATER CODE ANN. § 16.054(c) (WEST 2001).

[92] TEX. TAX CODE ANN. § 11.32 (WEST 2001), TEX. TAX CODE ANN. §151.355 (West 2001) (amended 2007) (exemption from State tax).

[93] TEX. WATER DEV. BD., 2002 STATE WATER PLAN 8 (2002), https://www.twdb.texas.gov/publications/State_Water_Plan/2002/WaterforTexas2002.pdf.

[94] Rick Perry, Governor of Texas, Gov. Rick Perry Announces Policies to Secure Abundant Water Supply (Apr. 29, 2002), *available at* http://www.lrl.state.tx.us/scanned/govdocs/Rick%20Perry/2002/remarks042902.pdf; *see also*, Rick Perry, Governor of Texas, Gov. Perry Speaks at Water 2025 Conference (Aug. 14, 2003), *available at* http://www.lrl.state.tx.us/scanned/govdocs/Rick%20Perry/2003/speech081403.pdf (promoting Texas coastal desalination project).

legislature initiated a desalination program, recognizing the importance of funding research and development of seawater desalination at the state level.[95]

Biennial progress reports required from the TWDB concerning the viability of seawater desalination in Texas, since 2003, have resulted in the issuance of a request for statements of interest (SOI) to develop a large-scale (i.e., greater than 25 MGD potable water) demonstration seawater desalination facility in 2002 and regular updates on progress and needs for further development of seawater desalination.[96] Using input from the planning areas, the TWDB developed five screening parameters: (1) need or potential benefit; (2) demonstration value; (3) siting advantages or benefits; (4) state/regional/local support; and (5) cost.[97]

That evaluative process resulted in the selection of projects in Brownsville, Corpus Christi, and Freeport, albeit for different reasons.[98] Brownsville was facing population growth and increasing water demand, but faced fluctuations in water availability and upstream demands along the lower Rio Grande River.[99] In Corpus Christi, water resources were deemed sufficient to meet the needs of its population for the next several decades, but the city's location at the end of four river basins would allow water planners to redistribute water rights upstream that become available with the increased supply. [100] Lastly, in Freeport, new desalination development could take advantage of existing infrastructure. With access to both ocean water and river water, the facility would have the capability to treat either and could switch between them depending on economics. [101] By 2007, desalination was identified as a path to providing 313,000 acre-feet per year by 2060, and three water planning areas projected using seawater desalination to meet water resource needs by 2060.[102]

3. Status of Texas Desalination Policy

Statewide biennial reporting on seawater desalination progress and needs is promising. Based on such monitoring, the state provided funding to meet a variety of priority requests in 2004, though such support fell away in subsequent years. To date, appropriations for seawater desalination by the Legislature that have funded feasibility and pilot studies in Brownsville, Corpus Christi, Freeport, and the Laguna Madre Water District (LMWD) total approximately

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[95] TEX. WATER CODE § 16.060(a) (2003) (amended 2015).
[96] *Desalination Documents*, TEX. WATER DEV. BD., *available at* https://www.twdb.texas.gov/innovativewater/desal/docs.asp.
[97] TEX. WATER DEV. BD., LARGE-SCALE DEMONSTRATION SEAWATER DESALINATION IN TEXAS 3 (Dec. 2002), *available at* https://www.twdb.texas.gov/innovativewater/desal/doc/FINAL%2012-16-02.pdf.
[98] Tedd Holladay, *Alternatives for Expanding Texas' Water Supplies: Desalination*, HOUSE RESEARCH ORGANIZATION INTERIM NEWS 78-8, Aug. 20, 2004, at 1; HOUSE COMM. ON NAT. RESOURCES, INTERIM REPORT TO THE HOUSE OF REPRESENTATIVES 79TH TEXAS LEGISLATURE (2004).
[99] BROWNSVILLE PUB. UTILS. BD., FINAL PILOT STUDY REPORT: TEXAS SEAWATER DESALINATION PROJECT, at 1-1(Oct. 24, 2008), *available at* http://www.twdb.texas.gov/innovativewater/desal/projects/brownsville/doc/BPUBPilot_Final_Report.pdf.
[100] CITY OF CORPUS CRISTI, CORPUS CRISTI DESALINATION DEMONSTRATION PROJECT (June 2014), *available at* http://engineercc.com/Websites/engineercc/images/library/pdf/VSD_TM_1.pdf.
[101] CDM SMITH, FREEPORT DESALINATION REPORT, at 5-1, *available at* http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/2004483514_Freeport_Desal.pdf.
[102] *Region H: Freeport Seawater Desalination Project*, TEX. WATER DEV. BD., *available at* http://www.twdb.texas.gov/innovativewater/desal/seaprojects/regionH/.

$1.53 million. [103] However, neither the 2010-2011 nor the 2011-2012 fiscal budgets appropriated any funds for seawater desalination projects.[104] However, water supply certainty is attractive, and when the state refrains from funding desalination projects, some water management districts move ahead independently. In 2011, the LMWD was authorized by voters to fund a desalination facility through bonds.[105]

What is unique to Texas is not so much a development of substantive desalination-oriented water law, but rather the invocation of an evaluative approach to inform planning. The state's mandate, for the TWDB to engage in biennial progress evaluations, creates a monitoring mechanism by which seawater desalination capacity and needs are assessed periodically at the state and regional level, which in turn informs the legislature and water management districts of when and how they might proceed to build capacity.[106] Table X, below, is an example of this process.

Table X. Texas Water Development Board Findings and Recommendations and resulting legislative action.

Year	TWDB Finding	TWDB Recommendation	Legislative action
2004 [107]	Seawater desalination technically feasible but financial assistance necessary	State legislature enact a financial assistance policy for desalination projects; Legislature allocate $2.4M to fund seawater & brackish ground water pilot studies to obtain data	Texas Water Code §15.102 amended; Legislature appropriated $2.5M for pilot plant studies
2006 [108]	Financial assistance needed to construct & operate a large-scale seawater desalination demonstration facility	State provide the Brownville Public Utilities Board (BPUB) $115M in grants & low-interest loans to assist in the building of a large-scale seawater desalination demonstration plant	Texas Legislature did not award the requested funds

[103] TURNER, COLLIE & BRANDEN INC., LARGE SCALE DEMONSTRATION DESALINATION FEASIBILITY STUDY, CITY OF CORPUS CHRISTI, TEXAS (Nov. 2004); DANNENBAUM ENGINEERING CORP., LOWER RIO GRANDE VALLEY BROWNSVILLE SEAWATER DESALINATION DEMONSTRATION PROJECT: FEASIBILITY STUDY (Nov. 2004); CDM SMITH, FREEPORT DESALINATION, FEASIBILITY STUDY (2004); NRS CONSULTING ENGINEERS, INC., FEASIBILITY AND PILOT STUDY SOUTH PARDRE ISLAND SEAWATER DESALINATION PROJECT - LAGUNA MADRE WATER DISTRICT (2010).

[104] TEX. LEGIS. BUDGET BD., TEXT OF CONFERENCE COMMITTEE REPORT SENATE BILL NO. 1, REGULAR SESSION (GENERAL APPROPRIATIONS ACT) art. IV-VIII (2009), http://www.lbb.state.tx.us/Documents/GAA/General_Appropriations_Act_2010-11.pdf.

[105] TEX. WATER DEV. BOARD, DESALINATION: SEAWATER (2016), *available at* http://www.twdb.texas.gov/publications/shells/Desal_Seawater.pdf.

[106] TEX. WATER CODE ANN. §16.060 (WEST 2015).

[107] TEX. WATER DEV. BOARD, THE FUTURE OF DESALINATION IN TEXAS, BIENNIAL REPORT ON SEAWATER DESALINATION (Dec. 2004), *available at* https://www.twdb.texas.gov/innovativewater/desal/doc/VOL1-V7_Final.pdf.

[108] TEX. WATER DEV. BD., THE FUTURE OF DESALINATION IN TEXAS, BIENNIAL REPORT ON SEAWATER DESALINATION (Dec. 2006), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2006Biennial-Final.pdf.

Year	TWDB Finding	TWDB Recommendation	Legislative action
2008 [109]	Major impediment to the construction of a large-scale seawater desalination facility is financial feasibility	Legislature appropriate a $28.2 M grant to assist with the implementation of a 2.5 MGD desalination facility in Brownsville[110]	Texas Legislature did not award the requested funds
2010 [111]	Additional information is needed on the possible environmental impacts & operations of desalination facilities, & to examine the regulatory path to determine if changes are needed	Legislature appropriate a $9.5 M grant to assist with the implementation of a 2.5 MGD desalination facility in Brownsville	Texas Legislature did not award the requested funds
2012 [112]	Appropriated funding has been exhausted as of 2010; seawater desalination remains cost prohibitive, but the LMWD is close to building a plant.	Legislature appropriate $9.5 M to complete Brownsville Ship Channel project; $5 M to help implement the LMWD project; $3.5 M biennium to support research and pilot studies; seek partnership opportunities with private sector.	Pending.
2014 [113]	No additional studies have been funded since 2010. TWDB staff has monitored desalination projects across the state.	Continue monitoring current projects.	

[109] TEX. WATER DEV. BD., THE FUTURE OF DESALINATION IN TEXAS, BIENNIAL REPORT ON SEAWATER DESALINATION (Dec. 2008), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2008_TheFutureofDesalinationinTexas.pdf.

[110] NRS, 2008 TEXAS SEAWATER DEMONSTRATION, PROJECT FINAL PILOT STUDY REPORT (OCT. 2008), *available at* http://www.twdb.texas.gov/innovativewater/desal/projects/brownsville/doc/BPUBPilot_Final_Report.pdf. The facility was initially proposed to be 25 MGD; however, the results of the Final Seawater Desalination Demonstration Project recommended that the 25 MGD facility "NOT be implemented at this time due to the magnitude of the required funding gap and the current lack of full demand by BPUB and regional partners." *Id*. at vii-viii. Although smaller in scale, the facility was projected to provide nine percent of the total BPUB water demand by 2012.

[111] TEX. WATER DEV. BD., THE FUTURE OF DESALINATION IN TEXAS 2010, BIENNIAL REPORT ON SEAWATER DESALINATION (Dec. 2010), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2010_TheFutureofDesalinationinTexas.pdf.

[112] TEX. WATER DEV. BD., 2012 BIENNIAL REPORT ON SEAWATER DESALINATION (Dec.2012), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2012_TheFutureofDesalinationinTexas.pdf

[113] TEX. WATER DEV. BD., 2014 BIENNIAL REPORT ON SEAWATER DESALINATION (Dec. 2014), *available at* http://www.twdb.texas.gov/innovativewater/desal/doc/2014_TheFutureofDesalinationinTexas_Final.pdf.

It is also worth noting that Texas's Coastal Zone Management Program has actively integrated desalination into its planning goals and projects. This state-run, federally supported program served as a planning platform for a wave energy site off the coast of Freeport, Texas, designed to produce bottled desalinated water by utilizing wave energy.[114] Since 2005, the Texas Department of Rural Affairs has offered grants of up to $1.5 million to local governments for projects that utilize wind energy and other renewable resources to desalinate brackish ground water.[115]

4. Reflections on Texas's Desalination Legal Landscape

Texas is unique among the three states in that the water resource agency biennially "advises" the legislature in the form of reports on the status of desalination, the opportunities and impediments to its use, and the role the state might play in furthering its use. As noted above, this iterative evaluation process keeps law and policymakers apprised of advances in technology, changes in water budgeting and forecasting, and opportunities for desalination investment. The state also serves as a model for efforts to integrate ocean renewable energy with the production of desalinated water.

C. *Florida*

Florida has a population of over 20 million people and recently overtook New York as the third most populous state in the U.S. [116] Florida's large and growing population is substantially water-borne. In addition to the evident peninsular shape, Florida sits above substantial aquifers. Supplemental to its groundwater, Florida garners its water supply from steady precipitation and substantial surface water flows.[117] Yet, those significant sources do not suffice, as the state faces chronic and increasing water shortages.

The state has five water management districts. One borders the Atlantic Ocean, three border the Gulf of Mexico, and one is bound by each of those saltwater bodies.

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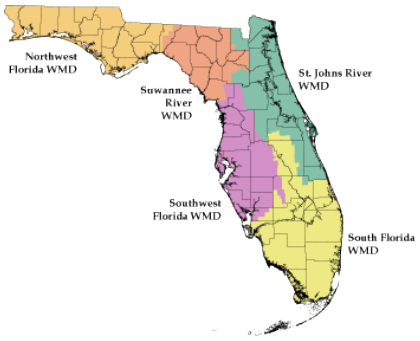
[114] TX. GEN. LAND OFFICE, TEX. COASTAL MGMT PROG., SECTION 309 ASSESSMENT AND STRATEGIES REPORT 2011-2015, HARTE RESEARCH INSTITUTE FOR THE GULF OF MEXICO STUDIES (2010), *available at* http://www.glo.texas.gov/coastal-grants/projects/11-027-section-309-assessment.html.

[115] *Id*.

[116] *QuickFacts: Florida*, U.S. CENSUS BUREAU (2016), https://www.census.gov/quickfacts/map/PST045216/12,06,00 (Florida's population was estimated to be 20,612,439 in 2016., and projected to be 25 million by 2040.); *see* S. Smith & S. Rayer, *Vol. 46 Bulletin 165: Projections of Florida Population by County, 2015–2040, with Estimates for 2012*, FLA. POPULATION STUDIES, UNIV OF FLA. BUREAU OF ECON. AND BUS. RES., (Mar. 2013), *available at* https://www.bebr.ufl.edu/sites/default/files/Research%20Reports/projections_2013.pdf.

[117] Robert B. Marcus & Debnath Mookherjee, *Problems of Florida's Water Resources*, 47 GEOGRAPHY 4, at 368-377 (Nov. 1962).



Florida Water Management Districts (WMDs) [118]

1. Impetus for Florida Desalination Policy

Florida's 2010 water demand of approximately 7 MGD is projected to increase to 8.7 MGD by 2025.[119] Population increases and growing agricultural and industrial water demands represent the major pressures on water resources.[120] Furthermore, intensified withdrawals from freshwater aquifers induces salt water intrusion into already brackish sources.[121]

Through the 1950s, Florida's water resource management was a tangle of overlapping districts dealing with segmented aspects of water resource management (flood control districts, sewer districts, etc.).[122] In 1955, the state legislature created a Water Resources Study Commission charged with examining challenges and recommending solutions. Prompted by the Commission's resulting report, the state passed the Florida Water Resources Act in 1957.[123] Unfortunately, the state agency established by the 1957 Act was not able to address the major issues, which included saltwater intrusion, drought, and loss of wetlands.[124]

A subsequent legislative effort in the form of the 1972 Water Resource Act acknowledged that different regions of the state varied in terms of the magnitude and complexity of their water resource problems.[125] As a result, the 1972 law established regional Water Management Districts (WMDs) along watershed boundaries as opposed to political

[118] *Water Management Districts*, FLA. DEP'T OF ENVTL. PROT. (Jun. 5, 2014), *available at* http://www.dep.state.fl.us/secretary/watman/.
[119] DESALINATION IN FLORIDA REPORT, *supra* note 16, at i.
[120] Marcus & Mookherjee, *supra* note 119, at 372 (industrial uses include electricity production, food processing, mining, and, historically, paper mills).
[121] *See, e.g.*, R.S. REESE, U.S. GEOLOGICAL SURVEY, WATER-RESOURCES INVESTIGATIONS REPORT 03-4242, HYDROGEOLOGY, WATER QUALITY, AND DISTRIBUTION AND SOURCES OF SALINITY IN THE FLORIDIAN AQUIFER SYSTEM, MARTIN AND ST. LUCIE COUNTIES, FLORIDA 96 (2004); C.D. HITTLE, U.S. GEOLOGICAL SURVEY, WATER-RESOURCES INVESTIGATIONS REPORT 99-4214, DELINEATION OF SALTWATER INTRUSION IN THE SURFICIAL AQUIFER SYSTEM IN EASTERN PALM BEACH, MARTIN, AND ST. LUCIE COUNTIES, FLORIDA, 1997-98 (1999); R.S. SONENSHEIN, U.S. GEOLOGICAL SURVEY, WATER RESOURCES INVESTIGATIONS REPORT 96-4285, DELINEATION OF SALTWATER INTRUSION IN THE BISCAYNE AQUIFER, EASTERN DADE COUNTY, FLORIDA (1995); RICK M. SPECHLER, U.S. GEOLOGICAL SURVEY, WATER RESOURCES INVESTIGATIONS REPORT 92-4174, SALTWATER INTRUSION AND QUALITY OF WATER IN THE FLORIDIAN AQUIFER SYSTEM, NORTHEASTERN FLORIDA 78 (1992).
[122] *See* Law of June 9, 1913, ch. 4322, § 1, *amended by* FLA. STAT. § 298.01 (2015).
[123] FLA. STAT. ANN. §§ 373.071-.251 (1967), *repealed by* 1972 Fla. Laws ch. 72-299.
[124] Ronald A. Christaldi, *Sharing the Cup: A Proposal for the Allocation of Florida's Water Resources*, 23 FLA. ST. U. L. REV. 1063, 1072 (1996).
[125] FLA. STAT. ANN. § 373.016(5) (WEST 2016).

boundaries.[126] The law called on each district to "develop, construct, operate, maintain, or contract for alternative sources of potable water."[127] In carrying out these functions, the prospect of desalination came into view, but the field was relatively new and the feasibility was questionable. As the technology advanced and shortages became more problematic, the legislature deemed the science proven and the state ready. A 2008 bill, that did not ultimately pass, nevertheless sent a signal to the state's Department of Environmental Protection to begin examining the practicality and feasibility of employing desalination. [128]

Three districts, Southwest Florida WMD, St. Johns River WMD, and the South Florida WMD, are actively pursuing seawater desalination to help meet water supply needs. Brief particular histories and circumstances for each of those districts is set forth below.

a. *South West Florida Water Management District*

Southwest Florida is experiencing saltwater intrusion into its groundwater at increasing rates, particularly in areas near the coast.[129] Even inland water is often brackish and in need of desalination processing.[130] Increasing rates of groundwater withdrawals exacerbate factors that threaten the condition and salinity levels of the aquifers.[131] In northern Tampa Bay, an increasing reliance on groundwater is cited as a significant factor degrading lakes and wetlands as fanning conflicts between water suppliers, regulators, and users.[132]

b. *St. Johns River Water Management District*

From 1965 to 1988, groundwater withdrawals in the northern most coastal counties of the St. Johns River WMD increased from 183 to 254 MGD.[133] Long term well samples from Duval County in the northern part of the district indicate that saltwater is gradually intruding on the state's aquifer system.[134] Similar to other regions of Florida, population trends are increasing rapidly. The counties in the St. Johns River WMD saw a 27% growth rate in the population

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[126] Christine A. Klein et al., *Modernizing Water Law: The Example of Florida*, 61 FLA. L. REV. 403, 422 (2009), (citing FLA. STAT. ANN. § 373.0.69 (WEST 2008)). This law established five Regional Water Supply Authorities in Florida, Northwest Florida Water Management District (NWFWMD), Suwannee River Water Management District (SRWMD), St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and Southwest Florida Water Management District (SWFWMD).

[127] FLA. STAT. ANN. § 373.1962(3) (2005) (*repealed by* 2010 Fla. Laws ch. 2010-205, § 8).

[128] *See* DESALINATION IN FLORIDA REPORT, *supra* note 16 at 1 (citing H.R. 199, 2008 Legis. Sess. (Fla. 1998)).

[129] DAVID L. SCHMERGE, U.S. GEOLOGICAL SURVEY, WATER-RESOURCES INVESTIGATIONS REPORT 01-4159 DISTRIBUTION AND ORIGIN OF SALINITY IN THE SURFICIAL AND INTERMEDIATE AQUIFER SYSTEMS, SOUTHWESTERN FLORIDA 41, *available at* https://perma.cc/G8VY-YTXL.

[130] *Id*. at 26.

[131] *Id*. at 1.

[132] SW. FLA. WATER MGT. DIST., CONSOLIDATED ANNUAL REPORT (2012), *available at* https://perma.cc/2KDR-4DMA.

[133] SPECHLER, *supra* note 123, at 78; *see also* ST. JOHNS RIVER WATER MGT. DIST., PUB. NO.: SJ2012-1, ST. JOHNS RIVER WATER SUPPLY IMPACT STUDY (2012), *available at* http://www.sjrwmd.com/technicalreports/tpubs1.html.

[134] SPECHLER, *supra* note 123, at 43.

between the years 2000 to 2016, growing from 3.9 million to 4.95 million.[135] Growth is expected to continue with projections of 6.6 million by 2035.[136]

c. *South Florida Water Management District*

In the 1800s, private landowners drained otherwise worthless land, sold off by the state, to engineer working farmland. Following the hurricane seasons and severe flooding events in the 1930s and 1940s, the federal government supported the use of these reclaimed areas by building dikes and developing other flood control projects.[137] The state worked to coordinate its efforts with the U.S. Army Corps of Engineers by establishing flood control districts in central and southern Florida in 1949.[138] The 1972 creation of the South Florida WMD prompted an expansion of those flood control district boundaries to better align with the natural boundaries of the watershed and the water management district. [139] The primary pressures on water use in the region have been from increased coastal development and population. Population in this region is expected to increase from 7.7 million in 2012 to 10.1 million by 2030. [140]

2. Apparatus for Florida desalination policy

General policy objectives under Florida's State Water Resource Plan include a call for water management districts to use the closest water resources available, including resources produced by desalination.[141] To obtain a permit for consumptive uses of water (PCUs) involving the transport of ground or surface water across county boundaries, the governing board or department approving the permit must consider alternatives to the transport and use of water, including desalination.[142] In 2012, the Florida Department of Water Resources engaged water management stakeholders to discern their concerns, and determined that "conjunctive use" permits could address restrictions on water management decisions by allowing permittees to construct water resource portfolios including brackish groundwater, surface water, or desalinated seawater.[143]

The state directive to WMDs to employ local sources first, and then consider

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[135] ST. JOHNS RIVER WATER MGT. DIST., COMPREHENSIVE ANNUAL FINANCIAL REPORT (2017), *available at* http://www.sjrwmd.com/financialstatements/pdfs/CAFR/CAFR_FY_2015-16.pdf.
[136] *Id*.
[137] *See* John J. Fumero & Keith W. Rizzardi, *The Everglades Ecosystem: From Engineering to Litigation to Consensus-Based Restoration*, 13 ST. THOMAS L. REV. 667, 668 (2001).
[138] Klein et al., *supra* note 128, at 417 (citing 1949 Fla. Laws 514).
[139] FLA. STAT. ANN. § 373.026 (LEXIS through Mar. 13, 2017).
[140] S. FLA. WATER MGT. DIST., STRATEGIC PLAN 2012-2017 (2012), at 14, *available at* https://www.sfwmd.gov/sites/default/files/documents/2012_strategic_plan.pdf.
[141] FLA. STAT. ANN. § 373.016 (4)(a) (LEXIS through Mar. 13, 2017); FLA. STAT. ANN. § 373.701(2)(a) (LEXIS through Mar. 13, 2017) ("[T]he Legislature directs the department and the water management districts to encourage the use of water from sources nearest the area of use or application whenever practicable. Such sources shall include all naturally occurring water sources and all alternative water sources, including . . . desalination.").
[142] FLA. STAT. ANN. § 373.223(3)(c) (LEXIS through Mar. 17, 2017). This requirement does not apply to use of water supplied by the C&SF Project or anywhere in the state where the transport and use is exclusively for bottled water. *Id*.
[143] FLA. DEP'T OF ENVTL. PROT., PERMITTING OF CONJUNCTIVE USE AND OTHER MULTIPLE WATER SOURCES, MEMO FROM DEPUTY SECRETARY FOR WATER POLICY AND ECOSYSTEM RESTORATION (Mar. 23, 2012), *available at* http://www.dep.state.fl.us/secretary/watman/files/014_permitting_use.pdf.

alternative water resources in their plans, raises an obvious question: what are the alternatives? Since transport across county boundaries is discouraged, attention turns to a great and proximate source--seawater. Florida considers, implements, and funds seawater desalination as a means of securing those alternatives sources.

Under state law, the funding for the development of alternative water supplies comes from the state budget, regional resources, and in coordination with local authorities.[144] Beginning in 2005-2006, the state committed funding a Water Protection and Sustainability Program Trust Fund to help develop alternative water supplies.[145]

While each WMD operates under the general state policy encouraging local sources first and the inclusion of alternative sources in water resource plans, districts have some discretion in determining their respective approaches. As a result, local and regional priorities play out in the use of state funds employed in constructing water supply portfolios. However, the state monitors these decisions. Each WMD submit water supply planning reports to the governor's office and legislature. The report must detail funding sources and the district's needs for alternative water supply projects.[146] The state retains authority by setting deadlines for responsive alternative water supply project planning.[147] It is notable, however, that since 2005, when the legislature passed the Water Protection and Sustainability Program to pay for alternative water supply projects, state funding has been inconsistent. For example, funding dropped precipitously, from 100 million in fiscal year 2005-2006 to 5.54 million in fiscal year 2008-2009.[148]

The legislature does not hesitate to meso-manage when it comes to desalination. As noted below, state lawmakers often call on individual districts to scrutinize their water management approaches, with an eye toward the employment of that process.

a. *Southwest Florida*

The state legislature included desalination among the alternative sources that should be developed in southwest Florida.[149] That prompted the creation, in 1998, of the Tampa Bay Water Partnership Agreement.[150] The agreement set policy objectives for the region that included the development of new water supplies.[151] This led to the region setting a target goal of developing

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[144] FLA. STAT. ANN. § 373.707 (LEXIS through Mar. 17, 2017).
[145] FLA. STAT. ANN.§ 373.707(8)(b) (LEXIS through Mar. 17, 2017).
[146] FLA. STAT. ANN. § 373.709(2) (LEXIS through Mar. 17, 2017).
[147] FLA. STAT. ANN.§ 163.3177(6)(c)(2) (LEXIS through Mar. 17, 2017) (Local plans for water resources, including alternative water sources, must be updated "at a minimum, every 5 years within 18 months after the governing board of a water management district approves an updated regional water supply plan.").
[148] FLA. DEP'T OF ENVTL. PROT., DIVI. OF WATER RES. MGT., DESALINATION IN FLORIDA: TECHNOLOGY, IMPLEMENTATION, AND ENVIRONMENTAL ISSUES 11 (Apr. 2010), *available at* http://www.dep.state.fl.us/water/docs/desalination-in-florida-report.pdf.
[149] FLA. STAT. ANN. §373.715(1)(f) (LEXIS through Mar. 13, 2017).
[150] SWFWMD, *Annual Alternative Water Supply Report*, 2006, *available at* https://www.swfwmd.state.fl.us/documents/reports/annual_alternative_water_supply_report.pdf; SWFWMD, *Partnership Agreement*, *available at* http://tampabaywater.org/documents/about/Partnership%20Agreement.pdf.
[151] WEST COAST REG'L WATER SUPPLY AUTH., AMENDED AND RESTATED INTERLOCAL AGREEMENT (June 10, 1998), *available at* http://www.tampabaywater.org/documents/Amended%20and%20Restated%20Interlocal%20Agreement%20050198.pdf.

85 MGD of new water supplies by 2007, reducing groundwater pumping, minimizing litigation, and funding the development of new alternative supplies of water.[152]

Prompted by a 1996 assessment focusing on the northern Tampa Bay area, the legislature passed a law requiring the Southwest Florida WMD to adopt minimum water levels for lakes and wetlands in several counties experiencing adverse impacts from groundwater withdrawals.[153] Under a comprehensive environmental resources recovery plan, withdrawal maximums are set, and permittees must demonstrate whether and how desalination and other alternative sources might mitigate withdrawals and their anticipated impacts.[154]

While the Southwest Florida WMD did not budget any amounts for seawater desalination in fiscal years 2003-2012, the district did offer to help fund a large-scale seawater desalination plant in the Tampa Bay area with $183 million through a partnership with Tampa Bay Water.[155] The district also agreed to reduce groundwater pumping by 40% from 158 MGD to 121 MGD by 2003 and to 90 MGD by 2007.[156] In return, Tampa Bay Water set targets to produce 38 MGD of additional water by 2002 and 47 MGD by 2007. Pursuant to that agreement, at least 50% of the new water produced must offset groundwater pumping at the stressed wellfields.[157] The Tampa Bay Seawater Desalination plant is co-located with Big Bend Power Plant and began producing desalinated water in March 2003.[158]

b. *Saint Johns River*

In 2003, the Saint Johns River WMD plan deemed the development of new alternative sources, such as seawater desalination, will "likely be unnecessary,"[159] even though the availability of seawater is noted as an "inherently reliable and virtually drought-proof source."[160] A subsequent plan noted that fresh groundwater continued to be the most desirable water source, given the fact that surface water sources are three to four times as expensive, and desalination was estimated to be even costlier.[161]

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[152] SW. FLA. WATER MGT. DIST., CONSOLIDATED ANNUAL REPORT (2012), *available at* http://www.swfwmd.state.fl.us/documents/reports/2012_consolidated_annual_report.pdf.

[153] Sw. Fla. Water Mgt. Dist., Northern Tampa Bay Minimum Flows and Levels White Papers 1 (Peer Review Final Draft Mar.19, 1999), *available at* http://www.swfwmd.state.fl.us/projects/mfl/reports/ntb_mfls_white_papers-seawater.pdf.

[154] FLA. ADMIN. CODE 40D-80.073 §§ 4(e)-(f) (effective May 19, 2014).

[155] Tampa Bay Water is a governmental water agency that develops and supplies water to three cities and three counties in Tampa Bay, Florida.

[156] EUGENE A. SCHILLER, SW. FLA. WATER MGT. DIST., TAMPA BAY SEAWATER DESALINATION, THE BUSINESS MODEL, *available at* http://attfile.konetic.or.kr/konetic/xml/descon/11A1A0400075.pdf.

[157] SWFWMD, *Partnership Agreement Website*, *available at* http://tampabaywater.org/documents/about/Partnership%20Agreement.pdf.

[158] *Id.*

[159] ST. JOHNS RIVER WATER MGT. DIST., TECHNICAL PUB. SJ2006-1, WATER SUPPLY ASSESSMENT 15 (2003), *available at* http://www.sjrwmd.com/technicalreports/pdfs/TP/SJ2006-1.pdf.

[160] *Id.* at 77.

[161] ST. JOHNS RIVER WATER MGT. DIST. TECHNICAL PUB. SJ2006-2D, DISTRICT WATER SUPPLY PLAN 2005, FOURTH ADDENDUM (2009), *available at* http://www.sjrwmd.com/technicalreports/pdfs/TP/SJ2006-2Addendum4.pdf.

Within the district, however, some counties have faced water management challenges. Rapid development and population growth in Flagler County prompted the crafting of an agreement between the county, municipalities, and the Saint Johns River WMD to identify alternative water sources that could augment groundwater supplies.[162]

Flagler County gathered information and established an assessment process that demonstrated the important role that seawater projects would play in meeting water needs. In 2008, the St. John's River WMD signed a memorandum of understanding with Flagler and other counties, as well as with a number of cities in the district, to develop a plan that would become the Coquina Coast Seawater Desalination Project.[163] As the project continued participants dropped out of the project. In 2011, the preliminary engineering research was completed for the project but it was then placed on hold where it remains today.[164]

c. South Florida

While encouraging the development of alternative water supply projects, the South Florida WMD Strategic Plan does not discuss desalination explicitly.[165] To the degree that the district did consider desalination, it focused on co-located versus standalone seawater desalination facilities. Co-location with electric power plants can reduce the cost of producing potable water by taking advantage of abundant plant cooling water, and existing intake and discharge facilities.[166] In 2002, the district and the Florida Power and Light Company developed a feasibility study for siting a reverse osmosis treatment facilities with existing electric power plants.[167] The study identified two possible locations from twenty-three co-location sites using a sum of fifty-six criteria over three phases. The criteria included cost, environmental impact, placement, public interest, permissibility, and consumers. In December 2006, the Southwest Florida WMD completed a second study, *Technical and Economic Feasibility of Co-located Desalination Facilities* .[168] Although it was determined that seawater desalination is two to three

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[162] ST. JOHNS RIVER WATER MGT. DIST., SPECIAL PUB. SJ2007-SP16, THE FLAGLER COUNTY WATER SUPPLY PLAN, (August 2007), *available at* http://www.sjrwmd.com/technicalreports/pdfs/SP/SJ2007-SP16.pdf.

[163] First Amended Memorandum of Agreement Between the St. Johns River Waret Mgt. Dist., City of Bunnell, City of Deland, Dunes Comm. Dev. Dist., City of Flagler Beach, Flagler Cnty., City of Leesburg, Marion Cnty., City of Mt. Dora, City of Palmcoat, St. Johns Cnty., Volusia Cnty., and the Water Auth. of Volusia For the Development of a Preliminary Design Report for the Coquina Coast Seawater Desalination Alternative Water Supply Project (2008), *available at* http://www.leesburgflorida.gov/government/agendas/20080728/pri_Agenda/item%204.c.3/supp_docs/documents/doc1.pdf.

[164] ST. JOHNS RIVER WATER MGT. DIST., CONSOLIDATED ANNUAL REPORT (2015), *available at* http://www.sjrwmd.com/WaterResourceDevelopmentWorkProgram.pdf.

[165] *See* S. FLA. WATER MGT. DIST., STRATEGIC PLAN 2012-2017 (2012), *available at* https://www.sfwmd.gov/sites/default/files/documents/2012_strategic_plan.pdf.

[166] S. FLA. WATER MGT. DIST., 2011–2014 WATER SUPPLY PLAN SUPPORT DOCUMENT 56 (Sept. 2014), *available at* http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/2011-2013_water_supply_plan_support_doc.pdf.

[167] WATER RESOURCES ASSOCIATES, INC., S. FLA. WATER MGT. DIST. FLA. POWER & LIGHT, FEASIBILITY STUDY FOR CO-LOCATING REVERSE OSMOSIS TREATMENT FACILITIES WITH ELECTRIC POWER PLANTS (June 2002), *available at* https://www.sfwmd.gov/sites/default/files/documents/june_2002_colocation_desal_feasibility_study.pdf.

[168] METCALF & EDDY, S. FLA. WATER MGT. DIST., TECHNICAL AND ECONOMIC FEASIBILITY OF CO-LOCATED DESALINATION FACILITIES (December 21, 2006), *available at*

times more expensive compared to other water supply alternatives, such as water conservation, reuse, and deep groundwater, the district "encourages" water utilities to include seawater desalination in water supply plans to increased supply reliability.[169]

3. Status of Florida Desalination Policy

As of 2014, there were thirty-five desalination plants in Florida, thirty-three of which treat brackish water, and two located in the Florida Keys that utilize seawater. There are a variety of new facilities under construction. In total, the current operating capacity is at 245 MGD.[170]

Florida law requires each water management district to develop a comprehensive water management plan based on a twenty year time period.[171] The planning process requires district-wide water supply assessments, which must be updated every five years.[172] Each plan must address desalination options.[173] This planning and reporting process allows for progress to be monitored regarding the seawater desalination prospects. Yet, while the state directs ongoing monitoring of the situation, it has not yet established portfolio mandate that would require the development or funding of seawater desalination plants.

Several aspects of Florida's latest Coastal Zone Management Plan (CZMP) may impact the development of seawater desalination operations in the state. Under gap or need analysis, the state's CZMP, which is developed in coordination with the WMDs, states it needs to develop maps identifying areas of vulnerability to pollution on a watershed and regional basis. Such maps should be required "for all permits that manage discharge to State waters and for permits that regulate the consumptive use of waters."[174] Another need that the plan identifies is an inventory of water resources on a watershed basis and for minimum volumes of water to sustain the health of the watershed. The plan then develops water budgets for coastal watersheds at the sub-WMD level, and sets minimum flows of surface and groundwater.[175] The development of twenty-year water budgets at sub-WMD levels could lead to a greater investment in seawater desalination.

In 2001, the state legislature enacted law to "clarify and streamline" the permitting process of desalination projects, and consequently to reduce the cost of obtaining permits. The law also allowed for discharge into protected waters[176] under specific conditions. Previously, utilities were not allowed to discharge into protected waters and were required to use deep well

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https://www.sfwmd.gov/sites/default/files/documents/2006_technical_economic%20feasibility_colocated_desal_facilities.pdf.

[169] S. FLA. WATER MGT. DIST., *Desalination and Drought*, http://mytest.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/desal_drought_sf.pdf.

[170] S. FLA. WATER MGT. DIST., SUPPORT DOCUMENT WATER SUPPLY PLAN UPDATE 2011-2014, *available at* https://www.sfwmd.gov/sites/default/files/documents/2011-2013_water_supply_plan_support_doc.pdf.

[171] FLA. ADMIN. CODE ANN. r. 62-0.520(1) (2005); FLA. STAT. ANN. § 373.036 (WEST 2016).

[172] FLA. ADMIN. CODE. r. 62-40.520(2) (2005).

[173] FLA. ADMIN. CODE. r. 62-40.531(2) (2005).

[174] FLA. COASTAL MGMT. PROGRAM, FINAL ASSESSMENT AND STRATEGIES FY2011-FY2015 47 (2011), *available at* https://www.dep.state.fl.us/cmp/links/files/FY2011-2015_Section309_Assessment_Strategies_revMay_6_2013_Final.pdf.

[175] *Id*.

[176] *Outstanding Florida Waters*, FLA. DEP'T ENVTL. PROT. (Nov. 21, 2016), *available at* http://www.dep.state.fl.us/water/wqssp/ofw.html (protected waters, or "Outstanding Florida Waters" (OFW) illicit special protection because of natural attributes).

injection, and thus the expenses saved by the loosened discharge standards will be passed onto consumers.[177] Florida Statute Section 403.061(11)(b) was amended to allow for the discharge of demineralization concentrate in protected waters under certain permits and if the byproduct disposal is "clearly in the public interest."[178] The amended statute stipulated that the Department of Environmental Protection (DEP) rules address permit applications, byproduct disposal options, and requirements, evaluation of mixing zone, and toxicity requirements.[179] The Florida Administrative Code now includes requirements applicable to water utilities for disposal options, uniform monitoring, and a permit application form.[180]

Between 2005 and 2008, 22% of WMDs' project funding went towards brackish ground water desalination projects, while only 0.3% went towards seawater projects.[181] The DEP projects that the funded brackish ground water desalination projects will result in 223 MGD of additional water by 2025.[182] Given the ample amount of brackish ground water in the state, coupled with the fact that the energy costs of desalinating seawater are two to five times more than brackish ground water, the majority of funding has been towards brackish as opposed to seawater desalination.[183]

In 2010, DEP completed an examination of available desalination technologies, analyzing existing desalination projects in the state, and developing recommendations to implement desalination in "an environmentally safe and cost effective manner."[184] The recommendations include utilization of emerging technology, sharing information on desalination technology, and exchanging environmental information.[185]

4. Reflections on Florida's Desalination Legal Landscape

Like California and Texas, Florida has a state policy to monitor water management activities, decisions, and rationales employed by the state's five water management districts. The state mandates that each district strive to develop its water sources locally before considering cross-county transport of water. The state's Water Protection and Sustainability Program Trust Fund is promising, but lacks sufficient funding. However, there seems to be some wisdom evident in Florida's policy focus on co-locating desalination facilities with energy production facilities. Yet, the cost disparities continue to impede wide-scale shifts from groundwater withdrawal and surface water use to brackish water and seawater processing.

V. CONCLUSION

[177] FLA. SENATE COMM. OF NATURAL RES., SENATE STAFF ANALYSIS AND ECONOMIC IMPACT STATEMENT (2001), *available at* http://www.flsenate.gov/data/session/2001/Senate/bills/analysis/pdf/2001s0536.nr.pdf.
[178] FLA. STAT. ANN. § 403.061(11)(b)(4) (WEST 2016).
[179] FLA. STAT. ANN. § 403.0882 (WEST 2016).
[180] FLA. DEP'T OF ENVTL. PROT., CHAPTER 62-620 WASTEWATER FACILITY AND ACTIVITIES PERMITTING (2012); FLA. DEP'T OF ENVTL. PROT., PERMIT APPLICATION FORM 2DC - DISCHARGE DEMINERALIZATION CONCENTRATE (July 9, 2006), *available at* https://www.dep.state.fl.us/water/wastewater/iw/forms/62-620.910_18_AppOnly.pdf.
[181] *Id*.
[182] *Id*.
[183] *Id*.
[184] FLA. DEP'T OF ENVTL. PROT., DIV. OF WATER RES. MGT., DESALINATION IN FLORIDA: TECHNOLOGY, IMPLEMENTATION, AND ENVIRONMENTAL ISSUES (April 2010), *available at* http://www.dep.state.fl.us/water/docs/desalination-in-florida-report.pdf.
[185] *Id*.

The three coastal states in this study all identified seawater desalination as a promising approach to securing sustainable water supplies to help meet current as well as future water needs. However, there are key distinctions. In Florida and Texas, where water management has been broken down into regions, finer scale decision-making and funding sources are available to support the development of seawater desalination. In Florida, where policy is in place to encourage regional water supply development, a few large-scale desalination plants have been constructed where needs are critical, where siting is advantageous, or both.

In Texas, regional water planning bodies were put in place more recently than in Florida. While Texas lags behind Florida in construction of larger scale seawater desalination plants, local initiatives have demonstrated a financial commitment to the development of seawater desalination research and pilot plants, as well as larger scale projects. While none of the three states seem to have achieved an integrated comprehensive approach to facilitate wide-scale adoption and employment of desalination, each state has institutionalized an information gathering and reporting process that should prepare states to achieve such an approach. Florida and Texas were early adopters of mandates that state and regional planning efforts to at least consider desalination. California lags behind in inclusion of desalination in the required regional planning process. As seawater desalination plants will ultimately impact and benefit the coastal region, state coastal management plans may be another avenue of standardizing and streamlining permitting processes and integrating seawater desalination with ocean energy efforts. Florida and California may also elicit advantages in the form of existing state-federal collaboration in the form of national marine sanctuaries that straddle state and federal waters.

This article is merely the preliminary examination of the development of desalination-oriented laws. It provides an opening to further review and assessment of the prospects of desalination and the resulting reshaping of water management strategies, laws and policies. New technology that provides an essential resource as fresh water will reshape our land and seascapes and refashion our water portfolios. This can only happen in an ecosystem of laws and policies that facilitate water production and allocation, while at the same time safeguarding the environment where that development takes place. Desalination will undoubtedly open new chapters in the body of water law. California, Texas, and Florida give us a peek at those new chapters.