

**Desalination: An Additional Water Source for  
Southern California’s Water Crisis and an  
Unsustainable 1944 U.S.-Mexico Water Treaty**

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**INTRODUCTION**

The condition of Southern California’s water is deceptive. Water in the region appears abundant, from the seemingly unlimited supply to the miles of lush greenery. The region has suffered, however, from prolonged drought and irresponsible water management that has left water resources scant and overwrought. Unless profound changes are made in how the region handles its water and from where the water is sourced, these extremely populated areas will become uninhabitable very soon.

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Whereas some 97% of the earth's water is in the oceans,<sup>1</sup> only 2.5% of the earth's water is in freshwater resources.<sup>2</sup> These freshwater resources are simply not enough to sustain the global population. Southern California and Mexico feature more arid climates that require more water to preserve agriculture and life in general. Both areas depend on the Colorado and Rio Grande rivers for the majority of their fresh water supplies, while the two rivers also make up two-thirds of the international border.<sup>3</sup> In addition to California and Mexico, the Colorado River also supplies water to Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming.<sup>4</sup> This means that more than 33 million people depend on a steady supply of water from the Colorado River.<sup>5</sup> However, the Colorado River is highly prone to multiyear droughts,<sup>6</sup> prolonged and deepened by the impacts of climate change.

Climate change, drought, and overconsumption have greatly contributed to the water crisis in California and Mexico. California recently declared a state of emergency in its water supplies, and is effectuating emergency mandatory conservation restrictions to ease the state's crisis.<sup>7</sup> Despite these restrictions, there is still not enough water from these overused sources. With a growing population,<sup>8</sup> it is imperative for the state to implement more long-term conservation practices.

The United States and Mexico entered into a water treaty in 1944. The 1944 U.S.-Mexico Water Treaty ("Treaty") remains in effect, with continued additions to its terms. Drought and overconsumption in the signatory countries have challenged both countries' abilities to fulfill

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<sup>1</sup> Aaron Schwabach, *Using International Law to Prevent Environmental Harm from Increased Use of Desalination*, 34 TEX. INT'L L.J. 187, 187 (1999).

<sup>2</sup> Robin Kundis Craig, *Symposium—Critical Intersections for Energy & Water Law: Exploring New Challenges and Opportunities: Water Supply, Desalination, Climate Change, and Energy Policy*, 22 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 225, 228–29 (2010).

<sup>3</sup> Allie Alexis Umoff, *An Analysis of the 1944 U.S.-Mexico Water Treaty: Its Past, Present, and Future*, 32 ENVIRONS ENVTL. L. & POL'Y J. 69, 71 (2008).

<sup>4</sup> NICOLE T. CARTER, CLARE RIBANDO SEELKE & DANIEL T. SHEDD, CONG. RESEARCH SERV., R44312, U.S.-MEXICO WATER SHARING: BACKGROUND AND RECENT DEVELOPMENT 9 (2013).

<sup>5</sup> Ian Lovett, *U.S. and Mexico Sign a Deal on Sharing the Colorado River*, N.Y. TIMES, Nov. 20, 2012, at A16, <http://www.nytimes.com/2012/11/21/us/us-and-mexico-sign-deal-on-managing-colorado-river.html>.

<sup>6</sup> CARTER ET AL., *supra* note 4, at 7.

<sup>7</sup> Matthew C. Lewis, Comment, *Thirsty for Change: Desalination as a Practical and Environmentally Friendly Answer to California's Growing Water Shortage*, 44 U.S.F. L. REV. 933, 933–34 (2010).

<sup>8</sup> *Id.* at 934.

their water delivery obligations. California needs a new water source, not only for its own well-being, but also to satisfy its responsibilities under the Treaty.

This paper will discuss the use of desalination of ocean water as a supplement to California's water supply to alleviate the burden on stripped environments such as the Colorado River. Furthermore, proper implementation of desalination could enhance international relations between the United States and Mexico, and provide the water that Californians and Mexicans need.

## I PURPOSE

### *A. California*

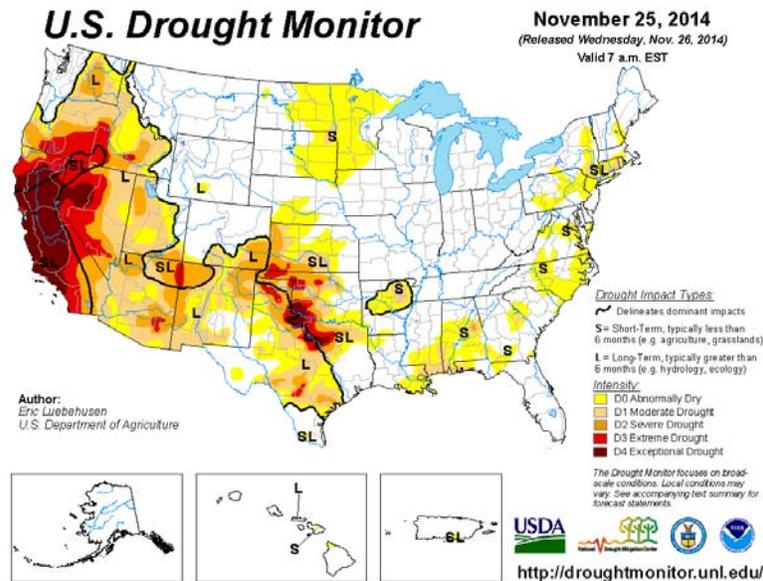
California's water comes from three primary sources: snowmelt from the Sierra Nevada mountain range, local groundwater, and the Colorado River basin.<sup>9</sup> All three sources are drying up, and even under the best forecasts, show continual decline for the next several decades.<sup>10</sup> The primary force behind this decline is climate change.

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<sup>9</sup> Jay Famiglietti, Opinion, *How Much Water Does California have Left?*, L.A. TIMES (July 8, 2014), <http://www.latimes.com/opinion/op-ed/la-oe-famiglietti-southern-california-drought-20140709-story.html>.

<sup>10</sup> *Id.*

Figure 1.



Climate change has a number of effects on water. These include: (1) increased water shortages due to changes in precipitation patterns and intensity, (2) decreased natural water shortage capacity from snowcap melting, which subsequently reduces long-term water availability, (3) enhanced vulnerability of ecosystems under rising temperatures, (4) volatility in precipitation patterns, (5) frequent severe weather events and prolonged droughts, and (6) rising sea levels.<sup>11</sup> Climate change has worsened the frequency and length of normal droughts in Southern California and intensified water scarcity issues.<sup>12</sup> Figure 1 shows how dire the circumstances have become. The Southern California region exceeds abnormally dry, moderate, severe, and extreme drought conditions; it has fallen in exceptional drought.<sup>13</sup> Under current climate conditions, events of drought are expected to worsen and substantially deteriorate California's primary water resources.

In addition to climate change, human wastefulness is also a factor in California's water woes. Farmers account for eighty percent of water

<sup>11</sup> Craig, *supra* note 2, at 232.

<sup>12</sup> Lewis, *supra* note 7, at 934.

<sup>13</sup> The National Drought Mitigation Center, *U.S. Drought Monitor*, THE U. S. DROUGHT MONITOR (Nov. 28, 2014), <http://droughtmonitor.unl.edu>.

consumption in the United States.<sup>14</sup> California is a major agricultural contributor to the country, producing nearly half of the country's total vegetable crop and more than half of the country's fruits and nuts.<sup>15</sup> California farmers are using more than eighty percent of the state's water to produce mass amounts of food.<sup>16</sup> California has over 8 million irrigated acres as of 2008, more than any other state.<sup>17</sup> Despite worsening drought conditions, Southern California farmers used more than 100 billion gallons of Colorado River water in 2013 to grow alfalfa to help boost the dairy industry.<sup>18</sup>

Agricultural water waste originates from irrigation methods. In the United States, farmers irrigate about half of the country's 60 million irrigated acres through a flood irrigation process,<sup>19</sup> which, as the name implies, simply floods fields with water.<sup>20</sup> Flood irrigation is an extremely wasteful and unnecessary practice, especially in light of more effective and environmentally-friendly alternatives, such as micro-irrigation.<sup>21</sup>

The low price of water is one of the main reasons for California's wasteful water habits.<sup>22</sup> The price, however, does not cover delivery, infrastructure depreciation, and research and development.<sup>23</sup> Utilities have no incentive to discourage consumption, as it would cause their revenue to decline.<sup>24</sup>

Because of climate change, drought, and overconsumption practices, California has been taking more than its share of the Colorado River for years.<sup>25</sup> California has granted to various farmers and agencies five

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<sup>14</sup> Eduardo Porter, *The Risks of Cheap Water*, N.Y. TIMES, Oct. 14, 2014, at B1, <http://www.nytimes.com/2014/10/15/business/economy/the-price-of-water-is-too-low.html>.

<sup>15</sup> PETER W. CULP, ROBERT GLENNON & GARY LIBECAP, SHOPPING FOR WATER: HOW THE MARKET CAN MITIGATE WATER SHORTAGES IN THE AMERICAN WEST 6 (2014).

<sup>16</sup> *Id.*

<sup>17</sup> *Id.* at 11.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.* at 28.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> Porter, *supra* note 14.

<sup>23</sup> *Id.*

<sup>24</sup> *Id.*

<sup>25</sup> Colorado River Delta Bi-National Symposium Proceedings (Sept. 11–12, 2001), at 14.

times the water rights than its average annual flow of surface water.<sup>26</sup> As a result, the situation has become contentious between states. Arizona, for example, has taken California to court to protect its rights in the Colorado River.<sup>27</sup> Arizona made great strides in its conservation practices. In Yuma, Arizona, the agricultural productivity had massive growth without increasing water demand.<sup>28</sup> Despite Arizona's great strides in state conservation practices, California's water crisis continues to threaten not only Arizona's water supplies, but also six other states' water supplies.

In February of 2009, Governor Arnold Schwarzenegger finally declared a state of emergency in California and demanded that state agencies take appropriate measures toward resolving water scarcity issues that reached nearly historic lows.<sup>29</sup> Projections show that the water supply under current usage trends would be sufficient to last until July 2015 or, at the very latest, January 2016.<sup>30</sup> In January of 2014, Governor Jerry Brown called for a 20 percent reduction in California's water use.<sup>31</sup> This cutback would aid in slowing water consumption, but would still not be enough to solve California's water scarcity problem in the long term.

To aid in reaching the governor's goal, the state imposed stricter water laws by creating mandatory restrictions and fines in July 2014, in hopes of driving down usage.<sup>32</sup> The restrictions were made in several areas, including: outdoor water use, hosing off driveways, and residential car washing.<sup>33</sup> Cities all over the state became more active in participating in water surveys in 2014.<sup>34</sup> Some cities even complained that official statistics did not accurately reflect just how

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<sup>26</sup> CULP ET AL., *supra* note 15, at 15.

<sup>27</sup> *Arizona v. California*, 530 U.S. 392, 392 (2000); Colorado River Delta Bi-National Symposium Proceedings, *supra* note 24.

<sup>28</sup> CULP ET AL., *supra* note 15, at 12.

<sup>29</sup> Lewis, *supra* note 7, at 933–34.

<sup>30</sup> See Famiglietti, *supra* note 9.

<sup>31</sup> Office of Governor Edmund G. Brown Jr., *Governor Brown Declares Drought State of Emergency*, CA.GOV (1-17-2014), <https://www.gov.ca.gov/news.php?id=18368>.

<sup>32</sup> The Associated Press, *California: Water Use Falls in Wake of Restrictions*, N.Y. TIMES, Oct. 7, 2014, at A17, <http://www.nytimes.com/2014/10/08/us/california-water-use-falls-in-wake-of-restrictions-.html>.

<sup>33</sup> Matt Stevens, *Californians Make Big Cuts in Water Usage, Report Says*, L.A. TIMES (Oct. 7, 2014), <http://www.latimes.com/local/la-me-1008-water-consume-20141008-story.html>.

<sup>34</sup> *Id.* (“State officials described the August survey of water use as among the most accurate they’ve done. The May survey was voluntary, and only 63% of water agencies participated. About 95% provided data for the August survey.”).

much water they conserved. The city of Tracy made the greatest improvement with a 41% overall reduction of average use.<sup>35</sup>

Emergency conservation efforts have been somewhat successful. As of August 2014, California cut back its water usage by 11.5% from the year before, which amounts to 27 billion gallons.<sup>36</sup> Although this was a substantial accomplishment for a summer of above-average temperatures, the reduction still did not meet Governor Brown's 2014 goal.<sup>37</sup> Unless there is a drastic increase in water conservation efforts and water resource substitutes, water prices will likely skyrocket to reflect extreme scarcity. The combination of price inflation and resource scarcity would make water less available to families, and majorly impact the state's agricultural industry.<sup>38</sup>

Another pertinent issue is California's growing population. In 1950, the population in Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming was 14 million.<sup>39</sup> This figure surged a staggering 400% to over 56 million in 2010,<sup>40</sup> dramatically impacting the Colorado River's usage and allocations. Furthermore, projections predict that California's population will increase by 15 million people from 2010 to 2060. See Figure 2.<sup>41</sup>

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<sup>35</sup> Stevens, *supra* note 33.

<sup>36</sup> *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> See Famiglietti, *supra* note 9.

<sup>39</sup> CULP ET AL., *supra* note 15, at 8.

<sup>40</sup> *Id.*

<sup>41</sup> Population Projections Press Release, Cal. Dep't of Fin. (Jan. 2013) (on file with the Cal. Dep't of Fin.).

**Figure 2.**

Population by Race/Ethnicity for  
California and its Counties 2010-2060

TOTAL POPULATION  
Source: State of California Department of Finance

	2010	2020	2030	2040	2050	2060
Los Angeles County	9,824,906	10,441,441	10,950,335	11,243,022	11,434,565	11,562,720
Napa County	136,811	145,660	158,649	172,927	185,238	196,243
Orange County	3,017,327	3,198,279	3,286,100	3,321,037	3,324,920	3,331,595
Riverside County	2,191,886	2,593,211	3,046,064	3,462,256	3,828,798	4,216,816
Sacramento County	1,420,434	1,543,522	1,708,114	1,913,756	2,063,132	2,191,508
San Bernadino County	2,038,523	2,273,017	2,626,945	2,988,648	3,248,440	3,433,047
San Diego County	3,102,745	3,333,995	3,530,896	3,749,240	3,969,663	4,152,763
San Francisco County	806,254	852,788	877,847	891,607	907,443	926,555
Santa Barbara County	424,050	449,505	473,356	492,610	506,466	519,034
Sonoma County	484,084	507,250	534,439	572,664	598,795	616,340
Ventura County	825,077	867,535	912,548	960,528	995,578	1,034,651
California	37,309,382	40,643,643	44,279,354	47,690,186	50,365,074	52,693,583

In addition to major population growth, projections show that demand per capita will grow. Currently, the average American consumes 159 gallons of fresh water per day.<sup>42</sup> Experts believe that this number may soon exceed 260 gallons per day.<sup>43</sup> By contrast, “half of the world’s population consumes less than twenty-five gallons per person per day.”<sup>44</sup> In 2012, the Bureau of Reclamation published a study examining the demand-supply index of water.<sup>45</sup> The study asserted that as of 2008, America’s demand for water officially exceeded its supply. Moreover, this disparity is only projected to grow as seen in Figure 3.<sup>46</sup> The demand will continue to increase to an average of 3.2 million acre-feet per year by 2060, which is an imbalance that is equivalent to about twenty percent of current Colorado Basin-wide demands.<sup>47</sup> In the worst circumstances, the study suggested an imbalance of more than 8 million acre-feet per year, which would be fifty percent greater than current demands.<sup>48</sup> The study determined that diligent planning through increasing water supply, reducing demand, and modifying operations must take place in order

<sup>42</sup> Schwabach, *supra* note 1, at 188.

<sup>43</sup> *Id.*

<sup>44</sup> *Id.*

<sup>45</sup> U.S. DEP’T OF THE INTERIOR BUREAU OF RECLAMATION, COLORADO RIVER BASIN WATER SUPPLY AND DEMAND STUDY (2012).

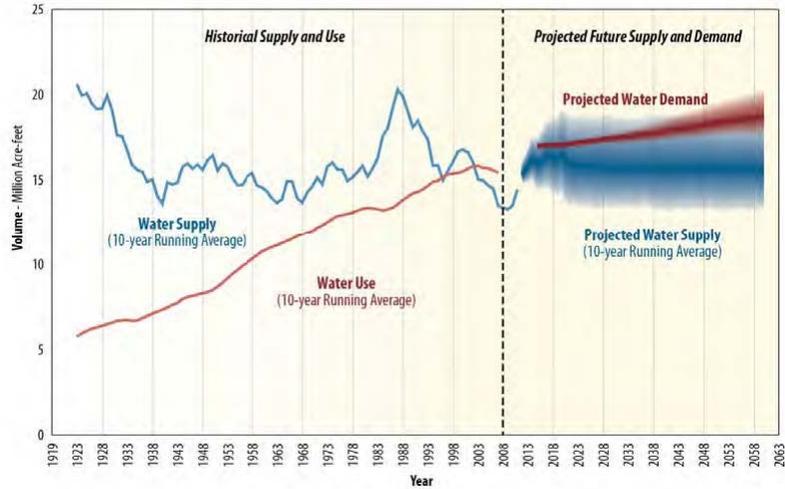
<sup>46</sup> U.S. DEP’T OF THE INTERIOR BUREAU OF RECLAMATION, COLORADO RIVER BASIN WATER SUPPLY AND DEMAND STUDY: EXECUTIVE SUMMARY at 10 (2012).

<sup>47</sup> CULP ET AL., *supra* note 15, at 9.

<sup>48</sup> *Id.*

to meet water needs.<sup>49</sup> For increasing water supply, the study suggests a variety of sources, such as desalination, reuse, local supply, watershed management (such as weather modification), and importation.<sup>50</sup> In terms of the highest potential yield, weather modification has the highest estimate; however, this is an expensive and unpolished process.<sup>51</sup>

**Figure 3.**



Desalination presents the second highest potential yield.<sup>52</sup> For reducing demand, the study suggests municipal and industrial conservation, agricultural conservation, and energy water use efficiency.<sup>53</sup> All of these options would augment water use methods to maximize the use of the resources. Finally, the study suggests that system operations and water transfers, exchanges, and banking accommodate the amount of the supply rather than the demand.<sup>54</sup>

One of the many proposed solutions to California's water crisis is the California 4.4 plan.<sup>55</sup> Urged by the U.S. Department of the Interior,

<sup>49</sup> U.S. DEP'T OF THE INTERIOR BUREAU OF RECLAMATION, *supra* note at 46, at 26.

<sup>50</sup> *Id.* at 13.

<sup>51</sup> *Id.*

<sup>52</sup> *Id.*

<sup>53</sup> *Id.* at 14.

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

this plan will aid California in weaning off its reliance on surplus flows of the Colorado River and get the state back within its allotted 4.4 million acre-feet per year.<sup>56</sup> The proposal aims to save up to 800,000 acre-feet per year through conservation and water transfers, canal seepage recovery, groundwater banking, conjunctive use, reoperation of Lake Mead, and possible desalination of drainage water.<sup>57</sup> While conservation and smarter water use are key in helping California recover from the water crisis, the California 4.4 Plan does not provide a complete solution. The Colorado River's allotments for the various states were based on a period when there was much more water flowing through the river.<sup>58</sup> In 1944, the Colorado River had 16.8 million acre-feet of water per year; by 2013, it had 14.4 million acre-feet per year.<sup>59</sup> Given the population increase since 1944 and the projected population increases, bringing California within 4.4 million acre-feet may be premature and overly ambitious. Additional water resources are vital to providing water to California.

Some options for encouraging conservation include providing incentives through market pricing and instituting different irrigation methods. One study suggested controlling market pricing by keeping moderate water use pricing low and making overuse more expensive.<sup>60</sup> This would still provide water to people at a relatively affordable price while discouraging people from overuse, thereby conserving the excess water that would usually be marked at the same low cost. Moreover, farmers would have the opportunity to sell or lease a portion of their water as an incentive to conserve.<sup>61</sup> Reduced water use during irrigation could mean more money through selling the remainder, while water would be conserved for state use in the process.

In terms of changing irrigation systems, the inefficient and wasteful use of flood irrigation by farmers on nearly half of the United States' 60 million irrigated acres must change.<sup>62</sup> Alternatively, micro-irrigation emits a precise quantity of water to each plant, and subsurface drip irrigation provides a slow drip on plants throughout an extended

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<sup>56</sup> *Colorado River Water Use 4.4 Plan*, WATER EDUC. FOUND., <http://www.watereducation.org/aquapedia/colorado-river-water-use-44-plan> (last visited Feb. 14, 2016).

<sup>57</sup> *Id.*

<sup>58</sup> CARTER ET AL., *supra* note 4, at 7.

<sup>59</sup> *Id.* at 8.

<sup>60</sup> CULP ET AL., *supra* note 15, at 13.

<sup>61</sup> *See id.* at 7. ("Market pricing for water can encourage conservation and wise use of water in our cities and industry.")

<sup>62</sup> *Id.* at 28.

period of time. Both irrigation systems produce a higher yield and use substantially less water.<sup>63</sup>

Because of climate change, drought, overconsumption, and a rapidly growing population, California needs an additional water source, preferably one that could withstand the effects of drought and rising sea levels, such as desalination. However, California should not be the only beneficiary of desalination.

### ***B. Mexico***

The United States and Mexico's water interests have been connected for more than seventy years. In 1944, the United States and Mexico established a treaty that allocated water from the Colorado and Rio Grande Rivers to each country.<sup>64</sup> Because the majority of the Colorado River is in U.S. territory, the United States provides a substantial amount of water to Mexico every year, under the treaty, in the amount of 1.5 million acre-feet.<sup>65</sup> In return, Mexico must provide an average of 350,000 acre-feet per year from their six tributaries of the Rio Grande River.<sup>66</sup> Mexico must deliver their water payments in five-year cycles.<sup>67</sup> The Treaty also provides that Mexico may accrue a 'water debt' in which it must pay off whatever water payment they have fallen back on in their five-year installments.<sup>68</sup> The Treaty does not mandate such a provision for the United States<sup>69</sup> Furthermore, while the Treaty provides that water exchanges may be temporarily diverted in times of drought, any further instruction particularly important in times of exceptional, prolonged drought were not specified.<sup>70</sup>

The Treaty also expanded the scope of the International Boundary Commission to the International Boundary and Water Commission (IBWC), which was given the responsibility of settling water disputes between the United States and Mexico.<sup>71</sup> When the IBWC exercises its rule-making power under the Treaty, it records its decisions as Minutes,

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<sup>63</sup> *Id.*

<sup>64</sup> Umoff, *supra* note 3, at 74.

<sup>65</sup> CARTER ET AL., *supra* note 4, at 4. One acre-foot is about 326,000 gallons.

<sup>66</sup> *Id.* at 5.

<sup>67</sup> *Id.*

<sup>68</sup> *Id.*

<sup>69</sup> *Id.*

<sup>70</sup> *Id.*

<sup>71</sup> Umoff, *supra* note 3, at 73.

which must be written in both English and Spanish.<sup>72</sup> If neither government expresses approval or disapproval, the Minutes are deemed approved.<sup>73</sup>

The Treaty had its fair share of difficulty. The Colorado River is naturally salty, but in the 1960s, the salinity levels were so high that the water the United States allotted to Mexico destroyed much of the Mexican crops.<sup>74</sup> In response, Mexico threatened to take their dispute with the United States to the International Court of Justice (ICJ).<sup>75</sup> Most scholars at the time believed that Mexico would win if the dispute reached the court.<sup>76</sup> The IBWC stepped in, however, and settled the dispute through Minute 242 in 1973.<sup>77</sup> In the Minute, the United States agreed that the water provided to Mexico would not have higher than 145 parts per million (ppm) of salt. The United States was also to assist Mexico in improving and rehabilitating the damage that had been done to the Mexicali Valley from the salty water.<sup>78</sup> The Minute remains in effect today, and salinity levels are a continued topic of concern.<sup>79</sup> Minute 242 led to the building of the Yuma Desalting Plant.<sup>80</sup> However, construction on the plant was not completed until 1992.<sup>81</sup> Furthermore, the plant has only been used twice since its completion due to normal salt levels from the Colorado River.<sup>82</sup>

Drought conditions have been so damaging that water deliveries to Mexico have been reduced by thirty-one percent between 1939 and 2013.<sup>83</sup> In 2012, the United States only delivered thirty-nine percent of Mexico's allotment.<sup>84</sup> By 2013, the United States only delivered a mere six percent.<sup>85</sup> New Mexico residents refer to the Rio Grande River as the "Rio Sand," because the river's flow has fallen so dramatically.<sup>86</sup>

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<sup>72</sup> *Id.* at 77.

<sup>73</sup> *Id.*

<sup>74</sup> CARTER ET AL., *supra* note 4, at 8.

<sup>75</sup> *Id.*

<sup>76</sup> Umoff, *supra* note 3, at 79.

<sup>77</sup> *Id.* at 80.

<sup>78</sup> *Id.*

<sup>79</sup> CARTER ET AL., *supra* note 4, at 9–10.

<sup>80</sup> *Id.* at 9.

<sup>81</sup> *Yuma Desalting Plant*, U.S. DEP'T OF THE INTERIOR, [http://www.usbr.gov/lc/yuma/facilities/ydp/yao\\_ydp.html](http://www.usbr.gov/lc/yuma/facilities/ydp/yao_ydp.html) (last updated Apr. 13, 2015).

<sup>82</sup> *Id.*

<sup>83</sup> CARTER ET AL., *supra* note 4, at 11.

<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> CULP ET AL., *supra* note 15, at 6.

During that time, the United States was not the only country defaulting on its water duties. At the end of the 1992 to 1997 cycle, Mexico accrued a debt of approximately one million acre-feet.<sup>87</sup> By the end of the 1997 to 2002 water cycle, the debt had increased by another half million acre-feet.<sup>88</sup> The IBWC requested that Mexico conduct and report on studies concerning drought management planning pursuant to Minute 308, which was executed near the end of the 1997 to 2002 cycle.<sup>89</sup> Mexico defaulted on its water payments for approximately thirteen years, before successfully satisfying its water debt in September 2005.<sup>90</sup> Much of the problem arose from drought conditions and overconsumption.

The Rio Grande is an over-allocated basin. From 1997 to 2004, water supply for U.S. agriculture in the Lower Rio Grande basin averaged fifty-three percent.<sup>91</sup> In average water years, Texan water users may only expect seventy percent of their allocation.<sup>92</sup> Mexico also over-allocated their portions of the Rio Grande due to agricultural expansion.<sup>93</sup> Over-allocation alone means that water users will not likely receive their water allocations, even in drought-free years. More water savvy distributions are necessary for both conservation reasons as well as simple sensibility. Under current circumstances, however, Mexico will continue to default on its water payments to the United States

The lack of water delivery has inevitably created diplomatic tension between the two countries. President Obama visited Mexico with the goal of discussing Mexico's late water deliveries.<sup>94</sup> Mexican President Peña Nieto was clear that he did not want the water issue to sour the countries' amicable relationship.<sup>95</sup> President Nieto prioritized working with IBWC to meet Mexico's water deliveries.<sup>96</sup> Water tensions between the United States and Mexico have not been at the forefront of

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<sup>87</sup> Umoff, *supra* note 3, at 82.

<sup>88</sup> *Id.*

<sup>89</sup> *Id.*

<sup>90</sup> *Id.*

<sup>91</sup> CARTER ET AL., *supra* note 4, at 14.

<sup>92</sup> *Id.*

<sup>93</sup> *Id.*

<sup>94</sup> CARTER ET AL., *supra* note 4, at 16.

<sup>95</sup> *Id.* at 16–17.

<sup>96</sup> *Id.* at 17.

international concern, but many other countries around the world have had similar tensions arise.<sup>97</sup> For example, China had issues with both contamination and damming water supplies, which negatively impacted downstream co-riparian nations, including: India, Cambodia, Laos, Vietnam, and Pakistan.<sup>98</sup> Incorporating new viable water sources is important for Southern California, but can also help international relations by applying these methods to situations where neighboring countries are going through a similar crisis.

In an attempt to mitigate recent drought and overconsumption issues, the IBWC established Minute 319 on November 20, 2012.<sup>99</sup> The Minute is viable for five years with the potential of being extended through 2026, if the Minute has not been supplanted or replaced.<sup>100</sup> The Minute established that Mexico will receive additional water deliveries when Lake Mead, which spans parts of both Nevada and Arizona, has high water levels and, conversely, lower water deliveries when Lake Mead's water levels are low.<sup>101</sup> In exchange for this contingency, the United States will store some of Mexico's water as well as pay for some of Mexico's damaged infrastructure from a major 2010 earthquake.<sup>102</sup>

Sources agree that the Rio Grande and Colorado Rivers are particularly prone to drought. Water sources in the southwestern region of the United States and Mexico are dwindling. With climate change conditions aggravating drought and overconsumption practices, Minute 319 has become a temporary bandage for a much deeper issue. In addition to simple capacity issues, water sources in both California and Mexico are regularly at risk of drought. The Colorado and Rio Grande Rivers are insufficient fresh water supply resources. While conservation and wiser allocations would be helpful, we must consider additional water sources, particularly sources that could withstand droughts and rising sea levels, are also just as imperative. Professor Rhett B. Larson argues that the 1944 Water Treaty may no longer be a fair allocation and that “[t]echnology can do more than improve or increase water supplies—it can change how nations perceive what is

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<sup>97</sup> Rhett B. Larson, *Innovation and International Commons: The Case of Desalination Under International Law*, 2012 UTAH L. REV. 759, 811 (2012).

<sup>98</sup> *Id.* at 772.

<sup>99</sup> CARTER ET AL., *supra* note 4, at 10.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.* at 11.

<sup>102</sup> Lovett, *supra* note 5.

fair.”<sup>103</sup> A process of purifying seawater recently became more feasible and offers an answer to this region’s water woes.

## II WHAT IS DESALINATION?

Desalination is a process that removes salt, minerals, and most biological or organic chemical compounds from seawater, producing water for human use and consumption.<sup>104</sup> There are many processes for purifying water, such as distillation, reverse osmosis, forward osmosis, charged carbon nanotubes, or biomimetics.<sup>105</sup> Distillation essentially boils water to eliminate impurities, but uses so much energy that it is prohibitively expensive for most regions.<sup>106</sup> Of the other processes, reverse osmosis is the favored method of desalination. Reverse osmosis treats the water and removes impurities.<sup>107</sup> Then, high pressure pushes the water through a semi-permeable membrane, which separates salts and other solids from the water.<sup>108</sup> The membrane effectively acts like a strainer that only allows water molecules to pass through.<sup>109</sup> Desalinated water has been shown to meet or exceed the quality of local, state, and federal standards of drinking water.<sup>110</sup> See Figure 4.<sup>111</sup>

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<sup>103</sup> Larson, *supra* note 97, at 774.

<sup>104</sup> *Process FAQs*, CARLSBAD DESALINATION PROJECT, <http://carlsbaddesal.com/process-faqs> (last visited Feb. 14, 2016).

<sup>105</sup> Aaron Schwabach, *Desalination and International Watercourse Law*, 2013 UTAH L. REV. ONLAW, 297, 298 (2013).

<sup>106</sup> Schwabach, *supra* note 1, at 190.

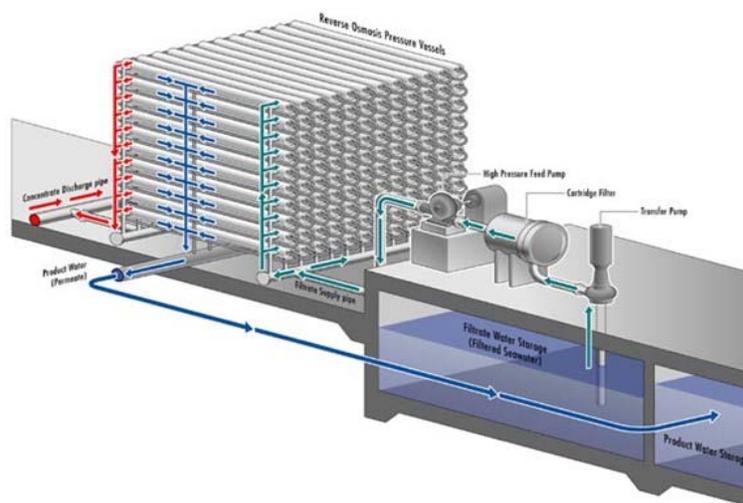
<sup>107</sup> CARLSBAD DESALINATION PROJECT, *supra* note 104.

<sup>108</sup> *Id.*

<sup>109</sup> *Id.*

<sup>110</sup> *Id.*

<sup>111</sup> *Id.*

**Figure 4.**

Countries all over the world have been increasingly turning to desalination due to a growing necessity to provide fresh drinking water.<sup>112</sup> Saudi Arabia desalinates up to one billion gallons of water per day, which meets seventy percent of the country's needs.<sup>113</sup> Israel shifted its primary fresh water reliance to the ocean, which has helped ease tensions between Israel and its surrounding countries over the dwindling fresh water supplies in the region.<sup>114</sup> China recently invested \$4 billion in a desalination project, with plans to invest an additional \$30 billion in the coming years.<sup>115</sup> China's investment was in response to expectations of a sixty-three percent increase in water demand.<sup>116</sup> In 2006, Singapore began a major desalination project, which accommodates ten percent of the nation's water demands and pumps in 36 million gallons per day.<sup>117</sup>

Australia is one of the major developed countries that struggles with clean water sources. Because of drought, declines in stream flow, and

<sup>112</sup> Craig, *supra* note 2, at 228.

<sup>113</sup> William M. Sloan, *Seawater Desalination: Urban Myth or Urban Supply?*, THE DIRT, 8 (Summer 2006), <http://media.mofo.com/docs/pdf/Dirt0706.pdf>.

<sup>114</sup> Larson, *supra* note 97, at 771.

<sup>115</sup> *Id.* at 772.

<sup>116</sup> *Id.*

<sup>117</sup> Craig, *supra* note 2, at 244-45.

a rapidly growing population, Australia began building its first desalination plant in 2006 and immediately began considering a second one.<sup>118</sup> By the time the first plant became operational in 2007, the city of Perth saw a twenty-one percent decrease in rainfall over the previous decade<sup>119</sup> and an even more severe sixty-five percent drop in actual water running into storage.<sup>120</sup> The Australian government committed over AUD\$7.5 billion to desalination plants.<sup>121</sup> The United States can learn from Australia's water plight; coastal cities face a water crisis from the increase of demand and rise in temperatures. The rise in temperatures causes glaciers to melt, sea levels to rise, and water loss through evaporation.<sup>122</sup> Rising sea levels can potentially push saltwater into underground fresh water resources, thereby contaminating them with salinity.<sup>123</sup> Both California and Mexico are substantially coastal and should learn from Australia's crisis.

In the past, the cost of desalination was so high that it rendered the process unfeasible. However, costs dropped significantly in recent decades and brought desalination to the forefront of the water crisis conversation. Current water (supplied by the Colorado River) rates are less than \$1 per 1,000 gallons.<sup>124</sup> In the 1950s, desalinated water cost between \$12 and \$14 per 1,000 gallons.<sup>125</sup> In 1990, costs fell to \$6 per 1,000 gallons.<sup>126</sup> Current technology has additionally dropped costs to between \$2 and \$3 per 1,000 gallons.<sup>127</sup>

Although desalinated water rates are presently more than double current water rates, the cost is not expected to be an issue, based on predictions that current water rates will skyrocket for several reasons. First, scarcity will cause water rates to rise. In other words, "the standard response to scarcity—grabbing more—cannot work any longer. There isn't more water to grab."<sup>128</sup> Second, newly adopted fines and restrictions will cause water rates to rise. On July 15, 2014,

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<sup>118</sup> *Id.* at 244.

<sup>119</sup> *Id.* at 233–34.

<sup>120</sup> *Id.* at 234.

<sup>121</sup> *Id.*

<sup>122</sup> *Id.* at 231.

<sup>123</sup> *Id.*

<sup>124</sup> Sloan, *supra* note 113, at 8.

<sup>125</sup> *Id.*

<sup>126</sup> *Id.*

<sup>127</sup> *Id.*

<sup>128</sup> Porter, *supra* note 14.

California approved new emergency conservation restrictions.<sup>129</sup> Some of the restrictions prohibit hosing down driveways, sidewalks, and outdoor landscapes, if it causes excess runoff.<sup>130</sup> Water cannot be added as a decorative feature, unless it uses a recirculating system.<sup>131</sup> Furthermore, Californians may only use a hose with a shut-off nozzle to wash their cars,<sup>132</sup> with offenders subject to a \$500 fine per day of violation.<sup>133</sup> Water suppliers must now require outdoor irrigation restrictions and report monthly water use.<sup>134</sup> Lastly, there have been increasing amounts of criticism over cheap water rates, especially since these rates do not cover the cost of delivery.<sup>135</sup> Criticisms of California's water rates condemn the practice of maintaining such a low cost to the consumer, because these rates have done nothing to deter wasteful water use.<sup>136</sup> Considering the factors of scarcity, new fines and restrictions, and recent criticisms, the predictions of current water rates skyrocketing are well supported; therefore, the cost of desalination as it stands is not prohibitively expensive over a similarly priced option in the future.

Another important concern of desalination is energy use and cost. Energy is the largest cost variable for a desalination plant, consisting of one-third to more than one-half of the cost of production costs.<sup>137</sup> However, there are many promising renewable energy resources that have been explored as options to power these desalination plants, including: nuclear energy, hydroelectricity, and solar energy.<sup>138</sup> All of these sources eliminate greenhouse gas emissions and reduce their carbon footprint.<sup>139</sup> Wind-powered desalination is one of the most promising options.<sup>140</sup> One of Australia's main desalination plants, the

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<sup>129</sup> Veronica Rocha, *Water-Use Restrictions Take Effect in California; Daily Fines Possible*, L.A. TIMES (July 30, 2014), <http://www.latimes.com/local/lanow/la-me-ln-new-california-water-use-restrictions-20140729-story.html>.

<sup>130</sup> *Id.*

<sup>131</sup> *Id.*

<sup>132</sup> *Id.*

<sup>133</sup> *Id.*

<sup>134</sup> *Id.*

<sup>135</sup> Porter, *supra* note 14.

<sup>136</sup> *Id.*

<sup>137</sup> HEATHER COOLEY ET AL. PAC. INST. FOR STUDIES IN DEV., ENV'T & SECURITY, *DESALINATION, WITH A GRAIN OF SALT: A CALIFORNIA PERSPECTIVE* 41 (Ian Hart ed., 2006).

<sup>138</sup> Craig, *supra* note 2, at 251.

<sup>139</sup> *Id.*

<sup>140</sup> *Id.*

Kwinana Plant, runs on renewable energy.<sup>141</sup> The Canary Islands' plant "will use solar panels to provide the heat for evaporation in a distillation and condensation desalination plant."<sup>142</sup> There are many innovative ideas in the area of powering desalination plants.

Desalination is a realistic option that can supplement Southern California's and Mexico's water resources. It provides a drought-proof solution and can withstand sea level rise contamination. Learning to purify ocean water is necessary for survival and long-term resources. Desalination only recently became a viable option because of rising water costs and falling desalination costs, and can be implemented immediately.

### *A. Legal Background*

The legal attitude in the United States for smart water use has been a push and pull. On the one hand, there has been a call for continued research in desalination. On the other hand, there are a great many water laws that make efficient and smart water distribution exceedingly difficult. In 1996, Congress enacted the Water Desalination Act.<sup>143</sup> The Act authorized spending \$30 million over a six-year period to desalination research technology.<sup>144</sup> Congress appropriated another \$25 million to fund desalination demonstration projects.<sup>145</sup> Congress repeatedly renewed the Act since then.<sup>146</sup> After twenty years, however, few desalination plants actually exist in the country.

In October 2014, the Hamilton Project and Stanford Woods Institute for the Environment published a study that explored how the market should assist in mitigating the water shortages in the American West.<sup>147</sup> Transferring water rights is important, because a major part of California's water problems lies in overconsumption and over-allocation. If laws are in place to help farmers sell their excess water without hurting their business, then major conservation efforts could be made since farmers use the majority of the United States' water.<sup>148</sup>

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<sup>141</sup> *Id.* at 252.

<sup>142</sup> *Id.* at 253.

<sup>143</sup> Craig, *supra* note 2, at 235.

<sup>144</sup> *Id.*

<sup>145</sup> *Id.*

<sup>146</sup> *Id.*

<sup>147</sup> CULP ET AL., *supra* note 15.

<sup>148</sup> Porter, *supra* note 14.

Furthermore, there are arbitrary water allocations all over the state that are simply wasteful. The study suggested that on the surface, American water laws seem simple and make transfer of title deceptively easy, but the doctrines that run within the laws actually make it exceedingly difficult.<sup>149</sup> The study lists the appurtenancy doctrine, no-harm-to-juniors rule, anti-speculation doctrine, beneficial use doctrine, and salvaged water doctrine as severely complicating water rights transfers.<sup>150</sup> For example, the no-harm-to-juniors rule significantly increases transaction costs for water rights exchanges, which is an obvious disincentive.<sup>151</sup> Another example is the beneficial use doctrine, which creates incentives for water owners to use all of their water every year, regardless of efficiency or wastefulness, so as not to lose their water rights.<sup>152</sup>

The study puts forth a plan to solve these water rights issues, including: (1) reform legal rules that discourage water trading to enable short-term water transfers, (2) create basic market institutions to facilitate trading of water, (3) use risk mitigation strategies to enhance system reliability, (4) protect groundwater resources, and (5) continue and expand federal leadership.<sup>153</sup> These suggestions are ideal because they address the major weaknesses of the current water system. Furthermore, the suggestions should serve as a benchmark for water rights, so there might be a more easily navigable legal landscape for additional water resources in times of great need. Finally, another study suggests that because water and energy resources are so significantly connected, it makes sense that water and energy policy should be formed together, rather than independently.<sup>154</sup> The study asserts, “[t]hinking about water policy and energy policy together . . . may generate new and creative ways of thinking about both.”<sup>155</sup>

The law must create a more efficient, water-savvy system for water conservation needs. By implementing the previously stated goals, desalination will have a chance at being particularly effective and transporting water to the most drought-affected areas.

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<sup>149</sup> CULP ET AL., *supra* note 15, at 14.

<sup>150</sup> *Id.*

<sup>151</sup> *Id.*

<sup>152</sup> *Id.*

<sup>153</sup> *Id.* at 7.

<sup>154</sup> See Craig, *supra* note 2, at 227.

<sup>155</sup> *Id.* at 255.

### ***B. Desalination in California***

There are some desalination plants in California, but not enough to fully support the worst of this water crisis. Currently, the largest desalination plant to date in California is under construction and is set to open in 2016.<sup>156</sup> Located in Carlsbad, the plant will produce approximately 50 million gallons of fresh water a day, serving about seven percent of San Diego's freshwater needs.<sup>157</sup> The percentage is so low because desalination has not been widely supported as a practice in the United States

In terms of other desalination projects being discussed in California, "the Metropolitan Water District conducted preliminary studies for a large-scale facility in Dana Point."<sup>158</sup> Moreover, the San Diego Water Authority is considering Camp Pendleton as an additional location for a plant that could produce up to 150 million gallons a day, three times as much as the Carlsbad plant, which would account for twenty-one percent of San Diego's freshwater needs.<sup>159</sup> The same company that built the Carlsbad plant is also considering building one in Huntington Beach, which would produce another 50 million gallons a day.<sup>160</sup> Lastly, there have also been a number of Bay Area water districts are collaborating together on additional large-scale desalination projects.<sup>161</sup> These plants, although small in comparison to the demand, are significant steps towards dependable and more efficient water sourcing.

### ***C. Desalination in Mexico***

Like California, Mexico also has a crucial interest in desalination, particularly in light of the 2010 earthquake, which knocked out its Tijuana aqueduct for three weeks.<sup>162</sup> Accordingly, desalination would likely make water more accessible to the people of Mexico in cases of natural disaster. The largest desalination plant in Mexico today is in

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<sup>156</sup> Schwabach, *supra* note 105, at 300.

<sup>157</sup> *Id.*; Elliot Spagat, *Mexico's Newest Export to U.S. May be Water*, HUFFINGTON POST: HUFFPOST GREEN (San Diego) (Oct. 15, 2011, 12:24 PM ET), [http://www.huffingtonpost.com/2011/10/15/mexicos-newest-export-to-us-water\\_n\\_1012479.html](http://www.huffingtonpost.com/2011/10/15/mexicos-newest-export-to-us-water_n_1012479.html).

<sup>158</sup> Sloan, *supra* note 113, at 9.

<sup>159</sup> Spagat, *supra* note 157.

<sup>160</sup> *Id.*

<sup>161</sup> Sloan, *supra* note 113, at 10.

<sup>162</sup> Spagat, *supra* note 157.

Cabo San Lucas, Baja California and produces only 5 million gallons a day.<sup>163</sup>

Per Minute 242, the United States has desalinated water for Mexico since 1992 through the Yuma Desalinating Plant. Using ocean water as an additional source to help meet Mexico's water allocation would be practical, and additionally, may help maintain good international relations.

The question of whether the United States could produce enough desalinated water to meet the Treaty's rules is yet to be determined. However, considering that Mexico only received six percent of their allotment from the United States last year, any marginal improvement would be beneficial, especially considering how drought conditions show no promise of letting up.<sup>164</sup>

In fact, four major U.S. water districts began discussing building two desalination plants in Playas de Rosarito, Mexico, about fifteen miles south of San Diego.<sup>165</sup> The water districts are hoping to open the additional plants in the next few years.<sup>166</sup> The combined plants would desalinate 150 million gallons per day, which would supply water to 300,000 homes on both sides of the border.<sup>167</sup> The agreement would provide that the United States and Mexico equally share the combined plants' fresh water output, in exchange for permission to build the plants there.<sup>168</sup> Another idea being considered is allowing Mexico to keep the plants in exchange for surrendering a portion of their water rights in the Colorado River.<sup>169</sup> If the United States gave Mexico the two desalinations plants being considered, the plants would fulfill a small percentage of Mexico's yearly water allotment, which would be a good start.

Although there is quite a bit of resistance over the idea of giving up any water rights in the Colorado River,<sup>170</sup> the desalination plants would provide a far more reliable water source than Mexico's stake in rivers that are drying up.

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<sup>163</sup> *Id.*

<sup>164</sup> NICOLE T. CARTER, CLARE RIBANDO SEELKE & DANIEL T. SHEDD, CONG. RESEARCH SERV., R44312, U.S.-MEXICO WATER SHARING: BACKGROUND AND RECENT DEVELOPMENT 11 (2013).

<sup>165</sup> *Id.*

<sup>166</sup> *Id.*

<sup>167</sup> *Id.*

<sup>168</sup> *Id.*

<sup>169</sup> *Id.*

<sup>170</sup> *Id.*

Some have speculated that the U.S. water districts' motive behind this move was to avoid the many environmental restrictions in the United States.<sup>171</sup> If these criticisms are true, then the U.S. water districts' attempt is both smart and defective. On the one hand, the desalination plants will open sooner in Mexico, because the proposals will be met with less restrictions and regulations by Mexican law than they might in the United States. As the general manager of Otay Water District stated, "[t]he Mexicans will ask all the same questions that [Americans] ask here, but it's not endless lawsuits."<sup>172</sup>

On the other hand, these water districts are forfeiting an opportunity to improve U.S. law and policy by making it more desalination-friendly. In this time of water crisis, opening desalination plants must become more accessible and approached with less resistance so that fresh water production can keep up with demand.

The IBWC should consider the re-allocation issues arising from the 1944 Water Treaty by either making appropriate amendments or creating an entirely new agreement. IBWC Principal Engineer, Carlos Peña, suggests a redistribution of water allocations that are geographically closer to where the water is sent.<sup>173</sup> For example, the United States' water allocations in Lake Mead could be increased and, in return, Mexico's allocations in the Rio Grande River would increase respectively. The Treaty would also have to account for new desalination sources and consider how to allocate them so that neither country's water supply suffers.

### III IMPACT CONCERNS

Many scholars have reservations about the environmental impact of desalination. Little is known about the total potential impact, but some scholars are concerned for marine life. Fortunately, Australia reported that there has been no significant environmental impact from the

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<sup>171</sup> *Id.*

<sup>172</sup> *Id.*

<sup>173</sup> Interview with Carlos Peña, Principal Engineer, International Boundary and Water Commission, in L.A., Cal. (Oct. 29, 2014) (on file with author); *see also* [http://www.ibwc.state.gov/Files/Press\\_Release\\_110515.pdf](http://www.ibwc.state.gov/Files/Press_Release_110515.pdf) (No direct discussion of reallocation by geography, but implies that Mexico's indebtedness and requirement to make up deficiency is more cost-prohibitive than altering treaty rights to allocate water sources differently.).

Australia, Florida, or California desalination plants so far.<sup>174</sup> In the case of water, no matter where it is being taken from, be it the Colorado River or the Pacific Ocean, there will be negative environmental impacts. This is an unfortunate and unavoidable cost. The only thing that can be done is careful planning to minimize the negative environmental impact as much as possible, which has already been done in first world desalination plants.

Until now, the Colorado River Delta faced significant environmental disrepair because of dams that severely restricted water flow to that area. A number of species of marine life became endangered or were at risk of becoming endangered because of the lack of water in the area. The Delta is only one part of the Colorado River that has seen major negative impact due to drought and overconsumption.<sup>175</sup> Pictures of the Delta (as seen below) show how severely the drought and overallotment have affected the region.<sup>176</sup> Cost and energy sources of desalination are also areas of concern.



#### ***A. Positive Impact***

One proponent stated, “[t]he time now seems ripe for large-scale seawater desalination in California, but it is still by no means assured.”<sup>177</sup> The ideal and most obvious resolution of desalination is

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<sup>174</sup> Craig, *supra* note 2, at 242–43.

<sup>175</sup> Umoff, *supra* note 3, at 90.

<sup>176</sup> Joe Spring, *Galleries We Like: Peter McBride’s Colorado River*, OUTSIDE ONLINE (Mar. 28, 2011), <http://www.outsideonline.com/1807796/galleries-we-peter-mcbrides-colorado-river>.

<sup>177</sup> Sloan, *supra* note 113, at 8.

the promise of finally having enough water to meet the demand. Beyond this, water sources could continue to provide in times of drought and the uncertain future of rising sea levels. Put simply, desalination can help alleviate the pressure on other water resources in times of scarcity.

According to environmental interest groups, the insufficient water flowing in the Delta, because of damming, has contributed to 90 percent of the degradation of the wetlands.<sup>178</sup> The degradation of the Colorado River would be slowed if more weight was put behind ocean water as a significant water source. There is scholarly support for the idea that desalination could leave more water in rivers and help take better care of those environments.<sup>179</sup>

Issues with water can quickly escalate to bigger problems when more than one country is involved. Pushing desalination as a resource to help supply Mexico with water is also a great tool to encourage good international relations. Israel's increased desalination plants, for example, has left more water from the Jordan River for development for their Jordanian neighbors, which has helped improve relations within that region.<sup>180</sup>

Also of note is that use of desalinated water is not meant merely to add to California's water resources, but also to replace some of the allotment that California has been taking from the Colorado River. As long as desalination practices remains mindful of environmental impact, through careful research, strategic placing and planning, and use of renewable energy, desalination plants may be less detrimental than simply pulling fresh water from the already abused Colorado River.

### ***B. Negative Impact***

The primary concern of desalination, aside from financial costs, is the environmental cost. With desalination, entrainment, and brine discharge are the main issues that must be carefully monitored to deter major negative environmental impact. Entrainment is the process of physically pumping the water out of the ocean.<sup>181</sup> The fear arises from

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<sup>178</sup> CARTER ET AL., *supra* note 4, at 9.

<sup>179</sup> Lewis, *supra* note 8, at 952.

<sup>180</sup> Larson, *supra* note 97, at 770.

<sup>181</sup> Lewis, *supra* note 8, at 942.

the damage to marine life that may get caught in the currents of the pumping.<sup>182</sup> There are no statistics that establish just how detrimental entrainment has the potential of being.

Brine discharge is the biggest environmental concern. Brine is the remaining salt and impurities from the desalination process.<sup>183</sup> Throwing the brine back into the ocean can kill the marine life in that particular area.<sup>184</sup> There have been some suggestions as to what to do with the brine.<sup>185</sup> For example, the Tampa Bay Desalination Plant dilutes the brine with the co-located electric power plant's cooling water.<sup>186</sup> This process is considered a success so far, because no significant environmental impact has yet been found from that plant.<sup>187</sup>

Another possible solution suggested is to require desalination plant operators to build and operate waste disposal facilities. Another option would be to tax or fine waste discharges, such as through the sale of effluent permits at such a rate that it becomes cheaper for the polluters to eliminate the pollution.<sup>188</sup>

The second major issue would be the financial cost of energy use. Reverse osmosis as a treatment of ocean water "consumes about ten times as much energy as normal water supply processes."<sup>189</sup> Because there has not been much desalination in the United States, there has not been much innovation in the area of making it more energy efficient. However, supporters remain hopeful that if desalination becomes more widespread in the United States, innovators will discover novel solutions. Many renewable energy resources have shown much progress; existing desalination plants have tested these resources to see what would work best. For example, solar power can lower energy costs, and the pressure transfer systems can conserve energy by recycling pressure from the brine waste streams to drive ocean water through treatment membranes.<sup>190</sup>

Another idea to drive down cost is through strategy. By placing desalination plants near power plants or wastewater treatment plants,

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<sup>182</sup> *Id.*

<sup>183</sup> *Id.* at 938.

<sup>184</sup> *Id.*

<sup>185</sup> Craig, *supra* note 2, at 243.

<sup>186</sup> *Id.* at 424-43.

<sup>187</sup> *Id.* at 242.

<sup>188</sup> Schwabach, *supra* note 1, at 199.

<sup>189</sup> Craig, *supra* note 2, at 229.

<sup>190</sup> Larson, *supra* note 97, at 766.

both energy and waste treatment costs would be significantly decreased.<sup>191</sup>

Although there may be some negative impact from desalination, the positive outweighs the negative. Aaron Schwabach is a law professor that has published law review articles that are substantially cautious and wary of desalination. Yet, even he conceded: “Non-distillation methods require varying amounts of energy and expense, but so far none is cheap enough for large-scale use other than in severely water-stressed areas such as the Arabian Peninsula or southern California.”<sup>192</sup>

### CONCLUSION

With concerns of drought and overconsumption, as well as climate change's real threat of worsening conditions, the water crisis is looming over the heads of Californians and Mexicans. This is the time to implement desalination. The cost has finally lowered enough to become competitive with the unavoidable cost increase of Colorado River water. Desalination provides a solution that can withstand drought and sea level rise. With proper, mindful practices, desalinated water may be the answer to meeting our water needs. Some final sage advice: “[b]ased on the experience of current proposals, anyone hoping to draw water from the ocean would be smart to first bury their straws underground.”<sup>193</sup>

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<sup>191</sup> Craig, *supra* note 2, at 242–43.

<sup>192</sup> Schwabach, *supra* note 105, at 1.

<sup>193</sup> Sloan, *supra* note 113, at 10.

