CHAPTER 1

Scientific, Legal, and Ethical Foundations for Texas Water Law

Gabriel Eckstein[1] *and Amy Hardberger* [2]

I. Introduction to Water Law

§ 1.1 Introduction

Water law is the field of law concerned with the ownership, allocation, and use of water resources, both surface and subsurface. Although most closely related to property law, recent developments in other legal fields, especially in environmental law, have heavily influenced the interpretation, application, and development of water law. As a result, water law today encompasses a broad perspective and often considers individual and community rights, environmental issues, commerce and economics, and other societal and legal concerns.

Significantly, modern water law is an interdisciplinary practice. In light of the continuously expanding body of knowledge of the hydrologic cycle, groundwater flow, wetlands, and freshwater resources in general, the field has expanded to include scientific considerations related to the management, use, and allocation of water resources. It is now no longer enough merely to be versed in water law. Rather, a water lawyer today must understand technical concepts such as hydrostatic pressure and Darcy's law, flow regimes, drainage basins, ecosystems' needs, consumptive uses, and crop yields.

Ultimately, though, water law advances societal values and goals related to water management and conservation. It is a means for bridging the gap between the demand for water and the availability of the resource. And therein lies the challenge—learning to practice water law to better society as well as to ensure the client's interests.

Part I of this chapter provides an overview of the scientific, legal, and ethical foundations that are pertinent to Texas water law. Part II discusses the availability of water in Texas and beyond, and part III addresses the hydrologic cycle and its relevance to water law. Part IV covers some of the basic concepts of the science of water that are particularly significant for understanding and applying water law. Finally, parts V and VI discuss the value and ethic of water.

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CHAPTER 23

Water Conservation

Karen Guz[1]

I. Introduction

§ 23.1 The Importance of Water Conservation

The 2022 State Water Plan makes it clear that water conservation is considered critical for future Texas water security. Conservation strategies are recommended for over half of the water user groups in our state. Collectively, if the conservation strategies are implemented, conservation would make up 29 percent of water supply shortfalls by 2070. *See* Texas Water Development Board, *Water for Texas 2022* 2 (2022), www.twdb.texas.gov/waterplanning/swp/2022 [hereinafter 2022 State Water Plan]. The challenges outlined in the updated plan still include a fast-growing population, declining water supplies, and higher municipal water demand. Drought needs are again emphasized by estimating that the 2070 potential water shortfall of 3.1 million acre-feet per year may balloon to over 6.9 million acre-feet per year under drought conditions. *See* 2022 State Water Plan, at 3. The 2022 plan builds on the conservation emphasis in the 2017 State Water Plan which included capital costs associated with municipal water conservation projects for the first time. *See* Texas Water Development Board, *Water for Texas 2017* 3 (2017), www.twdb.texas.gov/waterplanning/swp/2017 [hereinafter 2017 State Water Plan]. See Chapter 22 of this book for a further discussion of drought and drought planning.

Urban sectors of Texas are particularly motivated to plan carefully and to include conservation as a strategy, because municipal demands are expected to increase by over 87 percent between 2020 and 2070. *See* 2022 State Water Plan, at 6. The city of Forth Worth received $76 million in state loans to replace meters in a project expected to yield 9,000 acre-feet per year. 2017 State Water Plan, at 110. A similar urgency was reflected in Region L, which recommended that all user groups with water needs in 2020 reduce their 2020 demand by 5 percent during drought. 2022 State Water Plan, at 41. Given the challenge faced by municipal water providers, it is not surprising that every regional plan includes municipal conservation as a strategy. *See* 2022 State Water Plan, at 106.

Agriculture is and will remain the largest water use sector in Texas. However, agricultural use is expected to shrink. By 2070, agriculture irrigation demand should drop from 9.4 million acre-feet per year to 7.6 million acre-feet per year. Improved irrigation efficiency, reduced groundwater availability, and transfer of water rights to urban sectors will all contribute to the trend of reduced agricultural water demands. *See* 2022 State Water Plan, at 6.

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CHAPTER 36

Economics of Water in Texas

Gabriel Collins[1]

§ 36.1 Introduction

Mark Twain once allegedly quipped that "whiskey is for drinking—water is for fighting." While the quote is undated, the latest he could have uttered it would have been in 1910, when Texas had only about an eighth of the population it does now, but already faced the pressing challenge of managing alternating droughts and floods. Harry Grant Potter, III, *History and Evolution of the Rule of Capture*, Texas Water Development Board, www.twdb.texas.gov/publications/reports/numbered_reports/doc/R361/1%20CH%20Potter.pdf; Matt Levin, *A Look at the Worst Floods in Texas History and How They Compare to Recent Rains*, *Houston Chronicle*, June 15, 2015, www.chron.com/news/houston-texas/article/A-look-at-the-worst-floods-in-Texas-history-and-6328844.php#photo-7626161. Fast forward more than a century and the Texas water space has profoundly evolved. On a standalone basis, the state would now be among the fifty largest countries in the world by population and its citizens' effort and industry have built an economy roughly the size of Canada's (ranking number nine on the global GDP list). The World Bank, *Gross Domestic Product* (2022), https://databankfiles.worldbank.org/public/ddpext_download/GDP.pdf.

Texas is the third-largest groundwater pumper in the United States, according to U.S. Geological Survey data. Cheryl A. Dieter et al., *Estimated Use of Water in the United States in 2015*, U.S. Geological Survey Circular 1441, at 20 (2018), https://pubs.usgs.gov/circ/1441/circ1441.pdf. Data from the United Nations Food and Agricultural Organization indicate that based on the 1997–2017 median extraction volume, Texas would be the world's eleventh largest groundwater pumper—extracting about 10 million acre-feet (AF) of water per year, or slightly less than what Turkey extracts and a bit more than what Argentina extracts. For perspective, one million AF of water would cover the entire city of Houston roughly knee-deep. Texas is also a large surface water user. Adding surface water to the mix takes the total statewide annual use to about 15 million AF per year—enough water to submerge Houston nearly thirty-seven feet deep and about five times more water than Hurricane Harvey dropped on Harris County in 2017. Harris County Flood Control District, *Hurricane Harvey*, www.hcfcd.org/About/Harris-Countys-Flooding-History/Hurricane-Harvey.

And that's just today. Texas is one of the fastest growing states in the country and could add 20 million people over the next fifty years to the 30 million who already live here, bringing an additional

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