TEXAS GROUNDWATER LAW IN THE TWENTY-FIRST CENTURY: A COMPENDIUM OF HISTORICAL APPROACHES, CURRENT PROBLEMS, AND FUTURE SOLUTIONS FOCUSING ON THE HIGH PLAINS AQUIFER AND THE PANHANDLE

I. INTRODUCTION

Groundwater law in Texas has a long and contentious history. It is also a history that stands apart from the rest of the Western states as well.[1] While other areas of Texas jurisprudence have evolved with changing societal and cultural values, as well as with expanding scientific knowledge, groundwater law in Texas has remained largely constant from the inception of the absolute ownership doctrine in England in the mid-1840s to the present-day enforcement of the "modern" rule of capture.[2]

This article does is not intended to necessarily break new ground in the long debated discourse on the state of groundwater law in Texas. It is meant, however, to chronicle and analyze the recent chain of events occurring in the Panhandle concerning private marketing of groundwater. Further, this article is intended as a compendium containing detailed discussion and application of the varied sources of data and analysis pertinent to this issue from the very oldest approaches[3] to the newest problems,[4] and from the most detailed scientific exploration[5] to the most sophisticated legal examination.[6] In short, this article is presented as an all-inclusive exposition concerning the legal ramifications and scientific implications relating to the history and present condition of the allocation of groundwater among the ever-demanding populace of Texas.

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1. Joe Nick Patoski, *T. Boone Pickens Wants to Sell You His Water*, TEX. MONTHLY, Aug. 2001, at 121.
2. Ronald Kaiser & Frank F. Skillern, *Deep Trouble: Options for Managing the Hidden Threat of Aquifer Depletion in Texas*, 32 TEX. TECH L. REV. 249, 263. (2001).
3. *See* discussion *infra* Part. V.B.2.
4. *See* discussion *infra* Part VI.A.
5. *See* discussion *infra* Parts II, III.
6. *See* discussion *infra* Part V.

II. GROUNDWATER HYDROLOGY

A. Characteristics and Associated Terminology of Aquifers in General

Before delving into a lengthy discussion of the legal ramifications and implications involving groundwater and its uses, one must explore the precise terminology used to define the resource central to this article.

Groundwater is commonly defined as "[s]ubsurface water from which wells and springs are fed."[7] More specifically, groundwater is "[w]ater in the subsoil or of a spring,"[8] or composed of "underground streams and percolating waters."[9] Groundwater is most commonly contained in aquifers, which are classified as "porous [waterbearing] geologic formation[s]."[10] The term "groundwater" is typically used to refer to water found below the water table,[11] which is characterized as "the highest elevation, at or below the surface of the earth, under which the ground is saturated with water."[12] As such, the top of the saturated zone is also termed the "top of the water table."[13]

There are several basic measurements of water commonly used when discussing aquifer yields.[14] These measurements are separated into two fundamental categories: flow and quantity.[15] Flow measurements are typically quantified in cubic feet per second (cfs),[16] gallons per minute (gpm),[17] million gallons per day (mgd),[18] or in billion gallons per day (bgd).[19] Quantity measurements are frequently gauged in acrefeet,[20] acrefeet per day (afd),[21] acrefeet per year (afy),[22] or in millions of acrefeet (maf).[23] One acrefoot is the amount of water it takes to saturate one acre of land[24] to a depth of one foot.[25]

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7. JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES 941 (3d ed. 2000).
8. BLACK'S LAW DICTIONARY 704 (6th ed. 1990).
9. Woodsum v. Township of Pemberton, 412 A.2d 1064, 1067 (N.J. Super. Ct. Law Div. 1980).
10. SAX ET AL., *supra* note 7, at 939.
11. *Id.* at 941.
12. *Id.* at 942.
13. Kaiser & Skillern, *supra* note 2, at 254.
14. SAX ET AL., *supra* note 7, at 17.
15. *Id.* at 17-18.
16. *Id.* at 18. One cfs is equal to 448.80 gallons per minute or 646,317 gallons per day. *Id.* at 19 tbl.1-6.
17. *Id.* at 18.
18. *Id.* One mgd is equal to 1.55 cfs. *Id.* at 19 tbl.1-6.
19. *Id.* at 18. One bgd is equal to 1550 cfs. *See id.* at 19 tbl.1-6.
20. *Id.* at 18. One acrefoot is equal to 325,851 gallons. *Id.* at 19 tbl.1-6.
21. *Id.* at 19 tbl.1-6. The term "acrefoot" is commonly interchangeable with an afd (325,851 gallons). *See id.*
22. *Id.* One afy is equivalent to 365 afds, or a total of 118,935,615 gallons. *See id.*
23. TEX. WATER DEV. BD., WATER FOR TEXAS: A CONSENSUS-BASED UPDATE TO THE STATE WATER PLAN 3-3 (1997). A million acre-feet is equivalent to 325,851,000,000 gallons, or almost 326 billion gallons. *See* SAX ET AL., *supra* note 7, at 19 tbl.1-6.
24. One acre of land is "[a]n area of land measuring 43,560 square feet." BLACK'S LAW DICTIONARY 24 (7th ed. 1999).
25. SAX ET AL., *supra* note 7, at 18.

To ensure consistency, conversion between different flow and quantity measurements is essential when dealing with differing water management entities between states or between counties.[26]

To better understand the practical scale of these measurements, consider that farmers typically apply between two to six afy for each acre of irrigated crop in production.[27] In addition, many municipal water planners estimate that one afy for every five persons in their area is required to support domestic, commercial, industrial, and public needs.[28]

Aquifers are described as "geological formations that store, transmit, and yield . . . water,"[29] or a combination of all three. The "water" contained inside of an aquifer is actually composed of tiny amounts of water, and sometimes air, bonded to the individual soil particles found in the layer of subsurface strata in which the aquifer lies.[30] Aquifers are sometimes replenished or recharged through the flow of underground or surface streams,[31] or more frequently, by water seepage from surface precipitation.[32] This seepage or infiltration typically occurs gradually, moving down the soil profile at only a few meters per year or less.[33] Prior to agricultural development, aquifers remained in a state of dynamic equilibrium;[34] the longterm natural discharge due to evapotranspiration[35] and seepage to outflowing springs and streams was always balanced by natural longterm recharge from precipitation and infiltration.[36] However, with the advent of more advanced groundwater irrigation in the 1940s (beyond windmills and diversion ditches),[37] aquifers

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26. 1 cfs is equivalent to 1.98 afd or 722.70 afy, and 1 mgd is equivalent to 3.07 afd or 1120 afy. *Id.* at 19 tbl.1-6.

27. *Id.* at 18. The exact amount of water applied varies greatly depending on production region, soil type, and crop selection. *Id.*

28. *Id.*

29. Kaiser & Skillern, *supra* note 2, at 254.

30. *Id.*

31. 3 ROBERT E. BECK, WATERS AND WATER RIGHTS § 18.02 (Michie 1991).

32. MICHAEL BARCELONA ET AL., HANDBOOK OF GROUNDWATER PROTECTION 73 (1988).

33. SAX ET AL., *supra* note 7, at 347.

34. J.F. DUGAN & D.A. COX, WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER—PREDEVELOPMENT TO 1993 11 (U.S. Geological Survey, Water Res. Investigations Rep. 94-4157, 1994); *see also* EDWIN D. GUTENTAG ET AL., REGIONAL AQUIFER-SYSTEM ANALYSIS OF THE HIGH PLAINS AQUIFER IN PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING—GEOHYDROLOGY 28 (U.S. Geological Survey, Professional Paper 1400-B, 1984). Dynamic equilibrium is defined as "a state of balance between continuing processes." THE NEW SHORTER OXFORD ENGLISH DICTIONARY 770 (4th ed. 1993) [hereinafter DICTIONARY].

35. DUGAN & COX, *supra* note 34, at 11. *See* DICTIONARY, *supra* note 34, at 864 (defining evaportranspiration as "[t]he loss of water from the land to the atmosphere by evaporation from the soil and transpiration from plants"). Transpiration is described as "the loss of water from the plant in the form of water vapor." WILLIAM G. HOPKINS, INTRODUCTION TO PLANT PHYSIOLOGY 38 (2d ed. 1999).

36. DUGAN & COX, *supra* note 34, at 11.

37. *See* DAVID W. LITKE, HISTORICAL WATER-QUALITY DATA FOR THE HIGH PLAINS REGIONAL GROUND-WATER STUDY AREA IN COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, 1930-1998 2 (U.S. Geological Survey, Water-Res. Investigations Rep. 00-4254, 2000) (citing V.L. MCGUIRE AND J.B. SHARPE, WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER—PREDEVELOPMENT TO 1995, sheet 1 (U.S. Geological Survey Water-Res. Investigations Rep.

are now primarily depleted by surface pumping,[38] with the pumped groundwater being used for municipal, manufacturing, or irrigation purposes.[39]

There are two significant distinctions when referring to aquifers—confined and unconfined.[40] Confined aquifers are ones in which the water contained inside is pressurized, and therefore flows to the surface.[41] Unconfined aquifers are ones in which the water contained therein is not pressurized, and must be pumped in order to bring it to the surface.[42]

Groundwater itself is typically divided into two hydrological zones—unsaturated and saturated.[43] The unsaturated zone refers to areas found inside of aquifers where the spaces between the soil particles contain both air and water,[44] creating minute but very strong capillary forces[45] of adhesion between the water and soil particles,[46] and cohesion among the individual water molecules themselves.[47] These increased capillary forces, created by the unusual characteristics that result from water's unique molecular structure and concomitant hydrogen bonding capabilities,[48] make the pumping or extraction of the water contained in these zones impractical and nearly impossible.[49] Conversely, the saturated zone refers to an area within the aquifer where the spaces between soil particles are filled entirely with water, thereby reducing the capillary forces and enabling that water to be pumped freely.[50]

Although hydrologically indistinguishable, groundwater and surface water are litigated and regulated as distinct and separate entities under the varying legal and property theories used in the United States.[51]

The interactions between groundwater and surface water flowing in streams, creeks, or rivers are divided into two categories as follows: (1) gaining streams, and (2) losing streams.[52] In gaining streams, the water table is at roughly the same elevation or higher than the water level flowing in the

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97-4081, 1987); *see also* GUTENTAG ET AL., *supra* note 34 at 40.

38. Benjamin R. Vance, *Total Aquifer Management: A New Approach to Groundwater Protection*, 30 U.S.F. L. REV. 803, 804 (1996).

39. *See* discussion *infra* Part III.A.

40. *See* BARCELONA, *supra* note 32, at 73.

41. *Id.* Confined aquifers are those into which an artesian well is drilled. *See id.*

42. *See id.*

43. WILLIAM M. ALLEY ET AL., SUSTAINABILITY OF GROUND-WATER RESOURCES 7 (U.S. Geological Survey Circular 1186, 1999).

44. *See* BARCELONA, *supra* note 32, at 73. Most often, these spaces contain more air than water. *Id.*

45. Kaiser & Skillern, *supra* note 2, at 254.

46. *See* HOPKINS, *supra* note 35, at 27.

47. *Id.*

48. *Id.*

49. ALLEY, *supra* note 43, at 7.

50. Kaiser & Skillern, *supra* note 2, at 254.

51. SAX ET AL., *supra* note 7, at 349.

52. *Id.*

stream itself.[53] These streams gain water through the inflow of groundwater from an underlying, shallow aquifer.[54] A losing stream loses water through its streambed to an underlying, shallow aquifer.[55] In losing streams, the water table of the shallow aquifer is typically lower than the water level of the stream.[56] Losing streams, unlike gaining ones, can be either connected to the underlying aquifer by a zone of saturation, or disconnected by an unsaturated zone.[57] Most streams are actually both gaining and losing, whereby the stream is gaining in some reaches and losing in others.[58] See Figure II-1 below for gaining, losing, and disconnected stream schematics.

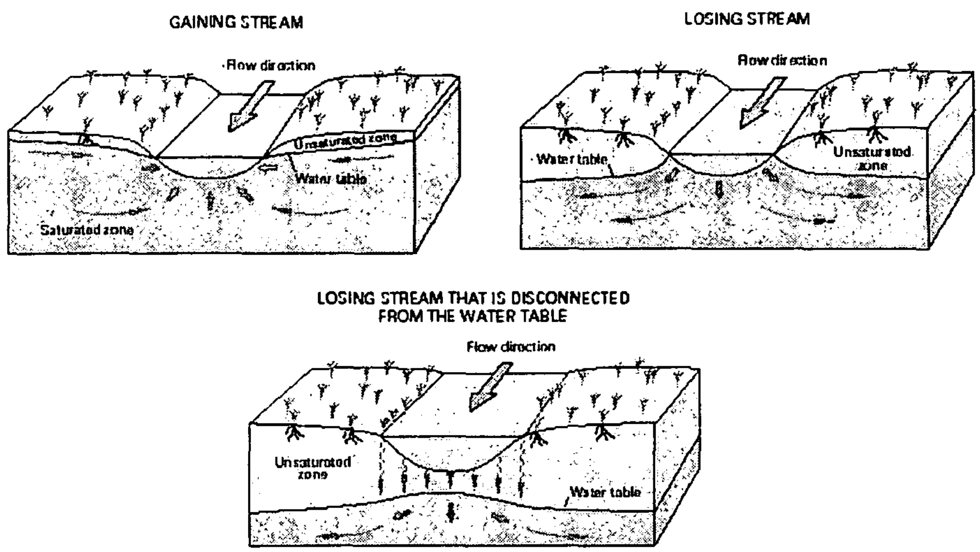

Figure II-1. Gaining, losing, and disconnected stream schematics. THOMAS C. WINTER ET AL., GROUND WATER AND SURFACE WATER—A SINGLE RESOURCE 9-10 (U.S. Geological Survey Circular 1139, 1998).

B. The Ogallala Aquifer

Named after the Ogallala Formation[59] in which the majority of the aquifer is encapsulated,[60] the High Plains Aquifer (HPA) is better known as

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53. *Id.*
54. *Id.*
55. *Id.*
56. *Id.*
57. *Id.* at 349–50.
58. *Id.* at 349.
59. LITKE, *supra* note 37, at 4. The Ogallala Formation consists of unconsolidated beds of silt, clay, and caliche alternated with beds of sand and gravel. *Id.* at 4; *see also* PANHANDLE GROUNDWATER CONSERVATION DISTRICT, PANHANDLE GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN 6 (1998) [hereinafter DIST. MGMT. PLAN]. The Ogallala formation dates back to some point between the Tertiary Epoch, some 65 million years ago, and the Pleistocene Age, some 1.80 million years ago. LITKE, *supra* note 37, at 4; *see also* Geologic Time Scale Discussion, *at* http://www.ucmp.berkeley.edu/help/timeform.html (last visited June 4, 2003).
60. Kaiser & Skillern, *supra* note 2, at 300.

the Ogallala Aquifer to most who depend on it for their municipal and irrigation needs.[61] The various hydrogeologic units present throughout the extent of the HPA are illustrated in Figure II-2. The zone of saturation within the HPA ranges from little more than a few feet to over twelve hundred feet thick[62] among depths of one hundred to three hundred feet.[63] The saturated thickness of the HPA in 1980 is shown in Figure II-3, and the depth to water in 1997 is shown in Figure II-4.

The HPA is the largest contiguous aquifer in the lower forty-eight states, underlying 174,050 square miles and portions of eight states.[64] The geographic extent of the HPA is shown in Figure II-5, and the major aquifers in Texas are illustrated in Figure II-6. The HPA underlies forty-nine counties in the Texas Panhandle as well.[65] Estimated water use throughout the entire HPA during 1995 averaged 1955 mgd.[66] The HPA provides water for twenty-seven percent of the Nation's irrigated crop production annually[67] and provides over ninety percent of the total water supplied to the Great Plains region as a whole.[68] Additionally, it is the source for the majority of the annual irrigated crop production in Texas.[69] Refer to Figure II-9 depicting the percent of Texas groundwater use by county in 1999.

1. Characteristics of the Overlying Land Area

The Great Plains lie between the Rocky Mountains on the western boundary and the Central Lowlands on the eastern boundary.[70] The High Plains are situated in the higher elevations of the Great Plains, ranging in elevation from seventy-eight hundred feet on the west to eleven hundred feet

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61. LITKE, *supra*, note 37, at 4. Dependence on the HPA has been a constant for settlers in the Great Plains since colonization began in the 1890s. W.D. JOHNSON, THE HIGH PLAINS AND THEIR UTILIZATION 682-83 (U.S. Geological Survey Annual Rep., vol. 21, pt. IV, 1900).

62. JOHN B. WEEKS & EDWIN D. GUTENTAG, SATURATED THICKNESS OF HIGH PLAINS AQUIFER—1980, sheet 2(U.S. Geological Survey, Hydrologic Investigations Atlas HA-648, 1980).

63. Kaiser & Skillern, *supra* note 2, at 300. Water stored in the HPA gradually flows through the formation towards the southeastern escarpment of the High Plains. *Id.*

64. *See* DUGAN & COX, *supra* note 34, at 4.

65. Figure II-7 displays the forty-nine counties underneath which the HPA lies.

66. *See* LITKE, *supra* note 37, at 6 tbl.1. This 1955 mgd is equivalent to 5999.90 afd or 2,189,961.68 afy. *See* SAX ET AL., *supra* note 7, at 19 tbl.1-6.

67. LITKE, *supra* note 37, at 1. This amount of water is equivalent to almost sixteen mgd. *Id.* at 6 tbl.1. This 15,640 mgd is equal to 47,999.16 afd or 17,519,693.40 afy. *See* SAX ET AL., *supra* note 7, at 19 tbl.1-6; *see also* RICHARD R. LUCKEY & MARK F. BECKER, ESTIMATED PREDEVELOPMENT DISCHARGE TO STREAMS FROM THE HIGH PLAINS AQUIFER IN NORTHWESTERN OKLAHOMA, SOUTHEASTERN COLORADO, SOUTHWESTERN KANSAS, AND NORTHWESTERN TEXAS 2 (U.S. Geological Survey, Water Res. Investigations Rep. 99-4104, 1999).

68. See Figure II-8 illustrating the percentage of land irrigated in the HPA during 1980. Patrick E. Corbett, *The Overlooked Farm Crisis: Our Rapidly Depleting Water Supply*, 61 NOTRE DAME L. REV. 454, 454 n.6 (1986) (describing the Great Plains region as encompassing portions of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming).

69. Kaiser & Skillern, *supra* note 2, at 250.

70. LITKE, *supra* note 37, at 2.

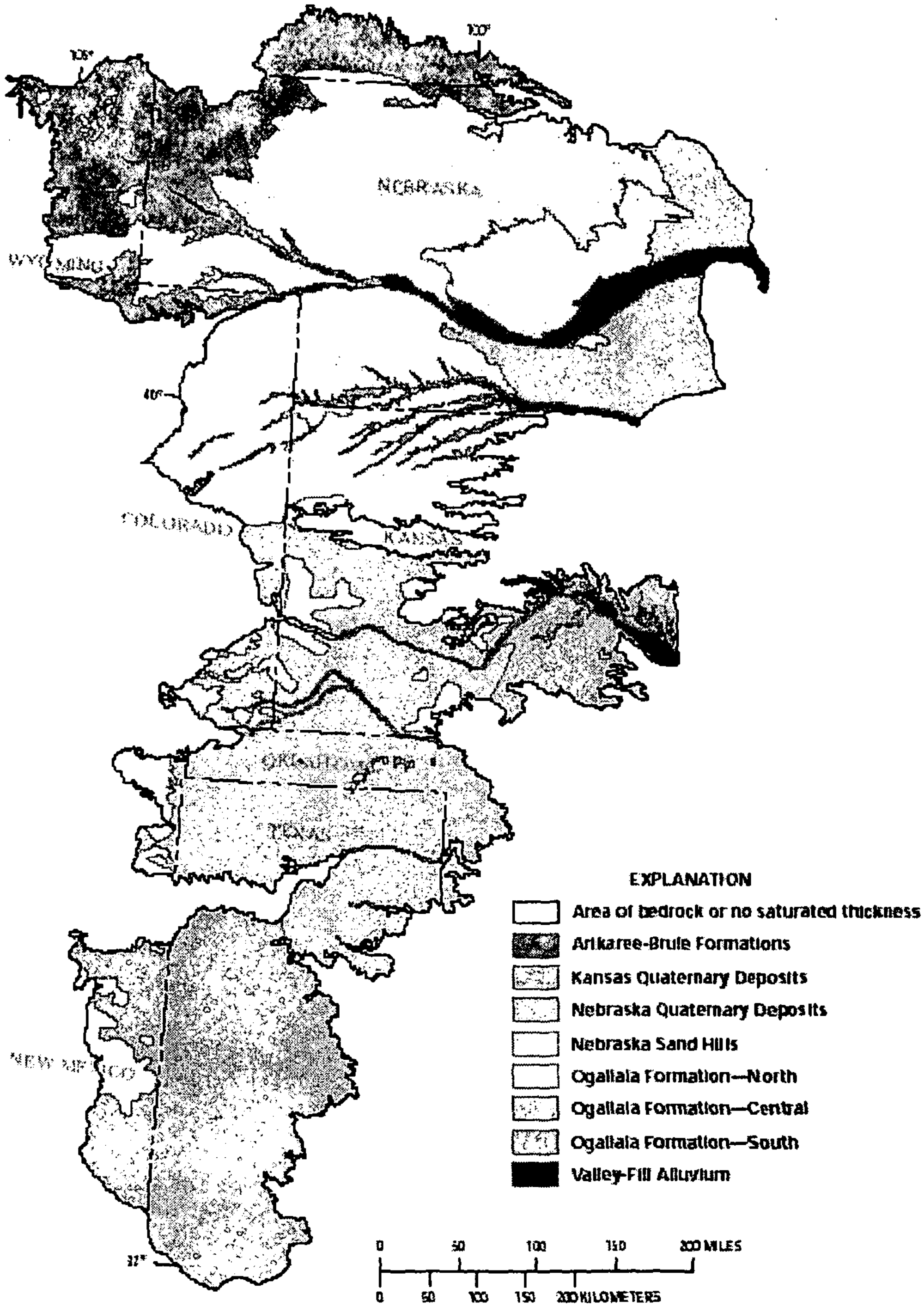

Figure II-2. Hydrogeologic units that comprise the HPA. DAVID W. LITKE, HISTORICAL WATER-QUALITY DATA FOR THE HIGH PLAINS REGIONAL GROUND-WATER STUDY AREA IN COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, 1930-1998 5 (U.S. Geological Survey, Water-Res. Investigations Rep. 00-4254, 2000).

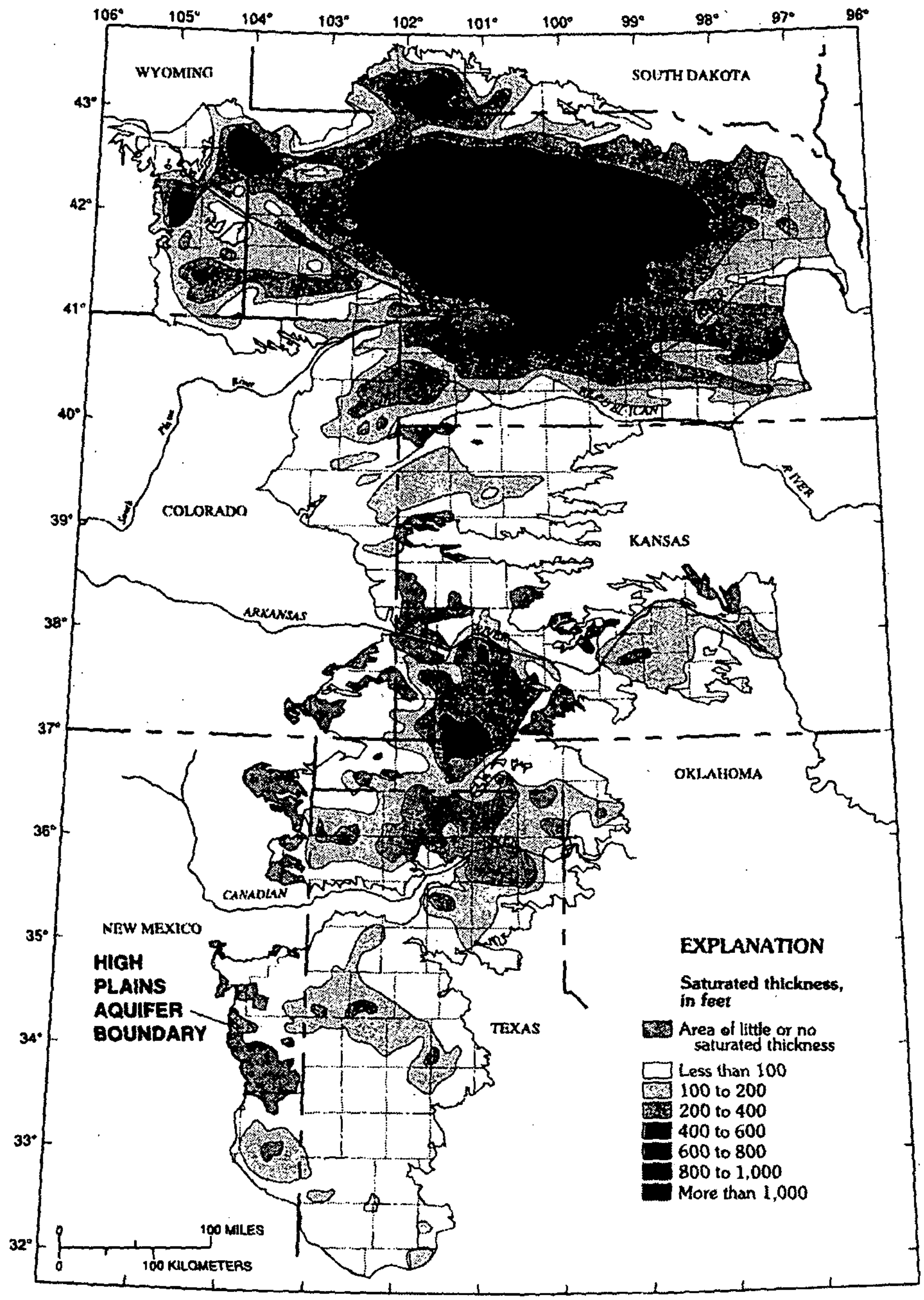

Figure II-3. Saturated thickness throughout the HPA in 1980. J.F. DUGAN & D.A. COX, WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER—PREDEVELOPMENT TO *1993 21* (U.S. Geological Survey, Water-Res. Investigations Rep. 94-4157, 1994).

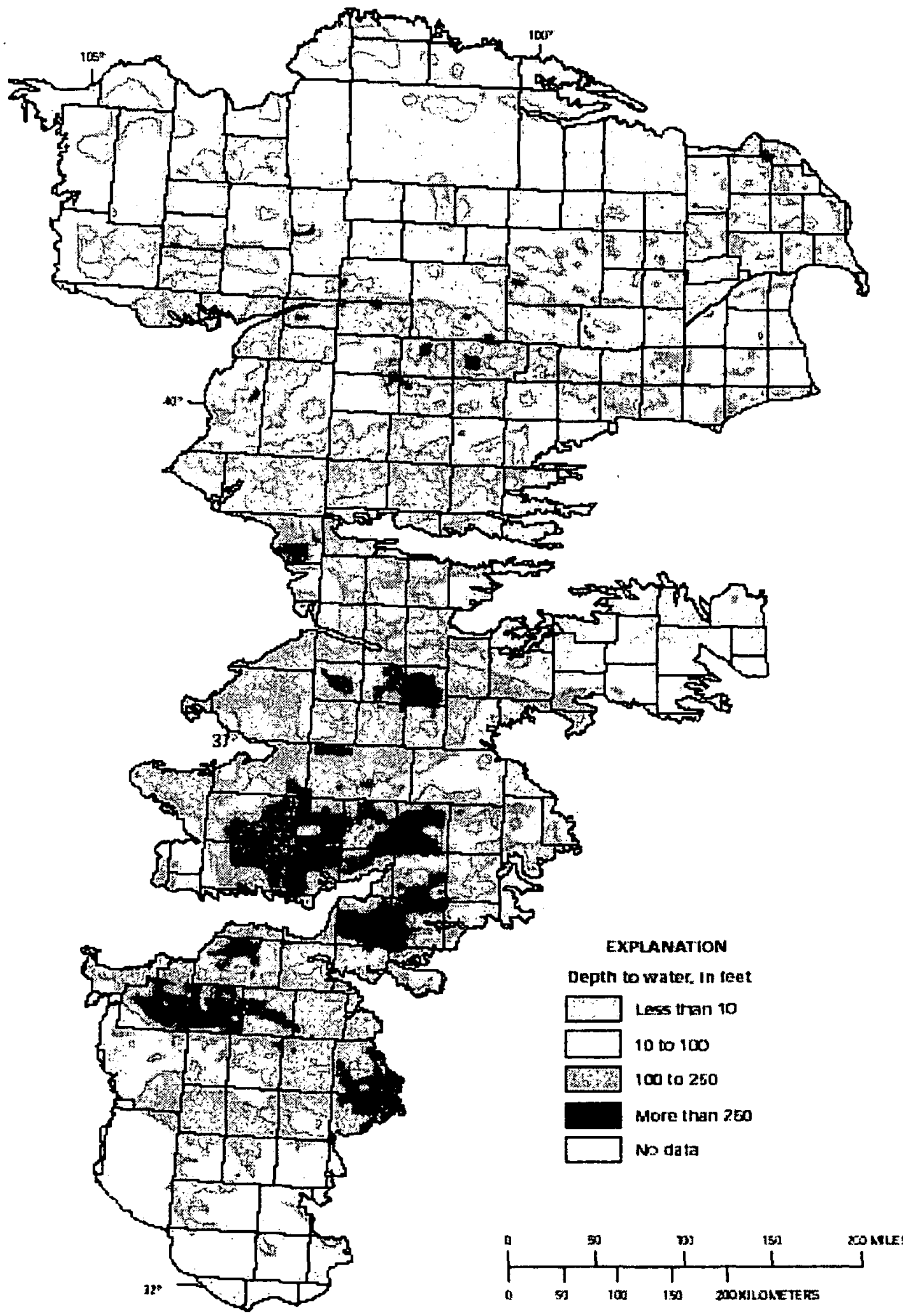

Figure II-4. Depth to water throughout the HPA in 1997. DAVID W. LITKE, HISTORICAL WATER-QUALITY DATA FOR THE HIGH PLAINS REGIONAL GROUND-WATER STUDY AREA IN COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, 1930-1998 17 (U.S. Geological Survey, Water-Res. Investigations Rep. 00-4254, 2000).

on the east.[71] The southeastern boundary of the High Plains is delineated by an escarpment formed by the exposed caprock of the Ogallala Formation.[72]

The topographic relief throughout most of the High Plains is less than three hundred feet, making the general appearance of this region gently sloping and relatively smooth,[73] broken only by rivers, creeks, and playa lakes.[74]

The climate in the High Plains is arid to semi-arid,[75] with annual precipitation amounts ranging from sixteen inches in the west to twenty-eight inches in the east,[76] and from sixteen inches in the south to twenty inches in the north.[77] Most of this precipitation falls in the form of rain during May and September.[78] These annual rainfall amounts are three to six times less than the annual, mean evaporation rate of seventy-two to eighty-one inches.[79] The mean minimum temperatures (usually recorded in January) reach 21°F in the north and 28°F in the south, while the average maximum temperatures (usually recorded in July) in the north hover around 93°F and 95°F in the south.[80]

Because the relative topography of the High Plains is generally flat, any precipitation that falls tends not to form actual surface streamflow.[81] Instead, most precipitation is captured in the region's playa lakes,[82] which are ephemeral and range in depth from a few feet to over fifty feet, and from a few hundred feet to a mile or more in diameter.[83] Rivers that flow through this region[84] derive most of their water from the outflow of the Rocky Mountains.[85]

The soils that predominate in the region are mostly red, gray, and black clays, sandy loams, and sands.[86] Soils found in the northern reaches of the High Plains are mainly clays and clay loams, while the soils in the south tend

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71. Refer to Figure II-5 illustrating the overlying land elevation of the HPA. *Id.* at 2-4.

72. *Id.* at 4.

73. *Id.*

74. JANIE HOPKINS, WATER QUALITY EVALUATION OF THE OGALLALA AQUIFER, TEXAS 1 (Tex. Water Dev. Bd., Report 342, 1993) [hereinafter Rep. 342].

75. *Id.*; *see also* LITKE, *supra* note 37, at 4.

76. LITKE, *supra* note 37, at 4.

77. Rep. 342, *supra* note 74, at 1.

78. *Id.*

79. THOMAS J. LARKIN & GEORGE W. BOMAR, CLIMATIC ATLAS OF TEXAS 66 (Tex. Dep't of Water Res. Rep. LP-192, 1983).

80. Rep. 342, *supra* note 74, at 1.

81. LITKE, *supra* note 37, at 4.

82. Approximately 20,000 playa lakes are located in the Panhandle of Texas alone. TEX. WATER DEV. BD., WATER FOR TEXAS—2002 84 (2002) [hereinafter WATER FOR TEXAS—2002].

83. Rep. 342, *supra* note 74, at 1 (citing RONIT NATIV & GAY NELL GUTIERREZ, HYDROGEOLOGY AND HYDROCHEMISTRY OF CRETACEOUS AQUIFERS, TEXAS PANHANDLE AND E. NEW MEXICO 1 (Univ. of Tex. at Austin, Bureau of Econ. Geology Geological Circular 88-3, 1988)).

84. The rivers are the Brazos, Canadian, Colorado, and Red. Rep. 342, *supra* note 74, at 1.

85. LITKE, *supra* note 37, at 4.

86. Rep. 342, *supra* note 74, at 1.

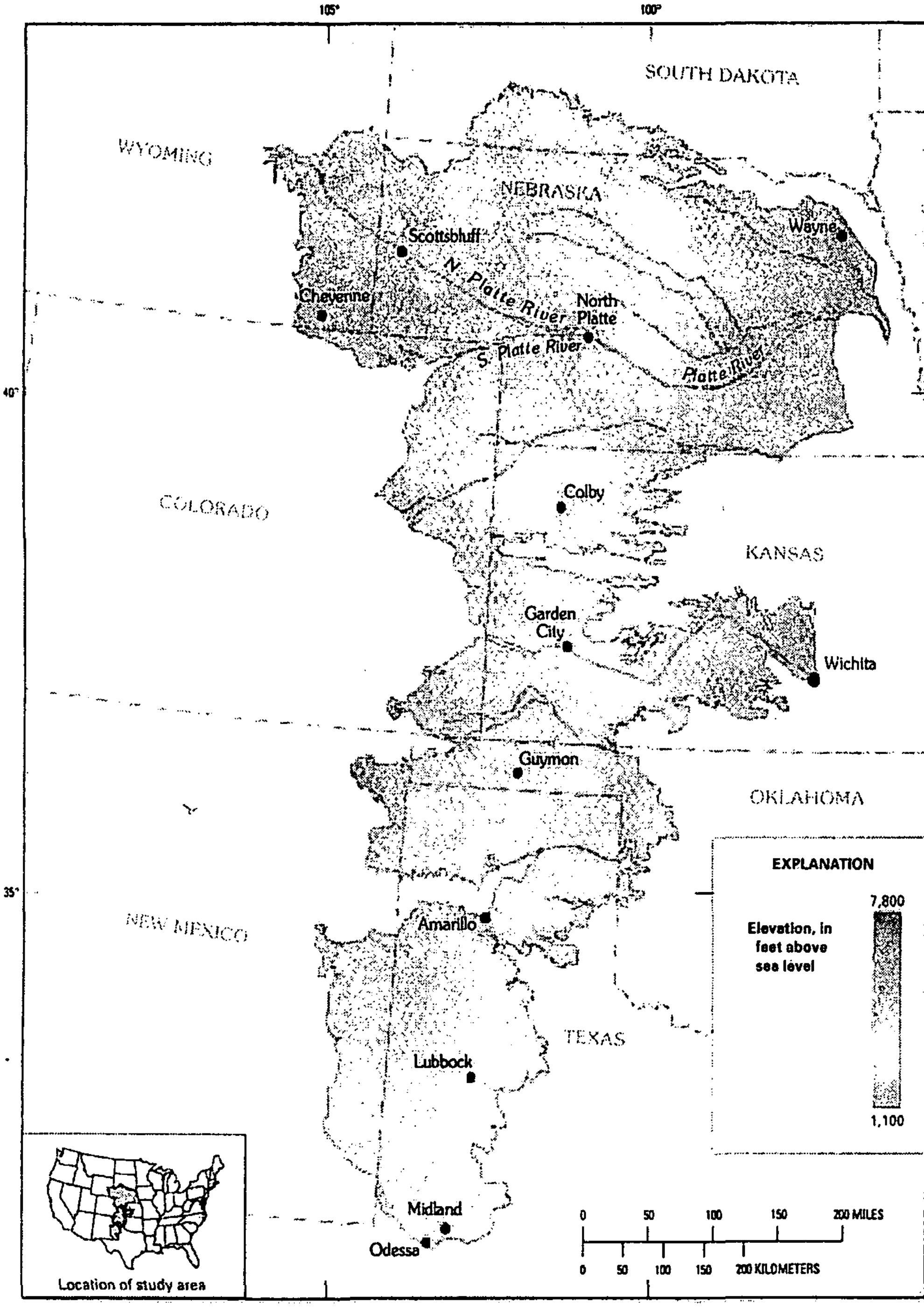

Figure II-5. **Geographic extent and overlying surface area elevation of the HPA. DAVID W. LITKE, HISTORICAL WATER-QUALITY DATA FOR THE HIGH PLAINS REGIONAL GROUND-WATER STUDY AREA IN COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, 1930–1998 3 (U.S. Geological Survey, Water-Res. Investigations Rep. 00-4254, 2000).**

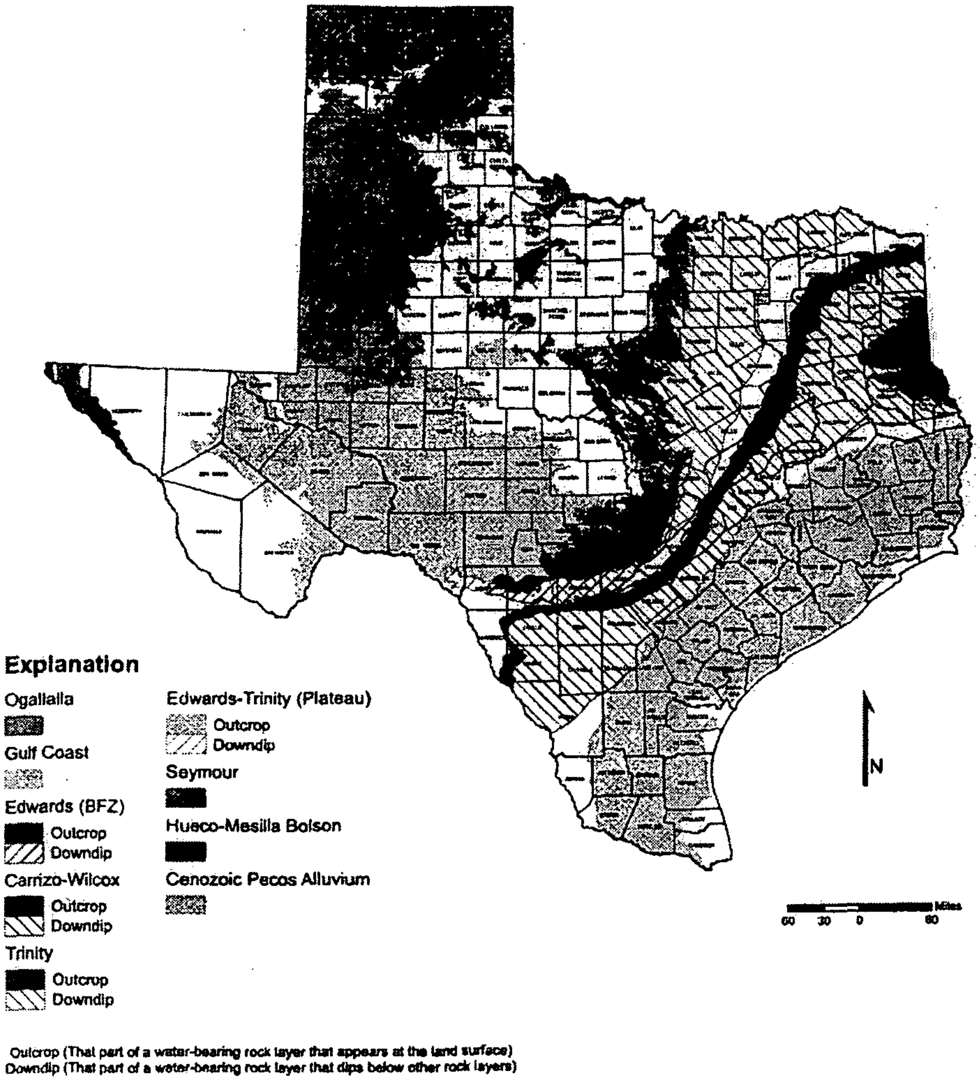

Figure II-6. The major aquifers of Texas. TEX. WATER DEV. BD., WATER FOR TEXAS—2002 40 (2002).

to be more dominated by sandy loams.[87]

The vegetation exhibited by the High Plains is mainly shortgrass prairie,[88] typified by a grama-buffalo grass complex.[89] This vegetative complex consists of: (1) blue grama and Buffalo grass growing on the clay and clay loam soils, (2) Indiangrass, Little bluestem, sand reedgrass, switchgrass, and western wheatgrass typifying the sandy loam soils;[90] and (3)

87. *Id.* (citing NATIV & GUTIERREZ, *supra* note 83, at 1).
88. Rep. 342, *supra* note 74, at 1. About one-half of the region is grassland. *Id.*
89. LITKE, *supra* note 37, at 4.
90. Rep. 342, *supra* note 74, at 1.

mesquite, sand sagebrush, shinnery oak, and yucca invading on all soil types.[91]

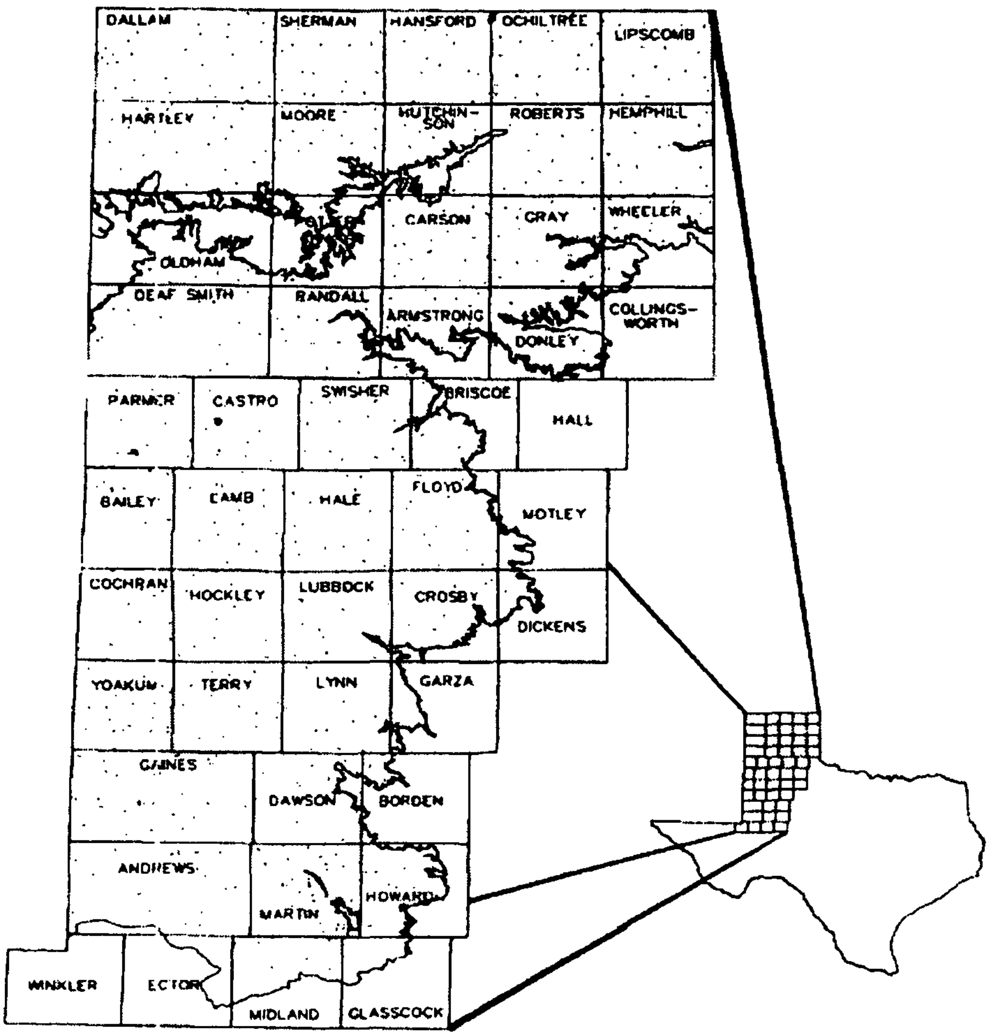

Figure II-7. The forty-nine counties overlying the HPA in Texas. JANIE HOPKINS, WATER QUALITY EVALUATION OF THE OGALLALA AQUIFER, TEXAS 2 (Tex. Water Dev. Bd., Report 342, 1993).

2. *Comparison of Historical and Present-Day Characteristics of the HPA*

Before development of the HPA began in the 1940s, the variations in the mean water level were relatively small and dynamic in equilibrium.[92] The approximate volume of drainable water in the aquifer around the turn of the century was equivalent to a mass of water thirty feet deep across the entire

91. *Id.*

92. LITKE, *supra* note 37, at 4.

174,000 square mile extent of the aquifer,[93] beginning at an average depth of almost seventy-five feet.[94] Annual recharge to the aquifer came primarily in the form of precipitation, providing 0.60 inches of replenishment per year.[95]

Subsequent to development, the mean amount of water pumped from the HPA rose to approximately two to two and one half inches annually,[96] with as much as 0.20 to 0.25 inches of that withdrawal returning to the aquifer each year.[97] The average cumulative volume of water removed from the aquifer since the 1940s amounts to between two and six feet, or between seven and twenty percent of the original water volume.[98] By 1980, the pre-development volume of groundwater stored in the HPA declined by twenty-three percent in Texas, sixteen percent in New Mexico, eight percent in Kansas, and a lesser amount in other states overlying the HPA.[99] See Figure II-10 for the water table change observed in the HPA from the 1940s to 1980. In 1980, there was about 3.25 billion acrefeet of accessible water remaining stored in the HPA, with approximately sixty-six percent of that total lying underneath Nebraska and twelve percent underlying Texas.[100]

There is some evidence that while withdrawal from the aquifer has increased, annual recharge has also increased due to the removal of native vegetative groundcover[101] in favor of agricultural row crops.[102] This situation is exemplified in Oklahoma where estimated recharge to the HPA is nearly three times as large as it was prior to development of the HPA.[103] On average, the HPA recharges only about forty percent of the approximate 2 to 2.50 inch yearly loss due to pumping, around 0.80 to 0.85 inches annually.[104]

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93. *Id.* (citing GUTENTAG ET AL., *supra* note 34 at 58).

94. *See* LITKE, *supra* note 37, at 6 tbl.1.

95. *Id.* (citing J.B. WEEKS ET AL., SUMMARY OF THE HIGH PLAINS REGIONAL AQUIFER-SYSTEM ANALYSIS OF THE HIGH PLAINS AQUIFER IN PARTS OF COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, A5 (U.S. Geological Survey, Professional Paper 1400-A, 1988)).

96. LITKE, *supra* note 37, at 4; *see* DUGAN & COX, *supra* note 34, at 1.

97. LITKE, *supra* note 37, at 4 (citing J.T. DUGAN & R.B. ZELT, SIMULATION AND ANALYSIS OF SOIL-WATER CONDITIONS IN THE GREAT PLAINS AND ADJACENT AREAS, CENTRAL UNITED STATES, 1951-80 54 fig. 37 (U.S. Geological Survey, Water-Supply Paper 2427, 2000).

98. LITKE, *supra* note 37, at 4 (citing DUGAN & COX, *supra* note 34, at 1).

99. JOHN B. WEEKS & REN JEN SUN, REGIONAL AQUIFER-SYSTEM ANALYSIS PROGRAM OF THE U.S. GEOLOGICAL SURVEY BIBLIOGRAPHY, 1978-1986 11 (U.S. Geological Survey, Water-Res. Investigations Rep. 87-4138, 1987).

100. *Id.* at 10.

101. *See* discussion *infra* Part II.B.1.

102. LITKE, *supra* note 37, at 4.

103. *Id.* (citing RICHARD R. LUCKEY & MARK F. BECKER, HYDROGEOLOGY, WATER USE, AND SIMULATION OF FLOW IN THE HIGH PLAINS AQUIFER IN N.W. OKLAHOMA, S.E. COLORADO, S.W. KANSAS, N.E. NEW MEXICO, AND N.W. TEXAS 45 (U.S. Geological Survey, Water Res. Investigations Rep. 99-4104, 1999)).

104. LITKE, *supra* note 37, at 4 (*citing* WEEKS & SUN, *supra* note 99 at 11, DUGAN & ZELT, *supra* note 97, at 54 fig. 37) (combining the 0.60 inches of natural recharge with the estimated 0.20 to 0.25 inches of return seepage).

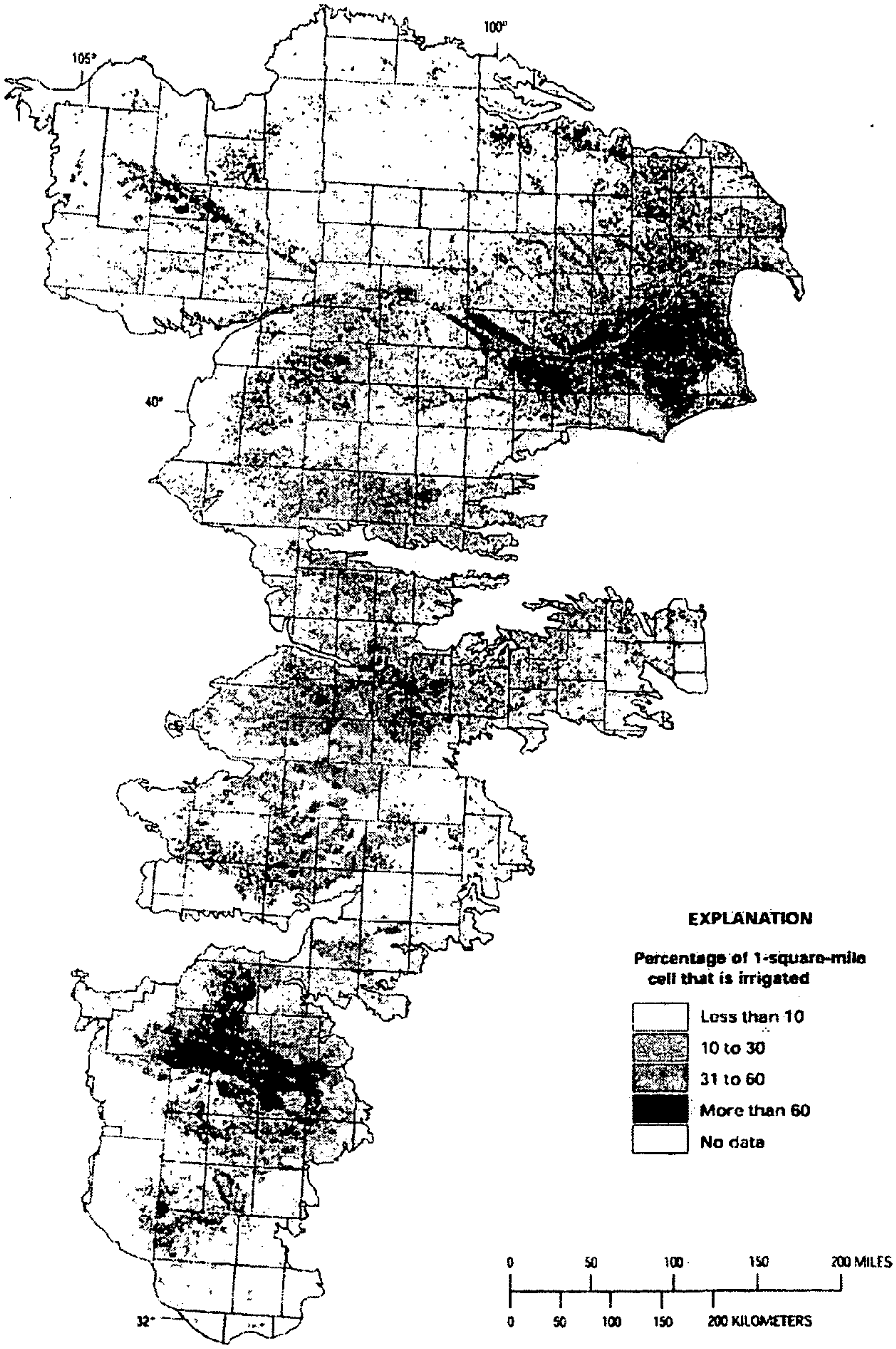

Figure II-8. Percentage of irrigation in the HPA during 1980. DAVID W. LITKE, HISTORICAL WATER-QUALITY DATA FOR THE HIGH PLAINS REGIONAL GROUND-WATER STUDY AREA IN COLORADO, KANSAS, NEBRASKA, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING, 1930-1998 19 (U.S. Geological Survey, Water-Res. Investigations Rep. 00-4254, 2000).

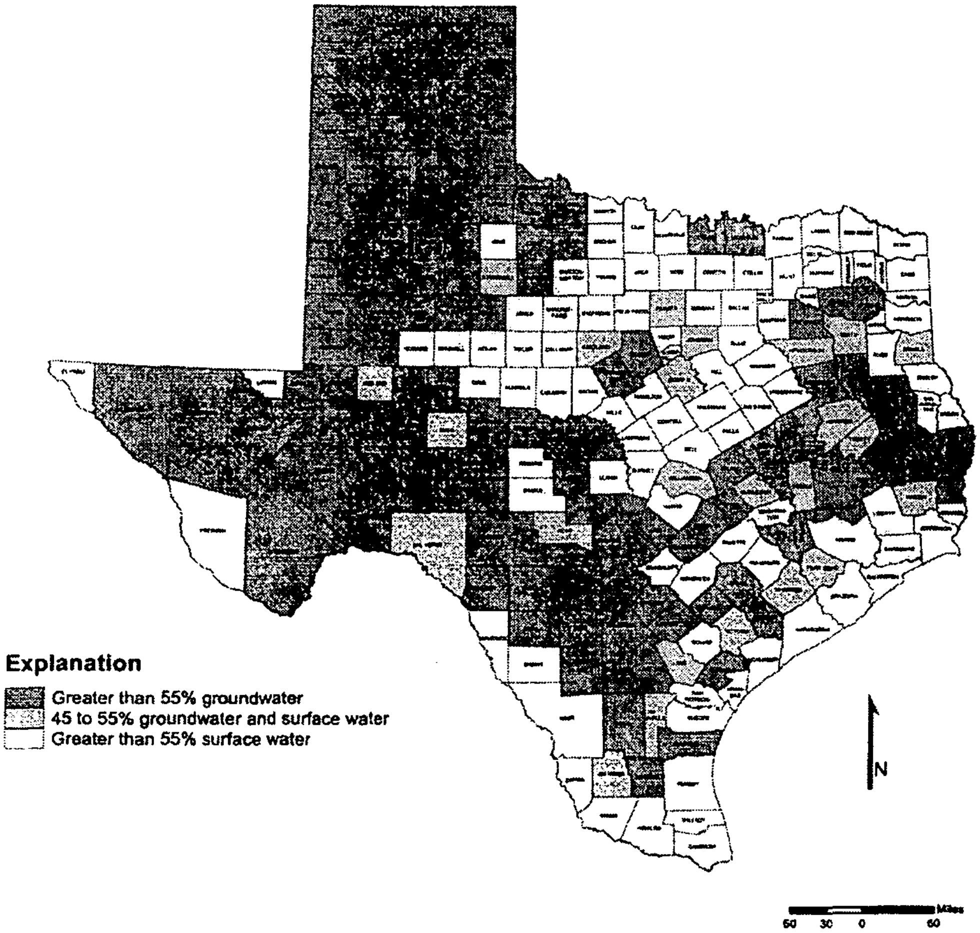

Figure II-9. Percentage of groundwater use by county in Texas during 1999. TEX. WATER DEV. BD., WATER FOR TEXAS—2002 39 (2002).

III. GROUNDWATER USES & EFFECTS

A. Uses

As mentioned in Part II.B of this comment, agricultural irrigation constitutes nearly eighty percent of the annual amount of groundwater pumped in Texas.[105]

105. Kaiser & Skillern, *supra* note 2, at 250.

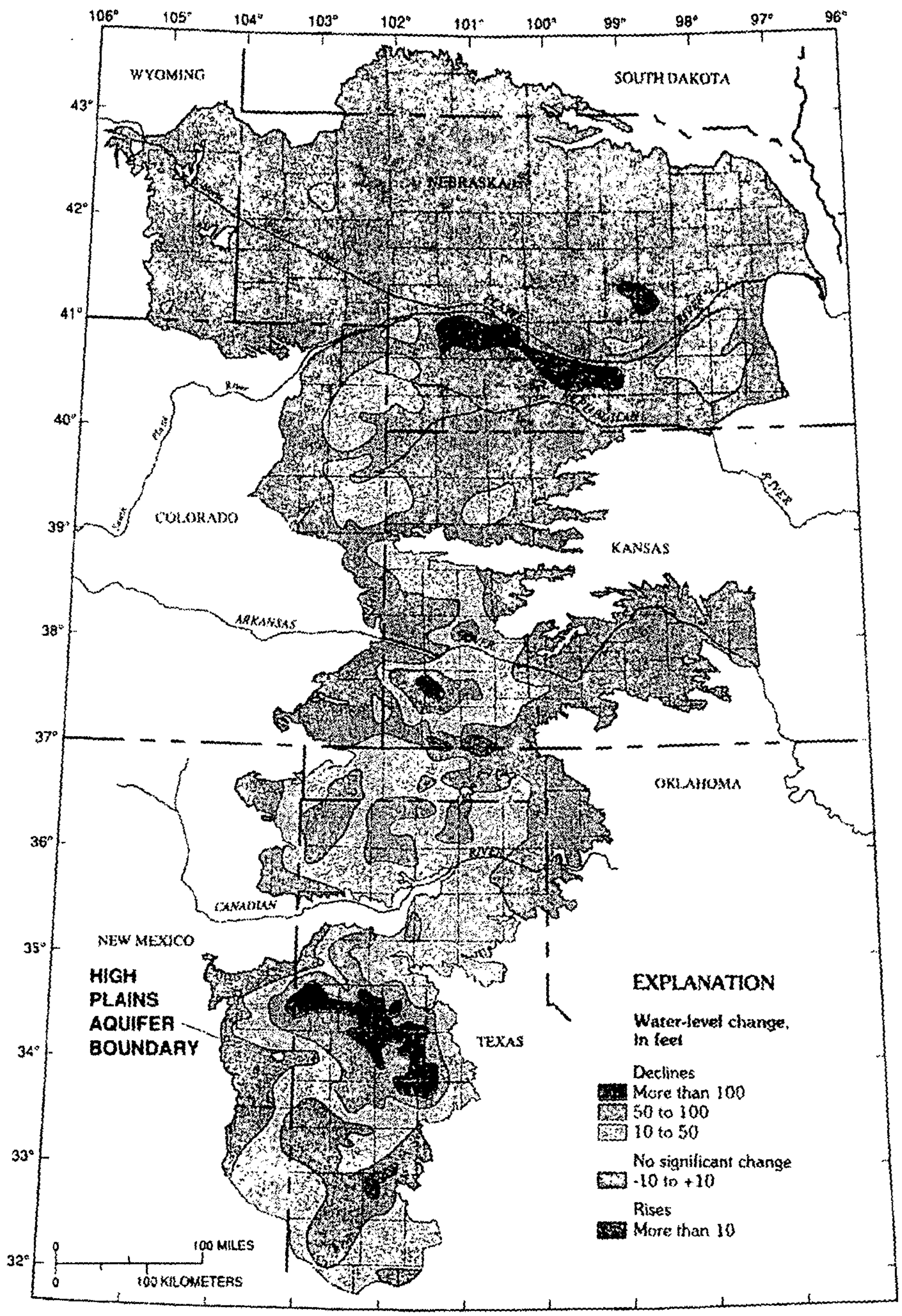

Figure II-10. Water table change in the HPA from predevelopment to 1980. J.F. DUGAN & D.A. COX, WATER-LEVEL CHANGES IN THE HIGH PLAINS AQUIFER—PREDEVELOPMENT TO 1993 21 (U.S. Geological Survey, Water-Res. Investigations Rep. 94-4157, 1994).

The remaining twenty percent is used for municipal and industrial uses.[106] More specifically, of the total water demanded in 2000, irrigation accounted for 9.70 maf of the water demanded, municipal uses demanded 4.20 maf, manufacturing used 1.80 maf, steam-electric uses consumed 0.61 maf, livestock consumption accounted for 0.33 maf, and mining used 0.25 maf.[107]

The usage levels of agriculture and municipal/manufacturing are trending in opposite directions however. Beginning in the 1970s, groundwater usage for irrigation began declining, by almost twenty percent as 1990 approached.[108] During that same time period, municipal-manufacturing water usage increased by more than sixty percent.[109] Four major causes for these opposing trends have been established as follows: (1) decreasing water affordability, (2) increasing water availability, (3) a reduction in irrigated acreage, and (4) improvements in water conservation practices.[110] The Texas Water Development Board (TWDB) estimates that irrigation water demand will decrease to 8.50 maf by 2050,[111] a decrease from eighty percent in 2000 to less than forty percent in 2050,[112] and municipal and manufacturing water demand will increase to 7.1 maf and 2.7 maf respectively,[113] an increase from about ten percent in 2000 for both uses to almost forty percent in 2050.[114]

B. Effects

The effects of pumping groundwater from aquifers are many and some are not necessarily problematic.[115] As currently practiced, however, groundwater pumping causes or has the potential to cause four major effects that are both economically and environmentally unsound.[116]

1. Drawdown[117]

The most basic effect of groundwater pumping is that as water is pumped out of an unconfined aquifer, the water table is lowered.[118] This

106. *Id.*
107. *See* WATER FOR TEXAS—2002, *supra* note 82, at 30 figs. 5-4, 5-5.
108. Kaiser & Skillern, *supra* note 2, at 259 n.53.
109. *Id.*
110. *Id.*
111. *See* WATER FOR TEXAS—2002, *supra* note 82, at 30 fig. 5-4.
112. *Id.* at 123.
113. *Id.* at 30 fig. 5-4.
114. *Id.* at 123.
115. ALLEY ET AL., *supra* note 43, at 22.
116. *See* discussion *infra* Parts III.B.2.a, b, c, and 3.a.
117. *See* discussion *infra* Part V.B.2.c.
118. David Todd, *Common Resources, Private Rights and Liabilities: A Case Study on Texas Groundwater Law*, 32 NAT. RESOURCES J. 233, 234 (1992).

temporary lowering of the water table is known as drawdown.[119] So long as aquifers are recharged by surface precipitation at a rate that is at least commensurate with the rate of withdrawal, this is not problematic.[120] This state of equivalent drainage and recharge is commonly referred to as "safe yield."[121] Because the accurate measurement of the exact amount of infiltration and withdrawal is extremely difficult to obtain,[122] safe yield is sometimes defined as "the amount of water that can be extracted each year from an aquifer on a renewable basis."[123] The term "undesired result" has been interpreted differently by various courts to include such interests as social, economic, engineering, and hydrological, resulting in a general reluctance to rely greatly on the term "safe yield" without specific clarification.[124] To remedy this general confusion, some states have taken to using the term "optimal yield" in state water statutes.[125] The definition of optimal yield varies from state to state, expressly defined in each state's statutes.[126]

Drawdown in an aquifer forms a conical-shaped depression in the water table itself, sometimes called a "cone of depression."[127] Refer to Figure III-1 below for an illustration of this effect. The cone of depression formed by drawdown is actually inverted, resembling a funnel. Drawdown becomes more pronounced in confined aquifers, where it expands rapidly, than in unconfined aquifers, where it expands more slowly.[128] The shallow end of a cone of depression formed in an unconfined aquifer can be anywhere from a few tens of feet to a few hundred feet in diameter, while the shallow end of a cone of depression embedded in a confined aquifer may have a diameter of several miles.[129] The differences in expansion rates among localized cones are due to the difference in storage coefficients in confined versus unconfined aquifers.[130] Confined aquifers have smaller storage coefficients because they are pressurized and unconfined aquifers have larger coefficients for water storage because they are unpressurized.[131]

119. *Id.*
120. DUGAN & COX, *supra* note 34, at 11.
121. SAX, *supra* note 7, at 353; *see* Kaiser & Skillern, *supra* note 2, at 257.
122. SAX, *supra* note 7, at 353.
123. *Id.* at 942.
124. *Id.* at 354.
125. *Id.*
126. *See id.*
127. ALLEY, *supra* note 43, at 11-14.
128. SAX ET AL., *supra* note 7, at 352.
129. BARCELONA, *supra* note 32, at 80.
130. SAX ET AL., *supra* note 7, at 352.
131. *Id.*

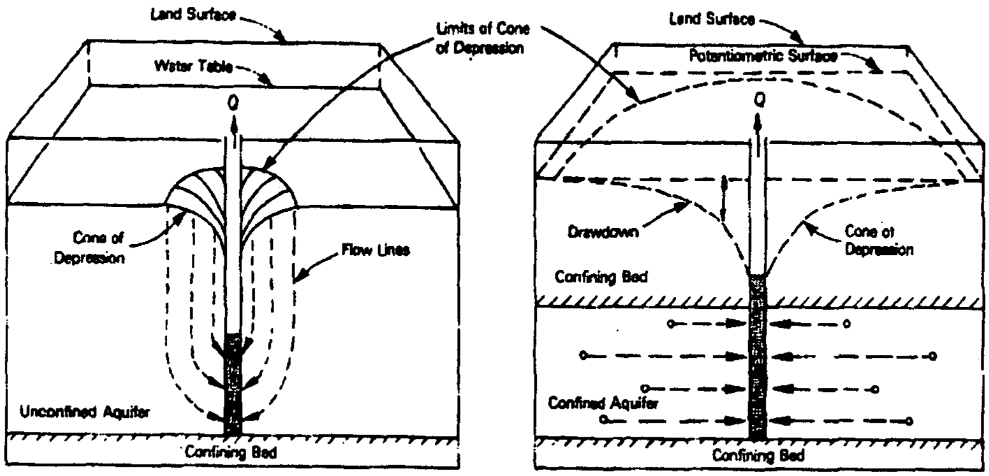

Figure III-1. Drawdown schematic. MICHAEL BARCELONA ET AL., HANDBOOK OF GROUNDWATER PROTECTION 81 (1988).

2. *Overdrafting*

When water is withdrawn from an aquifer faster than it can be recharged, the normal cycling of drawdown and refill is interrupted.[132] This net loss of water stored in the aquifer is known as overdrafting.[133] Alternatively, overdrafting is the state of exceeding the safe yield of a given aquifer.[134]

The HPA, in part because of its intensive use and expansive extent, continues to have, many instances of overdraft.[135] In 1975 alone, the total measured overdraft of the HPA was around fourteen maf,[136] and represented over half of the entire overdraft recorded in the contiguous United States.[137]

a. *Well Interference*

Well interference, as a result of overdrafting, is a highly contentious issue in the West.[138] Well interference is the lowering of the water level in a shallow or low-capacity well during and immediately after the time during

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132. ALLEY, *supra* note 43, at 7.

133. *Id.*

134. *Cf.* SAX ET AL., *supra* note 7, at 353 (explaining that the typical goal "in dealing with . . . 'overdraft' . . . is to limit pumping to the 'safe yield' of an aquifer." *Id.*).

135. LITKE, *supra* note 37, at 2.

136. Fourteen maf is equivalent to the entire flow of the Colorado River. MARC REISNER, CADILLAC DESERT 438 (1993).

137. *Id.*

138. Kaiser & Skillern, *supra* note 2, at 255.

which a nearby high capacity well (HCW) is in operation.[139] This effect has also been labeled the "Rule of the Big Pump."[140]

The well interference caused by an HCW may be permanent or temporary, depending on one of three factors. First, the well interference may prove temporary if it is caused by the cone of depression that results from the intermittent operation of a nearby HCW.[141] Second, the longer the HCW is in operation, the longer the well interference will last, causing the cone of depression to become permanent.[142] Third, as a result of the cone of depression reaching such size as to lower the entire water table, a portion of the aquifer becomes mined,[143] and the well interference becomes more likely to be permanent.[144]

Therefore, a fairly reliable predictor of the increased likelihood of the occurrence of well interference is the proximity of a smaller capacity well to a larger capacity well.[145]

Many cases have been litigated involving well interference.[146] The Nebraska Supreme Court awarded compensatory damages to a prior domestic-use driller whose pump welded itself to its casing after a subsequent irrigation-use driller's well decreased the water table in the underlying aquifer below the reach of the domestic-use pumper's well.[147] In its decision, the court relied on *Olson v. City of Wahoo*, which defined reasonable use in Nebraska,[148] and on statutory law that expressly mandated domestic uses as paramount to agricultural uses when determining the reasonableness of the use in question.[149]

b. Stream Baseflow Reduction

Many surface streams have, at their source, or somewhere along their reach, an artesian spring feeding the streamflow.[150] The reduction in the water stored in upstream artesian aquifers underlying the artesian springs can result in reduced or abated water flow in the streambed, and negatively affect

139. *See* ALLEY, *supra* note 43, at 11.

140. Tom Beard, *In Face of "Big Pump" Reality, "Rule of Capture" Needs Limits*, Livestock Weekly, ¶ 7 (Mar. 16, 2000) (on file with the Texas Tech Journal of Texas Administrative Law).

141. Kaiser & Skillern, *supra* note 2, at 255.

142. *Id.*

143. *See* discussion *infra* Part III.B.3.

144. Kaiser & Skillern, *supra* note 2, at 255.

145. ALLEY, *supra* note 43, at 11.

146. *See* Springer v. Kuhns, 571 N.W.2d 323 (Neb. Ct. App. 1997); *see also* Prather v. Eisenmann, 261 N.W.2d 766 (Neb. 1978); Olson v. City of Wahoo, 248 N.W. 304 (Neb. 1933), *superseded by statute as stated in Springer*, 571 N.W.2d at 327.

147. *Prather*, 261 N.W.2d at 772.

148. *Id.* at 771; *see also City of Wahoo*, 248 N.W. at 308.

149. *Prather*, 261 N.W.2d at 769; *see also* NEB. REV. STAT. § 46-613 (Michie 1995).

150. Todd, *supra* note 118, at 237.

those that use the water normally contained therein.[151] This effect is especially pronounced in gaining streams, or in reaches of streams that gain the majority of the stream's recharge through underlying aquifers.[152]

c. Saltwater Intrusion

Saltwater intrusion occurs mainly in the coastal regions and plains, due to their proximity to the ocean.[153] Saltwater intrusion is a process by which saline water flows into aquifers as the previously held freshwater is pumped out.[154] This intrusion of saline water can result from the proximity to ocean bed soils or by the intrusion of brackish waters, which normally line the lower portions of an aquifer[155] and are typically found in deeper aquifers.[156] Remediation of salinified freshwater aquifers requires the drilling of coastal injection wells, osmosis or catalysis treatment of the water withdrawn, or the drilling of new wells altogether.[157] Such measures are expensive and frequently cost prohibitive to the landowner.[158]

3. Mining

When an aquifer has been overdrafted for long periods of time with little or no recharge, the cumulative overdrafting is called mining.[159] Aquifer mining is most prevalent in confined aquifers or aquifers with slower recharge rates.[160] As the level of mining increases, groundwater users face more expensive extraction costs as the water table continually lowers.[161] The ultimate cost of aquifer mining is that the users of that portion of the aquifer will have to eventually turn to other water sources, implement reuse or conservation protocols, or abandon the use for which the aquifer was originally tapped.[162]

One example of mining occurred in Castro and Parmer counties in the Panhandle during the mid 1970s to early 1980s.[163] From 1975 to 1983, the total groundwater pumped from the HPA amounted to 11,269,000 acrefeet, which reduced the total amount of water stored in the HPA underlying those

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151. *Id.*

152. *See* discussion *supra* Part II.A.

153. ALLEY, *supra* note 43, at 64.

154. Todd, *supra* note 118, at 236; *see also* Susan Batty Peterson, *Designation and Protection of Critical Groundwater Areas*, 1991 BYU L. REV. 1393, 1397 (1991).

155. Patoski, *supra* note 1, at 186.

156. SAX ET AL., *supra* note 7, at 354.

157. Todd, *supra* note 118, at 236.

158. *Id.*

159. Kaiser & Skillern, *supra* note 2, at 257.

160. Todd, *supra* note 118, at 235.

161. *Id.*

162. *Id.*

163. *Id.*

two counties by 5,158,000 acrefeet, or an almost twenty percent decline in total water stored.[164]

a. Land Surface Subsidence[165]

One of the most drastic and alarming effect of aquifer mining is land subsidence. This is a process by which the surface elevation of the overlying land above a mined aquifer actually *lowers*.[166] Such subsidence occurs when all the water is pumped out of previously saturated soil, and the spaces between the soil particles that previously held water now contain only air.[167] The removal of the water from the soil pores causes a catastrophic loss of soil stability, leading to the collapse of the air-filled spaces, thereby lowering all layers of the soil strata up to the surface.[168] The actual depth of the subsidence can vary from a few inches to several feet.[169]

Another deleterious effect of subsidence is that once the soil layers are compacted, the soil pores that once held water now are eliminated, permanently preventing the recharge of the aquifer.[170] This *irreversible* loss of groundwater storage capacity for future generations is the most egregious form of groundwater mining.[171]

Land subsidence is usually a result of aquifer mining and not merely drawdown or overdrafting because the process is geologic by nature and therefore occurs only over long periods of time.[172]

IV. USE DOCTRINES

Several groundwater use doctrines are favored throughout the country, depending on the region and historical tradition.[173] The four major use doctrines commonly accepted in the United States are discussed below.[174]

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164. *Id.* at 236.

165. *See* discussion *infra* Part V.B.2.c.

166. Todd, *supra* note 118, at 238; *see also* Peterson, *supra* note 154, at 1395.

167. *See* Todd, *supra* note 118, at 238.

168. *See id.*

169. JAMES F. WILLIAMS III & C.E. RANZAU, JR., GROUND-WATER WITHDRAWALS AND CHANGES IN GROUND-WATER LEVELS, GROUND-WATER QUALITY, AND LAND-SURFACE SUBSIDENCE IN THE HOUSTON DISTRICT, TEXAS, 1980-1984 49 fig.26 (U.S. Geological Survey, Water Res. Investigations Rep. 87-4153, 1987) (showing that in some portions of the study area land surface subsidence was as great as nine feet).

170. SAX ET AL., *supra* note 7, at 355.

171. *Id.*

172. WILLIAMS & RANZAU, *supra* note 169, at 49 fig. 26 (showing that the subsidence recorded occurred from 1906-1978).

173. Kaiser & Skillern, *supra* note 2, at 262.

174. *Id.*

A. Rule of Capture

The rule of capture, also called the absolute ownership rule, is the absolute right of a landowner to withdraw unlimited quantities of water from beneath the landowner's property.[175] No liability is imposed on the landowner for any harm caused to neighboring landowners who use the same underlying aquifer.[176] The rule of capture allows groundwater pumped from beneath a landowner's property to be put to any use at any location the landowner sees fit.[177]

The absolute ownership rule gives no legal protection to any user.[178] Under this rule, no one owns the subsurface water while in place; therefore, no property right accrues until someone pumps the water.[179] The doctrine of absolute ownership has been labeled by some as the "Rule of the Big Pump" because of the vulnerability of "owned" groundwater to offsite tapping.[180]

Because an adjacent landowner has the legal right under the rule of capture to pump groundwater from beneath another landowner's property, the rights vested in landowners by this rule become nonappurtenant.[181] Many states adhere to the old absolute ownership rule, among them are the following: Connecticut, Georgia, Louisiana, Maine, Massachusetts, Mississippi, Rhode Island, and Texas.[182]

B. Reasonable Use

The doctrine of reasonable use evolved after the eastern and midwestern states, which had traditionally practiced the rule of capture, began reforming their jurisprudence so as to protect smaller capacity groundwater users from the overdrafting resulting from nearby HCWs.[183] It differs from the rule of capture in that it imposes a requirement of reasonableness on the use of the water.[184] The measure of reasonableness is quantified "by factors such as well location, amount of water, and the proposed use and placement of the water."[185]

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175. SAX ET AL., *supra* note 7, at 366.

176. Kaiser & Skillern, *supra* note 2, at 263.

177. *Id. See* discussion *infra* Part VI.A.

178. SAX ET AL., *supra* note 7, at 364.

179. Acton v. Blundell, 152 Eng. Rptr. 1223, 1235 (1843).

180. Beard, *supra* note 140, ¶ 7.

181. Appurtenant rights are generally accepted as those that serve a particular "parcel of land . . . in a way that cannot be separated from . . . the land." WILLIAM B. STOEBUCK & DALE A. WHITMAN, THE LAW OF PROPERTY § 8.2 (3d ed. 2000).

182. A. DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 4.6 (2002); *see also* BECK, *supra* note 31, §§ 21.05, 21.07.

183. *See* Kaiser & Skillern, *supra* note 2, at 264.

184. SAX ET AL., *supra* note 7, at 364.

185. Kaiser & Skillern, *supra* note 2, at 265.

Two distinct branches of reasonable use theory have evolved as well, the American and Restatement rules.[186] The American Rule requires all groundwater, which is reasonably withdrawn from an aquifer, to be used exclusively on the overlying land or within the overlying drainage basin.[187] The Restatement Rule allows for groundwater, which is reasonably withdrawn, to be applied outside of either the boundary of the overlying land or the boundary of the overlying drainage basin.[188] Both doctrines allow a landowner to pump unlimited amounts of water, so long as the landowner can show the water was withdrawn for a beneficial and reasonable purpose and does not unreasonably harm neighboring landowners.[189]

Many states follow some variation of the reasonable use rule, including the following: Arizona, Illinois, Iowa, Kentucky, Maryland, Michigan, New Hampshire, New York, Ohio, Pennsylvania, Washington, and West Virginia.[190]

1. American Rule

The American Rule is really a modified version of the rule of absolute ownership, both temporally and substantively.[191] After the rule of capture, the American Rule emerged, which was first adopted by New Hampshire in 1862.[192] Under the American Rule, groundwater may be pumped from an aquifer provided as follows: (1) that the use for which the groundwater is withdrawn is reasonable, (2) the groundwater withdrawn is used only for the benefit of the overlying land, and (3) uses on adjacent lands are per se unreasonable.[193]

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186. *Id.* at 264; *see also* SAX ET AL., *supra* note 7, at 364-65.

187. Kaiser & Skillern, *supra* note 2, at 264; *see also* SAX ET AL., *supra* note 7, at 364.

188. RESTATEMENT (SECOND) OF TORTS § 858 cmt. b (1979).

189. Finley v. Teeter Stone, Inc., 248 A.2d 106, 111-12 (Md. 1968); *see also* J. Castleberry, Jr., *A Proposal for Adoption of a Legal Doctrine of Ground-Stream Water Interrelationship in Texas*, 7 ST. MARY'S L.J. 503, 507-08 (1975).

190. TARLOCK, *supra* note 182, §§ 4.7, 4.18; *see also* BECK, *supra* note 31, §§ 23.02, 23.02(a), 23.02(c), 23.02(b)(1)-(b)(3), 23.02(c)(1), 23.02(c)(3), 23.03(a).

191. TARLOCK, *supra* note 182, § 4.8.

192. Basset v. Salisbury Mfg. Co., 43 N.H. 569 (1862).

193. FLA. STAT. ch. 373.016 (2000); *see also* Martin v. City of Linden, 667 So.2d 732, 734 (Ala. 1995) (holding that a municipality is forbidden from pumping water from a common aquifer beneath its land for use off property if adjacent landowners are injured or damaged); Adams v. Lang, 553 So.2d 89, 91 (Ala. 1989) (holding that plaintiff's beneficial use of groundwater restricted to the land from which it was withdrawn); Henderson v. Wade Sand & Gravel Co., 388 So.2d 900, 902 (Ala. 1980) (explaining defendant's incidental diversion of plaintiff's groundwater interfered with plaintiff's use); Koch v. Wick, 87 So.2d 47, 48 (Fla. 1956) (holding that county's pumping of large quantities of water from small strip of land was not for the beneficial use of strip of land and was therefore unreasonable); Bridgman v. Sanitary Dist. of Decatur, 517 N.E.2d 309, 313-14 (Ill. App. Ct. 1987) (ruling that sanitary district and engineering firm's ditch construction on land adjacent to plaintiff's land devalued and dewatered such land); United Fuel Gas Co. v. Sawyers, 259 S.W.2d 466, 468 (Ky. 1953) (holding that gas company's legitimately drilled gas well on its property which contaminated plaintiff's water well was a reasonable use of the company's land); *Finley*, 248 A.2d at 111-12 (*see supra* text accompanying note 189); Rouse

Among the justifications commonly accepted for the development of the American Rule include are as follows: (1) the creation of a system by which a rough method of sharing was implemented because exact measurements were unattainable, and (2) the overlying land limitation encouraged recharge to the aquifer via infiltration.[194] Because the American Rule contains an on-tract limitation to the use of water withdraw, the landowner is given a version of an appurtenant property right to the water contained underneath the land.[195]

Recently, however, both Arizona and Nebraska have somewhat relaxed the overlying land restriction of the American Rule and adopted modified versions of the American Rule that more closely approximate the Restatement Rule.[196]

While earlier cases allowed the offsite use of groundwater,[197] a 1976 Arizona Supreme Court case essentially shut down all water transport in Arizona from municipal to manufacturing uses.[198] Four years after the state supreme court's decision, however, the legislature passed, without amendment, an ambitious rewrite of Arizona's water laws that overhauled the administration and enforcement of state water policy,[199] giving the landowner the right of offsite use of Arizona groundwater.[200]

2. *Restatement Rule*

The Restatement Rule is really a rule limiting liability, but functions as a rule of allocation.[201] Only certain actions will result in liability to a

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v. City of Kingston, 123 S.E. 482, 490 (N.C. 1924) (ruling that city was liable to landowner for wrongfully and unlawfully withdrawing waters from land adjacent to plaintiff's); Forbell v. City of New York, 61 N.Y.S. 1005, 1007-08 (N.Y. App. Div. 1900) (enjoining city for overdrawing water from its pumping station, causing crop destruction for miles around the station); Nashville, Chattanooga & St. Louis Ry. v. Rickert, 89 S.W.2d 889, 897 (Tenn. Ct. App. 1935) (restraining adjacent landowner from overpumping his land so as to interfere with spring-fed land owned by railroad company).

194. *See* SAX ET AL., *supra* note 7, at 376 n.4.

195. *See* STOEBUCK & WHITMAN, *supra* note 181, § 8.2.

196. *See* NEB. REV. STAT. § 46-691 (1995) (mandating that groundwater could be transported off of the land it was pumped onto for: (1) agricultural purposes, (2) or for any purpose related to pollution remediation as long as the transport and use (i) will not adversely affect any other water user, (ii) is consistent with all applicable statutes, rules and regulations, and (iii) is in the public interest) *amended by* 2001 Neb. Laws 619; *see also* Jarvis v. State Land Dep't, 479 P.2d 169, 174 (Ariz. 1970) (invoking its equitable powers to hold that the city of Tucson could transport water off the site it was pumped on, so long as the city purchased all surrounding irrigated farmland, ceased the irrigation, and transported no more than the consumptive use amount equal to the historical maximum) *modified*, 550 P.2d 227, 229-30 (Ariz. 1976) (holding that the city of Tucson could only export a consumptive amount of water, or the amount of water pumped minus the seepage amount); Springer v. Kuhns, 571 N.W.2d 323, 330 (Neb. 1997) (holding that the § 46-691 is retroactive in application).

197. *Jarvis*, 479 P.2d at 174.

198. Farmers Inv. Co. v. Bettwy, 558 P.2d 14, 21 (Ariz. 1976).

199. Philip R. Higdon & Terence W. Thompson, *The 1980 Arizona Groundwater Management Code*, 1980 ARIZ. ST. L.J. 621, 621 (1980).

200. *Id.* at 656.

201. SAX ET AL., *supra* note 7, at 365.

landowner for withdrawal of neighboring groundwater. Landowners are liable if the withdrawal causes unreasonable harm to neighboring landowners by either lowering the water table or reducing the artesian pressure of the underlying aquifer.[202] Landowners are also liable if the withdrawal exceeds a reasonable portion of the annual groundwater storage for the underlying aquifer.[203] Lastly, landowners become liable if the withdrawal has a direct and substantial effect upon a surface watercourse or lake and causes unreasonable harm to downstream users entitled to the surface water.[204]

The main difference in the application of the American and Restatement rules is that the Restatement Rule does not require on-tract use of the pumped groundwater.[205] Comment b to § 858 of the Restatement explains that relaxing the onsite limitation of the American Rule encourages the most economically valuable use of the water pumped.[206] In addition, comment e describes the offsite allowance through the filter of liability, explaining that reasonableness is determined more by the excessive quantity of water for an unusual use than by the location of such a use.[207]

C. Correlative Rights

The correlative rights doctrine, also referred to as "riparianism tilted on its side,"[208] was first adopted by California in 1903.[209] Correlative rights can be confused with the Restatement Rule. An individual's right to remove groundwater from beneath the individual's land is tempered by neighboring landowners' rights to remove the water beneath their land in both the correlative rights and Restatement doctrines.[210] One of the main differences between the two doctrines is that the measure of reasonableness used in correlative rights is decided by the current reasonable and beneficial need for water,[211] as determined by the proportionate size of the landowner's overlying property.[212] In short, the larger the area of the land owned, the greater amount of groundwater that may be pumped from the underlying aquifer.[213] In addition, in correlative rights states, little distinction is made between

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202. RESTATEMENT, *supra* note 188, § 858(1)(a).

203. *Id.* § 858(1)(b).

204. *Id.* § 858(1)(c).

205. SAX ET AL., *supra* note 7, at 381 n.2.

206. RESTATEMENT, *supra* note 188, § 858 cmt. b.

207. *Id.* § 858 cmt. e.

208. SAX ET AL., *supra* note 7, at 379 n.3.

209. Katz v. Walkinshaw, 74 P. 766, 772 (Cal. 1903); *see also* Hudson v. Dailey, 105 P. 748, 751 (Cal. 1909) (holding that priority is irrelevant among on-tract users); Burr v. Maclay Rancho Water Co., 98 P. 260, 264 (Cal. 1908) (holding that water users on distant tracts are subordinate to water users on the overlying land).

210. Kaiser & Skillern, *supra* note 2, at 267; *see also* RESTATEMENT, *supra* note 188, § 858(1)(a).

211. SAX ET AL., *supra* note 7, at 369 n.4.

212. Tehachapi-Cummings Water Dist. v. Armstrong, 122 Cal. Rptr. 918, 924-25 (Ct. App. 1975).

213. Kaiser & Skillern, *supra* note 2, at 267.

overlying and adjacent uses[214] because off-tract uses are considered subordinate to on-tract uses.[215]

One similarity between the American Rule and correlative rights is that both doctrines afford the overlying landowner some version of appurtenant rights. Due to the riparian foundation of correlative rights, however, this appurtenant right is strongest in a correlative water rights state.[216]

An unintended consequence of the correlative rights doctrine is a situation where the landowner owns enough surface area to establish a monopoly on the use and application of the groundwater beneath the landowner's property.

California is considered the "cutting edge" of the groundwater management in the United States.[217] As such, California has developed the most comprehensive, if not the most "schizophrenic" system of correlative rights apportionment.[218] Ever since the adoption of correlative rights by the state in 1903, groundwater pumping has generally been organized through the tiered structure of priority that California uses, giving surface landowners a preference in the allocation over offsite water users.[219]

Currently Arkansas, California, Delaware, Hawaii, Minnesota, Missouri and New Jersey have adopted correlative rights.[220]

D. Prior Appropriation

Prior appropriation of groundwater was first adopted by both New Mexico and Idaho in 1931.[221] The use doctrine most analogous to traditional surface water appropriation systems in the west is that of prior appropriation.[222] Temporal precedence determines the allocation of groundwater under prior appropriation.[223] Whoever drills into an aquifer first is deemed first in time, and thus, first in right.[224] The first to drill into the resource determines the establishment of ownership, but various states impose differing versions of reasonableness restrictions.[225]

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214. Wright v. Goleta Water Dist., 219 Cal. Rptr. 740, 746-47 (Ct. App. 1985).

215. SAX ET AL., *supra* note 7, at 364.

216. Katz v. Walkinshaw, 74 P. 766, 772 (Cal. 1903) (describing the principles of common law applying to streams [riparianism] in its exposition on the adaptation of correlative rights).

217. SAX ET AL., *supra* note 7, at 446.

218. *Id.* at 458.

219. *Id.* at 429.

220. TARLOCK, *supra* note 182, §§ 4.13, 4.15; *see also* BECK, *supra* note 31, §§ 22.02-.04, 22.05(a)-(c).

221. N.M. STAT. ANN. § 72-12-1 (Michie 2001); *see also* Hinton v. Little, 296 P. 582, 584 (Idaho 1931).

222. Kaiser & Skillern, *supra* note 2, at 267.

223. *Id.*

224. *Id.*

225. *Id.* at 268.

These reasonableness restrictions vary greatly. In Colorado, a three-mile radius test was implemented by which no pumping would be allowed within the boundary if it would result in forty percent depletion of the available groundwater over a twenty-five year period.[226] In Idaho, the state supreme court prohibited all groundwater mining, enjoining all but four senior appropriators from withdrawing water from the underlying aquifer.[227] Finally, the Oregon Supreme Court ruled that the state statute that forbade groundwater pumping "below economic levels,"[228] did not give Oregon farmers the ability to pump and raise crops as long as they could do so profitably.[229]

Most western states follow this use doctrine, including as follows: Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming.[230]

E. Disputed Use States

There is also some dispute as to which use doctrines some states adhere. The following states have been classified in both some version of reasonable use and correlative rights as follows: Alabama, Arizona, Florida, Nebraska, North Carolina, Tennessee, Vermont, and Wisconsin.[231]

V. LEGAL ANALYSIS OF TEXAS GROUNDWATER LAW

A. Federal

1. Statutory Law

There is no single federal statutory scheme that oversees the management and allocation of the nation's groundwater supply; there are instead several small federal regulations that act in concert with one another to form a patchwork of federal involvement.[232]

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226. Fundingsland v. Colo. Ground Water Comm'n, 468 P.2d 835, 838 (Colo. 1970).

227. Baker v. Ore-Ida Foods, Inc., 513 P.2d 627, 635 (Idaho 1973). The court's decision was later modified by the Idaho Legislature in 1994, allowing the discretion of the Director of Water Resources to determine whether the mining in question was "in the public interest," and whether a program was likely to be in place in whatever time frame the selected by the Director. *See* IDAHO CODE § 42-237a(g) (Michie 1994).

228. OR. REV. STAT. § 537.525(8) (1989).

229. Doherty v. Or. Water Res. Dir., 783 P.2d 519, 525 (Or. 1989).

230. TARLOCK, *supra* note 182, §§ 5:7-:8; *see also* BECK, *supra* note 31, §§ 24.01(a), 24.02(a)(3), 24.02(b)(2)(B)-(E).

231. TARLOCK, *supra* note 182, §§ 4:7, 4:15; *see also* BECK, *supra* note 31, §§ 22.06(a), 22.06(c), 22.06(d)(1)-(2), 22.07, 23.03(b), 22.06(b).

232. Martha C. Brand & Joseph M. Finley, *Minnesota's Groundwater Protection Act: A Response to Federal Inaction*, 16 WM. MITCHELL L. REV. 911, 919 (1990).

This patchwork of regulation contains at least sixteen individual Acts that address groundwater issues in some form or fashion.[233] Some leading examples of this legislation include the Coastal Zone Management Act;[234] the Comprehensive Environmental Response, Compensation and Liability Act;[235] the Endangered Species Act;[236] the Federal Insecticide, Fungicide and Rodenticide Act;[237] the Resource Conservation and Recovery Act;[238] and the Safe Drinking Water Act.[239]

Texas is unique among the states of the union in that it is a little over ninety-four percent privately owned, with only two and half percent of the state being federally owned.[240] Because of this, the federal statutory framework has less influence on private property rights in Texas than in other states. Instead, the bulk of the regulatory burden rests with state control.[241]

In the past, the Supreme Court indicated a general willingness to uphold federal statutory intervention in groundwater management,[242] but the willingness of the present Court to be deferential to legislative action is doubtful.[243]

2. *Caselaw*

Hudson Water Co. v. McCarter first addressed interstate regulation of groundwater resources at the federal level in 1908.[244] In that case, the Supreme Court held that "[t]he constitutional power of the State to insist that its natural advantages shall remain unimpaired by its citizens is not dependent upon any nice estimate of the extent of present use or speculation as to future

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233. Vance, *supra* note 38, at 805-06.

234. 16 U.S.C. §§ 1451-1464 (1994) (authorizing funding to assist states in mitigating salt water intrusion into groundwater aquifers).

235. 42 U.S.C. §§ 9601-9675 (2000) (allowing the federal government to bring civil action against anyone implicated in groundwater contamination).

236. 16 U.S.C. §§ 1531-1544 (1973) (allowing federal intervention when endangered species or their habitats are threatened).

237. 7 U.S.C. §§ 136-136y (1994) (providing for the registration of pesticides and controlling their distribution, sale and use).

238. 42 U.S.C. §§ 6901-6991i (1988 & Supp. V 1993) (empowering the Environmental Protection Agency to set standards for hazardous waste landfills—partially in the attempt to prevent contaminants from leaching into groundwater aquifers).

239. 42 U.S.C. §§ 300f-300j-26 (1994) (directing states to establish wellhead protection programs and regulate underground injection wells used for waste disposal).

240. DAVID J. SCHMIDLY ET AL., TEXAS PARKS AND WILDLIFE FOR THE 21ST CENTURY: AN OVERVIEW OF THE TEXAS TECH UNIVERSITY STUDIES IN CONSERVATION AND RECREATION FOR THE COMING DECADES 13 (Tex. Parks and Wildlife Dep't, 2001).

241. *See* discussion *infra* Part V.B.

242. *See* discussion *infra* Part V.A.2.

243. Of the nine Justices currently serving on the Court, seven were appointed by conservative Presidents. Anonymous, *The Justices of the Supreme Court*, About the Supreme Court, *at* http://a257.g.akamaitech.net/7/257/2422/14mar20010800/www.supremecourtus.gov/about/biographies current.pdf (last visited June 4, 2003).

244. 209 U.S. 349 (1908).

needs."[245] This decision signaled the Court's view of the paramount importance of water resources over other natural resources, and thereby gave the state "more power to control its use movement outside state boundaries."[246]

Since the Court addressed interstate commerce and groundwater resources in *Hudson*, it has seemingly either overruled or modified *Hudson* by later decisions such as *Hughes v. Oklahoma*[247] and *Sporhase v. Nebraska*.[248] In the latter case, the Court used broad language to indicate that, under the Commerce Clause,[249] groundwater is an article in commerce.[250] The Court based its decision, in part, on the fact that the water in dispute came from the HPA, which was interstate in extent, and that most of the water was being used for agriculture, which was essentially commercial by nature and interstate in scope.[251] There was a significant federal interest in conserving and allocating the water under dispute.[252] In addition, the majority alluded in dicta to the Court's willingness to support congressional preemption of groundwater resource management.[253]

Federal courts have also created niches of preclusion in other areas of law previously under the sole discretion of the states, such as water quality,[254] endangered species,[255] navigation,[256] hydropower,[257] and reclamation of dry lands.[258]

Federal reservation of groundwater has been examined several times.[259] The reserved water doctrine itself was first established in 1908, just prior to the issuance of the decision in *Hudson*, in the case of *Winters v. United States*.[260] This doctrine, sometimes referred to as the "Winters Doctrine,"[261]

245. *Id.* at 356-57.

246. Matthew C. Urie, *Share and Share Alike? Natural Resources and Hazardous Waste Under the Commerce Clause*, 35 NAT. RESOURCES J. 309, 334-35 (1995).

247. 441 U.S. 322 (1979) (holding that state regulation of wildlife had no special precedence over state regulation of any other resource); *see also* The Editors, *Commerce Clause Limits States' Ability to Stop Groundwater Exports: Supreme Court Overturns Nebraska Reciprocity Rule*, 12 ENVTL. L. REP. 10083 (1982).

248. 458 U.S. 941 (1982).

249. U.S. CONST. art. I, § 8 cl. 3.

250. Urie, *supra* note 246, at 337.

251. *Id.* at 336.

252. *Id.* at 336-37.

253. *Id.* It should be noted that the ideological resemblance of the current Court membership to the 1982 Court members is minimal. Stevens, J., wrote the majority opinion and was joined by Burger, C.J., Brennan, J., White, J., Marshall, J., Blackmun and Powell, J.J. *Id.*

254. Riverside Irrigation Dist. v. Andrews, 758 F.2d 508, 513 (10th Cir. 1985).

255. Cappaert v. United States, 426 U.S. 128, 144 (1976).

256. United States v. Rio Grande Dam & Irrigation Co., 174 U.S. 690, 709 (1899).

257. United States v. Appalachian Elec. Power Co., 311 U.S. 377, 419-20 (1940).

258. California v. United States, 438 U.S. 645, 653 (1978).

259. *Cappaert*, 426 U.S. at 144; *see also* Cappaert v. United States, 508 F.2d 313, 317 (9th Cir. 1974); Winters v. United States, 207 U.S. 564 (1908).

260. 207 U.S. 564.

261. SAX ET AL., *supra* note 7, at 785 n.1.

upholds the right of the United States to reserve water found on federal land from disposition.[262]

The seminal case in this line of jurisprudence is *Cappaert v. United States*.[263] When heard at the appellate level, the Court of Appeals for the Ninth Circuit ruled that the reserved water doctrine applied to groundwater as well as surface water.[264] However, when reviewed on appeal by the Supreme Court, the Court declined to extend the Winters Doctrine to groundwater reasoning that "[n]o cases of this Court have applied the doctrine of implied reservation of water rights to groundwater," and instead held that the water in *Cappaert* was in fact "surface water."[265] Going further, the Court held that "the United States can protect its [reserved] water from subsequent diversion, whether the diversion is of surface or ground water."[266]

Federal courts have also addressed compensable takings, viewed through the lens of groundwater monitoring.[267] In *Hendler v. United States*, the federal circuit held that the installation of groundwater monitoring wells, put in place to scrutinize groundwater pollution, constituted a compensable taking to the landowner.[268]

The last legal area of groundwater doctrine addressed by federal courts is tax law. In 1965, the Fifth Circuit Court of Appeals held that an irrigator who was pumping from the HPA was entitled to claim a deduction[269] under a federal cost depletion statute dealing with oil and gas wells.[270] However, due to the peculiar conditions, this ruling was limited to the southern High Plains region of Texas.[271] The Internal Revenue Service later extended this deduction allowance to the entire HPA "where the pumper could show that the groundwater [was] being depleted and [that] recharge [was] negligible."[272]

B. State

1. Statutory Law

When the 75th Legislature enacted Senate Bill 1 in 1997,[273] Texas statutory groundwater law underwent "the most exhaustive rewrite of Texas

262. *Id.* at 784.
263. Cappaert v. United States, 426 U.S. 128 (1976).
264. 508 F.2d 313, 317 (9th Cir. 1974).
265. *Cappaert*, 426 U.S. at 142.
266. *Id.* at 143.
267. Hendler v. United States, 952 F.2d 1364, 1367 (Fed. Cir. 1991).
268. *Id.* at 1378.
269. United States v. Shurbet, 347 F.2d 103, 103 (5th Cir. 1965).
270. 26 U.S.C. § 611(a) (2002).
271. *Shurbet*, 347 F.2d at 109 (citing I.R.C. § 611 (1954)).
272. SAX ET AL., *supra* note 7, at 430 (citing Rev. Ruls. 82-214, 1982-2, C.B. 1115).
273. Tex. S.B. 1, 75th Leg., R. S. (1997) (codified and amended in scattered sections of TEX. WATER CODE ANN.).

water law in the last thirty years."[274] The scope of change undertaken by Senate Bill 1 is evidenced by the most recent decision handed down from the Texas Supreme Court, declining to make a sweeping change to the rule of capture, in favor of allowing Senate Bill 1 time to develop.[275]

Senate Bill 1 splits regulatory oversight and responsibility among three state agencies: (1) the Texas Water Development Board (TWDB),[276] (2) the Texas Commission on Environmental Quality (TCEQ),[277] and (3) the Texas Parks and Wildlife Department (TPWD).[278]

Article four of Senate Bill 1 directly affects groundwater.[279] This article specifically addresses both surface and groundwater sources.[280] For the first time in the history of Texas water law, Senate Bill 1 mandates that the administering agency[281] take into consideration the amount of groundwater available to a landowner through the rule of capture before granting surface water rights to the landowner.[282] While article four of Senate Bill 1 does not expressly overrule the rule of capture, it does place greater emphasis and regulatory power in Groundwater Conservation Districts (GCDs).[283] Despite the persistence of the rule of capture, GCDs are now empowered to prevent waste, to issue permits for wells, to impose limits on spacing and production of wells, to regulate the water transfers from one district to another, to acquire and sell property, to levy property taxes, and to transport and distribute surface or groundwater.[284] There are currently seventy-nine confirmed GCDs in Texas, while another ten GCDs are still pending confirmation from the TCEQ.[285] Figure V-1 illustrates the location of these GCDs overlaid with the

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274. Martin Hubert, *Senate Bill 1, The First Big and Bold Step Toward Meeting Texas's Future Water Needs*, 30 TEX. TECH L. REV. 53, 54 (1999).

275. Sipriano v. Great Spring Waters of America, 1 S.W.3d 75, 80 (Tex. 1999).

276. *See* TEX. WATER CODE ANN. § 6.012 (Vernon 2000); *see also* Frank F. Skillern, *Managing Water Resources in Texas: Water Policy for the Future*, 6 RIVERS 194, 198 (1998) (describing that the TDWB is vested with the responsibility of formulating and adopting a state water plan every five years by compiling the individual regional water plans of each of the GCDs).

277. *See* Skillern, *supra* note 276, at 198 (mandating that TCEQ, formerly named TNRCC, has the responsibility of considering the state water plan in matters brought before the commission).

278. Skillern, *supra* note 276, at 198 (explaining that TPWD has responsibility for providing input to the TWDB in the formulation of the state water plan).

279. Tex. S.B. 1, 75th Leg., R. S. (1997) (codified and amended in scattered sections of TEX. WATER CODE ANN.).

280. *Id.*

281. TEX. WATER CODE ANN. § 11.151 (Vernon 2000). TCEQ is the administering agency. *Id.*

282. John R. Pitts & Janet L. Hamilton, *Texas Water Law for the New Millennium*, 14 NAT. RESOURCES & ENV'T 35, 39 (1999).

283. TEX. WATER CODE ANN. §§ 36.002, .101 (Vernon Supp. 2003).

284. TEX. WATER CODE ANN. §§ 36.002, .101 (Vernon Supp. 2003); *see also* Cynthia DeLaughter, *Priming the Water Industry Pump*, 37 HOUS. L. REV. 1465, 1469-71 (2001); Skillern, *supra* note 276, at 199-202; GUY FIPPS, MANAGING TEXAS' GROUNDWATER RESOURCES THROUGH GROUNDWATER CONSERVATION DISTRICTS 5 (Texas Agric. Extension Serv., Publ'n B-1612, 11-98).

285. TEXAS WATER DEVELOPMENT BOARD, GROUNDWATER CONSERVATION DISTRICTS WITH GROUNDWATER MANAGEMENT AREAS AND PRIORITY GROUNDWATER MANAGEMENT AREAS, *at* http://www.twdb.state.tx.us/mapping/maps/pdf/gcd_gma_pgma_24x24.pdf (last modified Feb. 19, 2003).

Groundwater Management Areas (GMAs) and Priority Groundwater Management Areas (PGMAs).[286]

Some of the most confusing terminology dealing with statutory groundwater management emanates from the many versions of groundwater statutes that have been enacted by the legislature since 1949.[287] GCDs, by nature of having existed in some form or fashion for the past fifty-four years, go by many names, including the following: Aquifer Authorities,[288] Aquifer Conservation Districts, Conservation and Reclamation Districts, Fresh Water Supply Districts, GMAs,[289] Metropolitan Water Districts, PGMAs,[290] Subsidence Districts,[291] Underground Water Conservation Districts, Underground and Fresh Water Conservation Districts, Underground Water Conservation and Supply Districts, Water Management Districts, and most simply, Water Districts.[292]

With the enactment of Senate Bill 1, however, all previously named districts are treated substantially the same under the term GCD, with the exceptions of GMAs and PGMAs.[293]

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286. GMAs and PGMAs are explained further in footnotes 280 and 281.

287. FIPPS, *supra* note 284, at 2.

288. One such authority exists, the Edward's Aquifer Authority (EAA), established in 1993 and given special regulatory powers due to the discovery of several endangered species in the aquifer's watershed. Stephanie E. Hayes Lusk, *Texas Groundwater: Reconciling the Rule of Capture with Environmental and Community Demands*, 30 ST. MARY'S L. J. 305, 325 (1998). It should be noted that the EAA was technically created as a conservation and reclamation district. Tex. S.B. 1477, § 1.02, 73rd Leg., R. S. (Tex. 1993).

289. GMAs are special, larger GCDs that are specifically designed to encompass and manage the major and minor aquifers of Texas. Press Release, Texas Water Development Board, Texas Water Development Board Adopts Designation of Groundwater Management Areas, ¶ 1 (Nov. 13, 2002) *available at* http://www.twdb.state.tx.us/publications/press_releases/2003%20Press%20Releases/11-13-02 GMAs.htm (last modified Jan. 29, 2003) [hereinafter Press Release]. Senate Bill 2 authorized the TWDB and the TCEQ to designate GMAs covering all the major and minor aquifers in Texas. *Id.* Although § 35.004 of the Water Code originally directed state agencies to designate GMAs boundaries as close as possible to existing aquifer and geologic formation borders, subsequent public comment (which ended on Oct. 7, 2002) to the proposed TWDB rules and designations have changed this policy to one now favoring natural boundaries whenever possible, but allowing for GMA boundaries to approximate those of political subdivisions, such as county lines, whenever such a designation does not substantially compromise the management of the GMA. *Id.*

290. PGMAs are another special subset of the general GCD nomenclature. S.B. 1 authorizes the creation of PGMAs and state financial assistance for PGMAs. *See* TEX. WATER CODE ANN. §§ 35.002, .007 (Vernon Supp. 2003). Under Chapter 35, the TCEQ may designate a region that either is experiencing or expected to experience, within twenty-five years, any critical groundwater supply, contamination, or subsidence problems. FIPPS, *supra* note 284, at 3. PGMAs may not be so declared until a detailed study has been performed by the TCEQ, until such time, potential PGMAs are termed "study areas." FIPPS, *supra* note 284, at 3.

291. One of the two subsidence districts in existence is located in Harris County due to the abnormal levels of subsidence recorded there. WILLIAMS & RANZAU, *supra* note 169, at 49 fig.26.

292. *See* FIPPS, *supra* note 284, at 2-3; *see also infra* fig. V-1.

293. FIPPS, *supra* note 284, at 2-3; *see also* Press Release, *supra* note 289, ¶ 1.

2. Caselaw

Case law concerning Texas groundwater law reflects the long and unflappable history of the rule of capture.[294] Despite being one of only a few states left in the Union that still follows the English rule,[295] the Texas Supreme Court has repeatedly upheld its validity.[296] The rule of capture traces its roots to the property concept of absolute ownership, first ruled upon in the English case of *Acton v. Blundell*.[297] This case established in the landowner the exclusive right of ownership to water found percolating beneath the landowner's property.[298] The *Acton* court derived this absolute ownership rule from the common law property law maxim that states, "*[c]ujus est solum, ejus est usque ad coelum et ad infernos*," meaning "[w]hoever owns the soil owns everything up to the sky and down to the depths."[299] The court specifically applied the concept of absolute ownership to groundwater by stating:

> [T]he person who owns the surface may dig therein, and apply all that is there found to [the person's] own purposes at [the person's] free will and pleasure; and that if, in the exercise of such right, [the person] intercepts or drains off the water collected from underground springs in [the person's] neighbour's [sic] well, this inconvenience to [the person's] neighbour [sic] falls within the description *damnum absque injuria* (italics added) [an injury without a remedy] which cannot become the ground of an action.[300]

Texas formally adopted the rule of capture just after the turn of the 20th century in *Houston & Texas Central Railway Co. v. East*.[301] In *Houston*, the railway company had been using groundwater pumped from beneath its lands for use in locomotive maintenance and subsequently caused a neighboring landowner's wells to dry up.[302] In 1904, East argued for a version of the correlative rights and reasonable use doctrines.[303] The Texas Supreme Court

294. Also called the "English rule." *See* Friendswood Dev. Co. v. Smith-Southwest Indus., Inc. 576 S.W.2d 21, 28-29 (Tex. 1978).

295. TARLOCK, *supra* note 182, § 4:6 at 4-8 (2002); *see also* BECK, *supra* note 31, §§ 21.05, 21.07.

296. Sipriano v. Great Spring Waters of Am., 1 S.W.3d 75, 75 (Tex. 1999); *see also Friendswood*, 576 S.W.2d at 28-29; Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 148, 81 S.W. 279, 280 (1904).

297. 152 Eng. Rep. 1223, 1235 (1843).

298. *See id.*

299. BLACK'S LAW DICTIONARY 1628 (7th ed. 1999).

300. *Acton*, 152 Eng. Rep., at 1235.

301. 98 Tex. 146, 81 S.W. 279 (1904).

302. Kaiser & Skillern, *supra* note 2, at 263.

303. *Houston*, 98 Tex. at 149, 81 S.W. at 280.

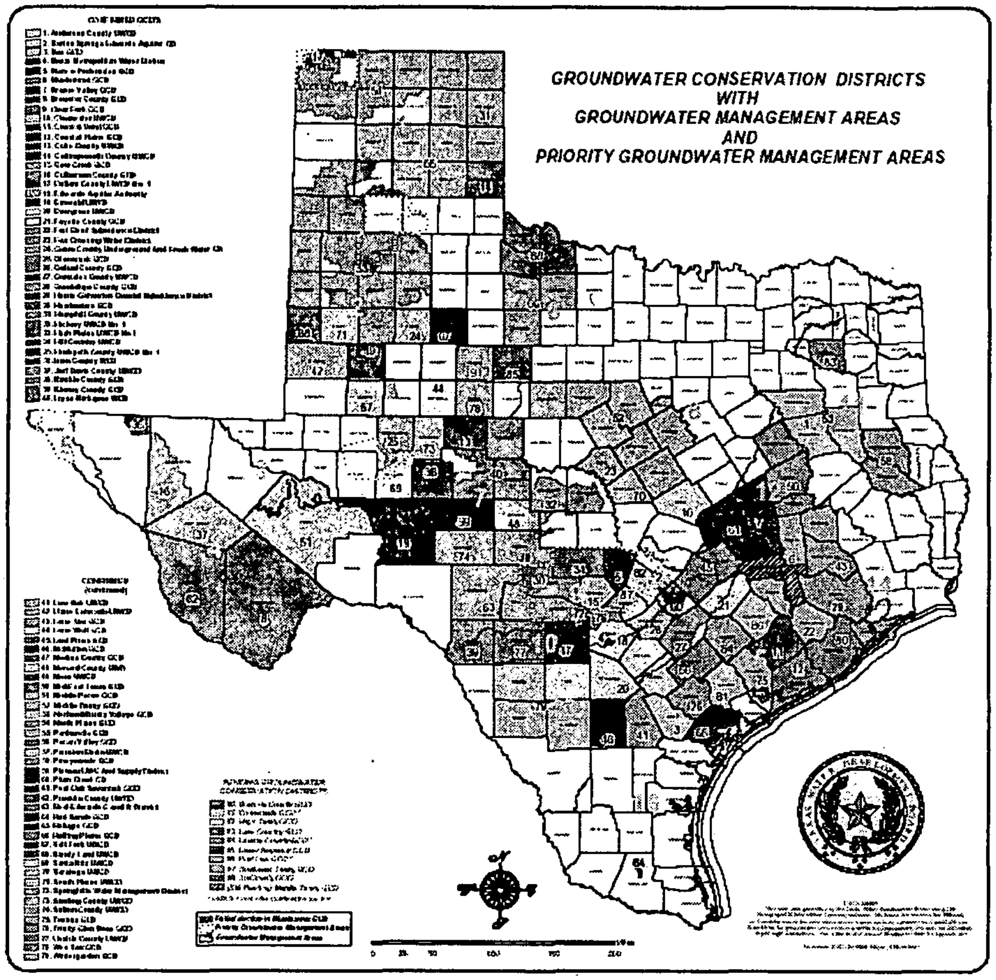

Figure V-1. The sixteen GMAs, seventy-nine GCDs, ten pending GCDs, and five PGMAs in Texas. TEXAS WATER DEVELOPMENT BOARD, GROUNDWATER CONSERVATION DISTRICTS WITH GROUNDWATER MANAGEMENT AREAS AND PRIORITY GROUNDWATER MANAGEMENT AREAS, *available at* http://www.twdb.state.tx.us/mapping/maps/pdf/gcd_gma_pgma_24x24.pdf (last modified Feb. 19, 2003).

expressly rejected this argument, instead denying that the railway had any monetary liability and refusing to place a limit on the amount of water the railway could pump.[304]

The rule of capture was most recently visited by the Texas Supreme Court in 1999[305] after the enactment of Senate Bill 1 in 1997.[306] The court upheld the rule of capture once again, expressly rejecting the theory of reasonable use after liability was not imposed on the respondent for pumping water at a rate of ninety-thousand gpd,[307] resulting in the depletion of the

304. *See id.* at 149-50, at 280-81.

305. Sipriano v. Great Spring Waters of America, 1 S.W.3d 75 (Tex. 1999).

306. *See* discussion *supra* Part V.B.1.

307. *Sipriano*, 1 S.W.3d at 76. This rate of withdrawal was equivalent to 0.28 afd, or 100.80 afy. *See* SAX ET AL., *supra* note 7, at 19 tbl. 1-6.

petitioner's well.[308] The court deferred its authority to change the Texas common law in favor of letting the recent "sweeping" statutory changes of Senate Bill 1 develop and mature.[309] This decision is based on the holding of the *Friendswood* court that groundwater comes under the police power of the state to protect the public health and welfare because groundwater is owned by the landowner and qualifies as real property.[310]

a. Ownership

To determine ownership, four important legal distinctions are necessary.[311] Ownership of groundwater is determined by the method the water travels through the soil profile; by whether it percolates,[312] underflows,[313] is part of an underground stream,[314] or is part of an artesian source.[315]

If groundwater is found to be percolating, then it falls under the purview of private ownership and the rule of capture.[316] The *Houston* court justified the adoption of the rule of capture for all percolating waters by stating that the movement of groundwater is "so secret, occult, and concealed that an attempt to administer any set of legal rules [with] respect to [it] would be involved in hopeless uncertainty, and would, therefore, be practically impossible," due to the poor understanding of groundwater's "existence, origin, movement and of course" the time.[317] The court further justified the adoption of the rule of capture by stating that any "recognition of correlative rights[318] would interfere, to the material detriment of the commonwealth, with drainage and agriculture, mining, the construction of highways and railroads,

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308. *Sipriano*, 1 S.W.3d at 80.

309. *Id.* at 75.

310. Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 30 (Tex. 1978).

311. Douglas G. Caroom, *Water Law in a Nutshell*, *available at* http://www.bickerstaff.com/articles /waternut.htm, ¶ 3 (last modified Oct. 24, 1997).

312. Frazier v. Brown, 12 Ohio St. 294, 304 (Ohio 1861), *overruled by* Cline v. Am. Aggregates Corp., 15 Ohio St.3d 384 (holding that percolating water is water moving "without any distinct and definite channel, ooz[ing], filter[ing] and percolat[ing]").

313. Caroom, *supra* note 311, ¶ 9 (describing underflow as aquiferous water that flows beneath a surface water course, mainly occurring in sand and gravel deposits found beneath a surface water course's streambed, but "hydrologically connected to the surface flow of the stream"); *see also* Wells A. Hutchins, *Trends in the Statutory Law of Ground Water in the Western States*, 34 TEX. L. REV. 157, 160 (1955).

314. Caroom, *supra* note 311, ¶ 10 (describing an underground stream as a subsurface watercourse and sharing in common all characteristics of a surface watercourse such as "beds, banks which form a channel, and a current of water"); *see also* Richard C. Ausness, *Water Rights Legislation in the East: A Program for Reform*, 24 WM. & MARY L. REV. 547, 550 (1983).

315. BARCELONA, *supra* note 32; *see also* Caroom, *supra* note 311, ¶ 12 (describing artesian water as "groundwater confined under pressure by an impermeable geologic layer, capable of flowing 'above the first impervious stratum below the surface of the ground' when properly cased in a well").

316. Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 148, 81 S.W. 279, 280 (1904).

317. *Id.* at 281 (quoting *Frazier*, 12 Ohio St. at 311).

318. *See* discussion *supra* Part IV.C.

with sanitary regulations, building and the general progress of improvement in works of embellishment and utility."[319] All groundwater in Texas is assumed to be percolating by default.[320]

If groundwater either underflows a surface stream or is part of an underground stream, then it is deemed to be owned by the state.[321] However, for a subsurface stream to be deemed legally similar to a surface stream, it must possess the same characteristics of the surface stream.[322] These characteristics are "beds, banks [which] will form [a] channel, and a current of water."[323] In addition, at least one Texas aquifer has been held to not be an underground stream by the legislature.[324] Finally, if otherwise percolating or artesian waters form or appreciably contribute to the source or path of a surface stream, then they are also subject to state ownership.[325] Artesian water sources are deemed akin to percolating waters in Texas, and so are subject to private ownership and the rule of capture.[326] The one distinction made between ownership of percolating waters and artesian waters is found in the Texas Water Code (Code).[327] The Code mandates that the drilling of wells [328] into artesian aquifers be regulated by the TCEQ,[329] and waste[330] is prohibited.

One interesting wrinkle that has recently developed in the ownership of groundwater under the Texas rule of capture is the issue of the storage of

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319. *Frazier*, 12 Ohio St. at 294.

320. *See e.g.*, Tex. Co. v. Burkett, 117 Tex. at 29, 296 S.W. at 278 (1927) ("[T]he presumption is that the sources of water supply . . . are ordinary percolating waters, which are the exclusive property of the owner of the surface. . . ."); *see generally* Denis v. Kickapoo Land Co., 771 S.W.2d 235 (Tex. App. —Austin 1989, writ denied) (applying legal presumption of percolating groundwater to find no liability); Bartley v. Sone, 527 S.W.2d 754, 760 (Tex. Civ. App.—San Antonio 1974, writ ref'd n.r.e.) (presuming that groundwater is percolating); Pecos County Water Control & Improvement Dist. No. 1 v. Williams, 271 S.W.2d 503, 506 (Tex. Civ. App.—El Paso 1954, writ ref'd n.r.e.) (presuming percolation of groundwater); Caroom, *supra* note 311, ¶ 13.

321. TEX. WATER CODE ANN. § 11.021 (Vernon 2000); *Burkett*, 117 Tex. at 29, 296 S.W. at 278 (holding surface water or subsurface streams with defined channels are the property of the state); *Houston*, 98 Tex. at 146, 81 S.W. at 279 (stating rule of absolute ownership only applies to percolating groundwater); Caroom, *supra* note 311, ¶ 13.

322. *Denis*, 771 S.W.2d at 235.

323. Caroom, *supra* note 311, ¶ 10.

324. Tex. S.B. 1477, 73rd Leg., R.S., ch 626, 1993 Tex. Gen. Laws 2350.

325. *See* Fleming v. Davis, 37 Tex. 173, 201 (1873) (ruling that spring waters nourishing surface waters governed by surface water rules); *see also* Bartley v. Sone, 527 S.W.2d 754 (Tex. Civ. App.—San Antonio 1974, writ ref'd n.r.e.) (ruling that landowners own percolating waters not applicable to subterranean streams, river overflow, nor springs that are source of flowing stream or that add appreciably to streamflow).

326. Caroom, *supra* note 311, ¶ 12.

327. TEX. WATER CODE ANN. § 11.201 (Vernon 2000).

328. *Id.*

329. *Id.* § 11.202.

330. Waste is defined as the willful or knowing cause or permitting of the "water to run off [of] the owner's land or to percolate through the stratum above which the water is found." *Id.* § 11.205.

appropriated groundwater in existing aquifers.[331] The recent trend toward underground storage has its genesis in the current concern over the high financial and environmental costs of dams,[332] as well as the high evaporation rates associated with water storage in reservoirs.[333] This practice has an extensive legal history in other states,[334] but its utilization in Texas is relatively new.[335] In 1995, the 74th Legislature added provisions to the Code to enable the storage of appropriated water in aquifers.[336] Under the current Code, the TCEQ is to begin to determine the feasibility of artificial groundwater storage by issuing temporary and term permits for demonstration projects.[337] The permits may be reissued on a more permanent basis at the end of the temporary term[338] if the project meets several criteria outlined in § 11.154 of the Code.[339] Additional criteria include the adverse effects injected surface water has had on the aquifer, the feasibility of withdrawing the stored water from the aquifer a second or repeat time, and the monitoring scheme in place to restrict the unauthorized use of the stored water.[340]

Another consequence of this practice, currently untested under Texas law, that appears in other states, is that once water has been withdrawn from the ground, its character as being "captured" for use by the appropriator is fixed, even if the water is re-injected into the ground.[341]

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331. SAX ET AL., *supra* note 7, at 431.

332. SAX ET AL., *supra* note 7, at 431 n.3.

333. Caroom, *supra* note 311, ¶ 67.

334. Niles Sand & Gravel Co. v. Alameda County Water Dist., 112 Cal. Rptr. 846 (1974) (allowing the Alameda County Water Dist. to engage in "water replenishment" in San Francisco Bay to forestall saltwater intrusion); *see also* Jensen v. Dep't of Ecology, 685 P.2d 1068 (Wash. 1984) (clarifying that mingling of water stored artificially in an aquifer with naturally occurring water has not lost its identity and thereby reverted back to the public domain); *see generally In re* Application U-2, 413 N.W.2d 290 (Neb. 1987) (holding incidental water mound formed by leaking county canal system was not available for private appropriation).

335. The first case raising this issue in Texas courts was brought in 1995 in Tex. Rivers Prot. Assoc. v. Tex. Natural Res. Conservation Comm'n, 910 S.W.2d 147 (Tex. App.—Austin 1995, writ denied).

336. Act of June 5, 1995, 74th Leg., R.S., ch. 309, 1995 Tex. Sess. Law Serv. 2693.

337. TEX. WATER CODE ANN., § 11.153(a) (Vernon 2000).

338. *Id.* §§ 11.153(c), .154.

339. *Id.* § 11.154.

340. *Id.* § 11.154(c)(d).

341. *In re* Application U-2, 413 N.W.2d at 290 (applying the fixed nature test in a reasonable use state); *see also* Jensen, 685 P.2d at 1068 (applying the fixed nature test in a prior appropriation state). It should be noted here that the Austin Court of Appeals ruled precisely against the national trend in *Tex. Rivers Prot. Assoc.*, and held that beneficial use of the injected water controls its title, and therefore that injected water, no matter who withdrew it, reverts back to an attainable water resource under the Rule of capture once it is reinjected. Tex. Rivers Prot. Assoc. v. Tex. Natural Res. Conservation Comm'n, 910 S.W.2d 147, 155 (Tex. App.—Austin 1995, writ denied).

b. Exceptions

There are three exceptions to the common law rule of capture in Texas.[342] These three exceptions are as follows: (1) groundwater must be percolating,[343] (2) groundwater that is withdrawn from underneath one's own land may not be subject to waste,[344] and (3) groundwater cannot be withdrawn in order to maliciously injure another.[345]

The practical applicability of these exceptions is debatable as recent decisions have minimized the exceptions' effectiveness.[346]

First, the determination that groundwater is percolating often comes down to a "battle of the experts."[347] In the absence of clear certainty, courts will err on the side of the presumption of percolation.[348]

Second, actual instances where parties prevail on the exception for malicious withdrawal of groundwater is rare.[349] The requirement that one "maliciously [took] water for the sole purpose of injuring [one's] neighbor" has proven to be almost impossible to meet.[350] To do this, a landowner has to affirmatively prove that there is no other possible explanation for why the landowner's neighbor was draining the landowner's property, perhaps other than spite.[351] It has been proposed that the standard of proof required to prove this limitation is unattainable.[352]

Third, courts have shown little inclination to find the exception for wanton waste.[353] This reluctance by courts to find waste was exemplified by

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342. *See* Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 147-51, 81 S.W. 279, 280-82 (1904).

343. Caroom, *supra* note 311, ¶ 13.

344. Sipriano v. Great Springs of America, 1 S.W.3d 75, 76 (Tex. 1999) (clarifying that absent willful waste, a landowner may pump unlimited quantities of water from under the landowner's property); *see also* Friendswood Dev. Co. v. Smith-S.W. Indus., Inc., 576 S.W.2d 21, 29 (Tex. 1978) (explaining that the English rule limits "willful waste"); City of Corpus Christi v. City of Pleasanton, 154 Tex. 289, 294, 276 S.W.2d 798, 801 (Tex. 1955) (English rule prohibits wanton or willful waste); Pecos County Water Control & Improvement Dist. No. 1 v. Williams, 271 S.W.2d 503, 505 (Tex. Civ. App.—El Paso 1954, writ ref'd n.r.e.) (explaining that the absolute ownership prohibits waste); Cantwell v. Zinser, 208 S.W.2d 577, 579 (Tex. Civ. App.—Austin 1948, no writ) (explaining that the English rule does not encompass right to "intercept and waste percolating water"); *Houston*, 98 Tex. 149-51, 81 S.W. at 281-82 (explaining that the absolute ownership rule limits waste).

345. *Sipriano*, 1 S.W.3d at 76 (clarifying that, absent malice, a landowner may pump unlimited quantities of water from under the landowner's property); *see also Friendswood*, 576 S.W.2d at 29 (holding that the English rule limits "malicious malice"); *Corpus Christi*, 154 Tex. at 294, 276 S.W.2d at 801 (ruling that the English rule does not encompass malice or wanton conduct); *Houston*, 98 Tex. 149-51, 81 S.W.2d at 281-82 (stating that absolute ownership rule forbids malice or wanton conduct).

346. Lana Shannon Shadwick, *Obsolescence, Environmental, Endangerment and Possible Federal Intervention Compel Reformation of Texas Groundwater Law*, 32 S. TEX. L. REV. 641, 661-62 (1991).

347. *Id.* at 663.

348. Tex. Co. v. Burkett, 117 Tex. 16, 28-30, 296 S.W. 273, 278 (1927).

349. Shadwick, *supra* note 346, at 663.

350. *Corpus Christi*, 154 Tex. 289, 294, 276 S.W.2d at 801.

351. Shadwick, *supra* note 346, at 663.

352. *Id.*

353. George W. Pring & Karen A. Tomb, *License to Waste: Legal Barriers to Conservation and*

the 1955 *Corpus Christi* decision.[354] In that case, the court did not find waste, although up to seventy-four percent[355] of the water pumped for public benefit was lost due to "evaporation, transpiration and seepage."[356]

c. Liability

Under the rule of capture, proving any kind of liability against a neighboring "big pump" is difficult. Proving liability is complicated in Texas because of the presumption of groundwater percolation[357] and because the nature of the remedy sought can increase the burden of proof.[358] The typical and preferred remedy is to stop injurious pumping by injunction.[359] This remedy, the *Pecos* court warned, requires the petitioner to negate ". . . every other reasonable hypothesis except [the] one advanced by [the petitioner]."[360]

The concept of absolute ownership, so fundamental to the rule of capture, has been used to negate liability for well interference, stream baseflow reduction, land surface subsidence, and waste, as well as tort actions for nuisance and negligence.[361]

Houston is the leading case in Texas dealing with liability in well interference.[362] Under the "injury without a remedy" concept adopted in that case, the fact that the court found that the respondent's well was entirely drained and that the petitioner's withdrawal had been the proximate cause of the respondent's resulting dry well, resulted in the Court finding no cause of action and no subsequent recovery against the petitioner.[363]

Efficient Use of Water in the West, 25 ROCKY MTN. MIN. L. INST. 25-1, -18 (1979) "The cases reveal a remarkable judicial tolerance for waste despite rhetoric to the contrary." *Id.*; *see also* Robert Emmet Clark, *Background and Trends in Water Salvage Law*, 15 ROCKY MTN. MIN. L. INST. 421, 461 (1969) (explaining that the waste concept is "poorly defined[,] . . . hesitantly applied and rarely enforced"); Robert A. Pulver, Comment, *Liability Rules as a Solution to the Problem of Waste in Western Water Law: An Economic Analysis*, 76 CAL. L. REV. 671, 688 n.91 (1988) (*stating* that Courts rarely decree waste because there is no clearly defined standard of waste); *see also* discussion *infra* Part V.B.2.c.

354. 154 Tex. 289, 276 S.W.2d 798.

355. 154 Tex. at 291, 276 S.W.2d at 800. The amount of water lost ranged from approximately 6,300,000 gpd (19.30 afd.) to 7,500,000 gpd (22.98 afd.). *See* SAX ET AL., *supra* note 7, at 19 tbl. 1-6.

356. *Corpus Christi*, 154 Tex. at 291, 276 S.W.2d at 800.

357. Tex. Co. v. Burkett, 117 Tex. 16, 296 S.W. 273 (1927).

358. Todd, *supra* note 118, at 255.

359. Damages may also, and often are, pleaded, but the first priority for an injured landowner in a groundwater dispute is to stop the pumping that is causing the injured landowner harm, as is evidenced by most major groundwater rights cases that have been litigated in Texas. *Corpus Christi*, 154 Tex. 289, 276 S.W.2d 798 (bringing suit to enjoin the harmful withdrawal and transport of the plaintiff's groundwater); Pecos County Water Control & Improvement Dist. No. 1 v. Williams, 271 S.W.2d 503 (Tex. Civ. App.—El Paso 1954, writ ref'd n.r.e.) (bringing an injunctive action to cease the harmful pumping of the plaintiff's groundwater).

360. *Pecos*, 271 S.W.2d, at 503.

361. Todd, *supra* note 118, at 251-52.

362. 98 Tex. 146, 81 S.W. 280 (1904).

363. Todd, *supra* note 118, at 252.

Liability for stream baseflow reduction is not generally recognized in Texas.[364] However, there is some dissension among Texas courts on this issue. In 1954, the *Pecos* court did not impose liability on the pumpers for drainage of feeder springs to Commanche Springs.[365] The court held the springs were not owned until they emerged from the ground, not while merely flowing underground.[366] This holding is in direct conflict with both the Texas Supreme Court[367] and the San Antonio Court of Civil Appeals.[368] In *Bartley*, the San Antonio court ruled that

> absence of evidence that the flow of the spring in question had its source in a subterranean stream, or was of sufficient magnitude to be of any value to riparian proprietors, or was the source of, or added perceptibly to the flow of, a stream, it will be presumed that the spring was of such character that plaintiff "had the right . . . to . . . the use of their waters for any purpose."[369]

This ruling opened the door for the possibility that if an injured landowner could prove the source of the landowner's stream was subterranean, or that a large portion of the landowner's streamflow was derived from a subterranean source, the general rule of capture would not apply.[370]

The Texas Supreme Court ruled that there is no recognized claim for liability due to land subsidence.[371] This ruling came despite evidence presented at trial that the respondent had prior knowledge that subsidence would be the likely result of the pumping scheme that was ultimately put into place.[372] The court's stated reasoning for the decision was along the lines of the "injury without a remedy" doctrine of *Acton*,[373] stating that the damages suffered by the petitioner were "without the invasion of legal right or the violation of a legal duty."[374] The court did hold that if a landowner negligently withdraws water from the landowner's property, and that is found to be the proximate cause for subsidence on another's land, then the pumper may be held liable for such subsidence.[375]

364. *Id.*
365. *Pecos*, 271 S.W.2d at 505.
366. *Id.*
367. Fleming v. Davis, 37 Tex. 173 (1873).
368. Bartley v. Sone, 527 S.W.2d 754 (Tex. Civ. App.—San Antonio 1974, writ ref'd n.r.e.).
369. *Id.* at 760.
370. Caroom, *supra* note 311, ¶ 10.
371. Friendswood Dev. Co. v. Smith-S.W. Indus., Inc., 576 S.W.2d 21 (Tex. 1978).
372. Todd, *supra* note 118, at 252.
373. Acton v. Blundell, 152 Eng. Rep. 1223, 1235 (1843).
374. *Friendswood*, 576 S.W.2d at 28.
375. *Id.*

The common law theory of nuisance, frequently defined as the substantial and unreasonable interference with the use or enjoyment of land,[376] is in direct conflict with the *Houston* court's holding that "[n]o action lies against the owner for interfering with or destroying percolating or circulating water under the earth's surface."[377] Because of this, groundwater well interference that would nominally come under the purview of nuisance law in forty other states in the Union, does not do so in Texas.

Negligence is the one injury where a Texas plaintiff may be able to be granted some relief. This glimmer of judicial hope to injured landowners or water consumers was first ruled upon by the Texas Supreme Court in 1936 in *Turner v. Big Lake Oil Co.*[378] The court stated that "the law imposes [a duty] upon all persons to use due care in the use of their property or the conduct of their business to avoid injury to others."[379] Although the *Friendswood* court endorsed this recovery theory, the court refrained from using it in the case at bar so as not to complicate nor confuse future property cases.[380] Curiously, this argument has largely disappeared from subsequent groundwater cases.[381] This is perhaps due to the *Friendswood* court's strict interpretation that *Turner* only applies to subsidence cases after 1978,[382] or more likely, that the "injury" mentioned in *Turner*[383] is rendered nonexistent by the *Acton* and *Houston* decisions' nonexistent injury maxim.[384]

The courts also continue to be somewhat unclear on the liability standard applied for wasting groundwater. Beginning in 1948, the court of Civil Appeals in Austin condemned the loss of water from a "leak[y] . . . earthen tank," stating that "waste of natural resources is against the public policy of this State."[385] But as previously mentioned, the court in the *Corpus Christi* case refused to find waste of groundwater pumped and transported in such a manner so as to lose up to seventy-four percent of its original volume to "evaporation, transpiration and seepage."[386] The court justified its holding by stating that the "percentage of the [water lost to] evaporation, seepage, et cetera is wholly immaterial."[387]

376. RESTATEMENT, *supra* note 188, §§ 86, 88.
377. Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 150, 81 S.W. 279, 281 (1904) (quoting Pixley v. Clark, 35 N.Y. 520 (1866)).
378. 128 Tex. 155, 159-61, 96 S.W.2d 221, 223 (Tex. 1936).
379. *Id.*
380. Friendswood Dev. Co. v. Smith-S.W. Indus., Inc., 576 S.W.2d 21, 30 (Tex. 1978).
381. Todd, *supra* note 118, at 253.
382. *Id.*
383. *Turner*, 128 Tex. at 161, 96 S.W.2d at 223.
384. Acton v. Blundell, 152 Eng. Rep. 1223, 1235 (1843); Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 149, 81 S.W. 279, 280 (1904).
385. Cantwell v. Zinser, 208 S.W.2d 577 (Tex. Civ. App.—Austin 1948, no writ).
386. City of Corpus Christi v. City of Pleasanton, 154 Tex. 289, 291, 276 S.W.2d 798, 800 (1955).
387. *Id.* at 154 Tex. at 295, 276 S.W.2d at 803.

VI. CURRENT PROBLEM

A. Private Acquisition, Depletion, and Distribution of Panhandle Groundwater

1. History

Water rights and development have long been important to the livelihoods of farmers and residents in the Panhandle. The discovery of the HPA at the turn of the 20th century[388] and later development of the HPA in the 1940s allowed increased agricultural production and the urbanization of previously sparsely inhabited areas.[389]

Public water marketing began in the Panhandle in the 1920s when the city of Amarillo purchased water rights to its present-day water system, including a well-field and distribution system, from private landowners in Randall County.[390] During a severe drought in the mid-1950s, Amarillo purchased water rights to approximately sixteen thousand acres in Carson County, and an additional one hundred thousand acres in Dallam and Hartley Counties.[391] In 1986, the city purchased the water rights to another eighteen thousand acres in northern Potter County.[392]

The present day water market in Roberts County began in the 1970s, when Quixx Corp. (Quixx), a subsidiary of public utility provider Xcel Energy, purchased approximately one hundred thousand acres in order to provide water for a nuclear power plant.[393]

In 1997, after Quixx won its suit in district court upholding its ability to transport water from the site from which the water was pumped.[394] It sold water rights to 42,765 of its 100,000 acres to the Canadian River Municipal Water Authority (CRMWA)[395] to augment Lake Meredith, the principal source of potable water for both Amarillo and Lubbock.[396] Quixx sold another forty thousand acres to the city of Amarillo as well,[397] although the

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388. *See* JOHNSON, *supra* note 61, at 681-83.

389. LITKE, *supra* note 37, at 4.

390. Rick Storm, *Water Wars an Old Story*, AMARILLO GLOBE-NEWS, June 30, 2002, ¶ 3, *at* http://www.amarillonet.com/stories/063002/new_waterwars1.shtml (last modified June 30, 2002) [hereinafter *Water Wars*].

391. *Id.* ¶ 7. These water rights, purchased some fifty years ago, have still not been exercised to this day. *Id.* ¶ 9.

392. *Id.* ¶ 11.

393. *Id.* ¶ 12. The planned nuclear power facility was never pursued due to the nationwide political trend during the decade to move away from nuclear power. *Id.* ¶ 13.

394. *See* discussion *infra* Part VI.A.2.

395. The CRMWA's member cities are Amarillo, Brownfield, Borger, Lamesa, Levelland, Lubbock, O'Donnell, Pampa, Plainview, Slaton and Tahoka. *Water Wars*, *supra* note 390, at ¶ 31.

396. Patoski, *supra* note 1, at 120.

397. *Water Wars*, *supra* note 390, ¶ 26.

city still has not begun exploration on its acreage[398] and does not plan to do so for another twenty-five years.[399] The CRMWA, however, began pumping and transporting water from its twenty-seven wells through a fifty-four inch pipeline in December 2001.[400] By sheer coincidence, the CRMWA property lies on the southwest border of a twenty-four thousand acre tract of land[401] owned by Texas businessman T. Boone Pickens.[402] Mr. Pickens has owned the Mesa Vista Ranch since 1971, but has said he did not consider developing the water resources underneath his land until the CRMWA began its development in the late 1990s.[403] In order to protect his water rights under the "Rule of the Big Pump,"[404] Mr. Pickens organized neighboring landowners and formed a corporation called Mesa, Inc. (Mesa), gaining control of the water rights for nearly one hundred and fifty thousand acres in Roberts County.[405] The formation of Mesa led directly to eventual administrative allocation of water rights in Roberts County.[406]

2. *Litigation and Regulation*

The acquisition of the acreage by Quixx in Roberts County spurred the first litigation of this issue. In 1994, Quixx sued the Panhandle Groundwater Conservation District (PGCD)[407] in the 251st District Court, challenging a district rule that required a permit in order for water right owners to transport water out of the PGCD.[408] Judge Patrick Pirtle ruled against the PGCD on December 4, 1995, stating that "any rule attempting to regulate or prevent the transportation of water out of the district is ultra vires and invalid."[409] The judge went on to hold that "[t]he district does not have the authority to regulate or prevent, by permit or otherwise, the transportation of water outside of the district."[410] This ruling comports with the rule of capture[411] and complies with § 36.122(g) of the Water Code that states "[t]he district may

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398. *Id.*

399. Rick Storm, *Pickens Gets Water Permit*, AMARILLO GLOBE-NEWS, May 16, 2002, ¶ 14, *at* http://www.amarillonet.com/stories/051602/new_getswater.shtml (last modified May 16, 2002) [hereinafter *Gets Permit*].

400. *Id.* ¶ 13; *see also* Water Wars, *supra* note 390, ¶ 29.

401. Mr. Pickens' ranch is called the Mesa Vista Ranch. *Water Wars*, *supra* note 390, ¶ 39.

402. *Id.*

403. *Id.*; *see also* Joseph Nocera, *Return of the Raider*, FORTUNE, May 27, 2002, at 100.

404. Beard, *supra* note 140, ¶ 7.

405. *Water Wars*, *supra* note 390, ¶ 41; *see also* Patoski, *supra* note 1, at 120.

406. *Permits Given to Draw Ogallala Aquifer Water*, HOUSTON CHRONICLE, May 16, 2002, at A30.

407. The PGCD is comprised of the twenty-one most northern counties in Texas, including Roberts County. DIST. MGMT. PLAN, *supra* note 59, at 5.

408. *Water Wars*, *supra* note 390, ¶ 19. The city of Amarillo intervened in the Quixx suit as well. *Id.*

409. *Id.*

410. *Id.*

411. *See* discussion *supra* Part V.B.2.

not deny a permit based on the fact that the applicant seeks to transfer groundwater outside of the district. . . ."[412]

The ability of GCDs to encroach upon the common law right of capture was again limited in *South Plains Lamesa Railroad v. High Plains Underground Water Conservation District No. 1*, where the Amarillo Court of Appeals held that the High Plains Underground Water Conservation District (HPGCD) could not deny a water permit based on the "disproportionate" amount of water pumped to the size of land owned.[413]

The most recent adjudication of water rights in the Panhandle was initiated by T. Boone Pickens, acting on behalf of Mesa. Drawing on his entrepreneurial background,[414] Mr. Pickens directed Mesa to attempt to market its water rights to interested municipalities statewide, including Dallas-Fort Worth, El Paso, and San Antonio.[415] In September of 2000, Mesa applied to the PGCD for eight[416] high impact permits[417] to pump one hundred and fifty thousand afy (one afy per acre owned).[418] In June of that year, however, the CRMWA filed a protest to Mesa's application with the PGCD, claiming that Mesa's application was too vague and might impinge on the water rights of one of the eleven member municipalities that the CRMWA serviced.[419]

Mesa and the CRMWA attempted to negotiate an agreement but failed to do so.[420] Mesa subsequently filed suit against the CRMWA , in August of 2001, in the 31st District Court before Judge Steven Emmert.[421] Mesa sought an injunction against the CRMWA[422] to prevent it from using its wells until it had prepared a Takings Impact Assessment in accordance with the Texas Private Real Property Rights Preservation Act (TPRPRPA).[423] The city of

412. TEX. WATER CODE ANN. § 36.122(g) (Vernon Supp. 2003).

413. 52 S.W.3d 770, 779 (Tex. App.—Amarillo 2001, no pet.).

414. Nocera, *supra* note 403, at 100.

415. *Tycoon, Landowners Woo Potential Water Customers*, LUBBOCK AVALANCHE-JOURNAL, January 25, 2002, ¶ 5, *at* http://www.lubbockonline.com/stories/012502/sta_012502059.shtml (last modified Jan. 25, 2002) [hereinafter *Tycoon*]; *see also Water Wars*, *supra* note 390, ¶ 42; Patoski, *supra* note 1, at 120.

416. *Gets Permit*, *supra* note 399, ¶ 11.

417. A high impact permit is defined by the PGCD as any permit for more than 350,000 gallons per acre (alternatively; for an acrefoot or more). PANHANDLE GROUNDWATER CONSERVATION DIST., PANHANDLE GROUNDWATER CONSERVATION DIST. RULES, RULE 4.5(1) (1998).

418. *Water Wars*, *supra* note 390, ¶ 45.

419. *Id.*; *see also Tycoon*, *supra* note 415, ¶ 8.

420. Rick Storm, *Roberts County, Tex., Water Dispute Could Be Settled*, AMARILLO GLOBE-NEWS, January 17, 2002, ¶ 1, *at* http://www.amarillonet.com/stories/011702/new_besettled.shtml (last modified Jan. 17, 2002) [hereinafter *Settled*].

421. *Dallas and State Digest—Miami*, FORT WORTH STAR-TELEGRAM, February 7, 2002, ¶ 38 (on file with the Texas Tech Journal of Texas Administrative Law) [hereinafter *State Digest*].

422. Rick Storm, *Judge Rules for CRMWA Over Mesa*, AMARILLO GLOBE-NEWS, February 7, 2002, ¶ 6, *at* http://www.amarillonet.com/stories/020702/new_overmesa.shtml (last modified Feb. 7, 2002) [hereinafter *Judge Rules*].

423. Chapter 2007, subtitle A, title 10 of the TEX. GOV'T CODE ANN. (Vernon 2000 & Supp. 2003).

Amarillo later intervened as a codefendant.[424] In October of 2001, Judge Emmert heard motions for summary judgment from the CRMWA and partial summary judgment from Mesa.[425] In early February of 2002, the judge ruled against Mesa, granting summary judgment for the CRMWA on the grounds that Mesa had failed to show that the CRMWA wellfield adjacent to the Mesa Vista Ranch was infringing on Mr. Pickens' property rights under the TPRPRPA.[426] Immediately following the district court's ruling, Mesa appealed the decision to the Amarillo Court of Appeals on February 26, 2002.[427]

In the interim, the PGCD voted to approve Mesa's permit applications on May 15, 2002, allowing Mesa to pump up to one hundred and fifty thousand afy, after Mesa and the CRMWA had agreed to a draft agreement.[428] Several conditions were imposed as part of the permit approval. The most significant of these are as follows: (1) before any well drilling can commence and within five years, Mesa must find a destination user, which must be a municipality in Texas, or the permit automatically expires; (2) after the destination user is identified, Mesa must begin construction within two years and have all construction complete within five years of identifying the municipality,[429] or the permit automatically expires; (3) each municipality identified must file and abide by conservation and drought plans; (4) Mesa will be charged an export fee; (5) Mesa must, at its own expense, construct at least twenty-five monitoring wells; and (6) Mesa cannot drill wells less than one-half mile from any project boundary, and may not drill more than two wells per section.[430]

Because the PGCD approved Mesa's permit application, Mesa dropped the appeal in the Amarillo Court of Appeals on May 23, 2002.[431] The three-

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424. *Judge Rules*, *supra* note 422, ¶ 9.

425. *Settled*, *supra* note 420, ¶ 15.

426. *Judge Favors Water Authority*, LUBBOCK AVALANCHE-JOURNAL, February 7, 2002, ¶ 1-2, *at* http://www.lubbockonline.com/stories/020702/reg_020702052.shtml (last modified Feb. 7, 2002); *see also* *Judge Rules*, *supra* note 422, ¶ 2-3; *State Digest*, *supra* note 421, ¶ 3.

427. Kennedy v. Canadian River Mun. Water Auth., No. 07-02-0103-CV (Tex. App.—Amarillo 2002, no pet.) (filed February 26, 2002) (not designated for publication).

428. *Gets Permit*, *supra* note 399, ¶ 2; *see also* William McKenzie, *Politics of Water Looking More Like Politics of Oil*, DALLAS MORNING NEWS, May 21, 2002, at 19A; *Permits Given to Draw Ogallala Aquifer Water*, HOUSTON CHRONICLE, May 16, 2002, at A30.

429. Construction of the infrastructure necessary to pump and transport HPA water out of the High Plains has been estimated to cost anywhere from $1.20 to $1.80 billion dollars. Nocera, *supra* note 403, at 100.

430. C.E. Williams, *Water Plan Protects Interests*, AMARILLO GLOBE-NEWS, May 26, 2002, ¶ 12, *at* http://www.amarillonet.com/stories/052602/nopi_williams.shtml (last modified May 26, 2002) (it should be noted that Mr. Williams is the Manager of the PGCD). A section is equivalent to one square mile or 640 acres, so Mesa's permit allows for the drilling of up to 468 wells. *See* DICTIONARY, *supra* note 34, at 2752.

431. Appellant's Motion for Dismissal, Kennedy et al. v. Canadian River Mun. Water Auth., No. 07-02-0103-CV (Tex. App.—Amarillo 2002, no pet.) (filed May 23, 2002).

judge panel later issued an order on May 30, granting Mesa's motion for dismissal.[432] The dismissal of this action, while understandable under the factual background, is unfortunate. If this case had been argued before the Amarillo court, and then appealed to the Texas Supreme Court, the unanswered question concerning the future of the right of capture in Texas may have been settled once and for all.

One of the latest development in the ongoing saga is that the CRMWA filed a motion for a rehearing with the PGCD on May 28, 2002, alleging that a paragraph included in the draft agreement between Mesa and the CRMWA was not included in the final permit approved by the district.[433] This paragraph apparently contained language that allows the PGCD to regulate the water withdrawals of both Mesa and the CRMWA with modeling of *projected* water use, not *actual* water use.[434] The CRMWA contended that the existing permit holders could be harmed if a speculative model predicted that the "50/50" rule would be broken.[435] If this occurred, the PGCD could cut back the permits of existing users;[436] however, the CRMWA withdrew their motion for rehearing in the summer of 2002 prior to the issuance of the permits.[437]

Also during this past summer, Mr. Pickens announced in a statement made before the Texas Water Advisory Council that Mesa was ready, willing and able to deliver up to 150,000 afy of water to anywhere in the state within five to seven years.[438] Mr. Pickens bolstered this assertion, explaining that he had received assurances from both investment bankers and civil engineers that tax-exempt financing would be available and that the actual construction of the water pipeline would be feasible.[439]

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432. Kennedy v. Canadian River Mun. Water Auth., No. 07-02-0103-CV (Tex. App.—Amarillo 2002, no pet.) (not designated for publication).

433. *Water Wars*, *supra* note 390, ¶ 58; *see also* Rick Storm, *Water Hearing to be Decided*, AMARILLO GLOBE-NEWS, June 6, 2002, ¶ 4, *at* http://www.amarillonet.com/stories/060602/new_water hearing.shtml (last modified June 6, 2002) [hereinafter *Hearing*]; Kay Ledbetter, *CRMWA Wants Rehearing on Water Permits*, AMARILLO GLOBE-NEWS, May 30, 2002, ¶ 4, *at* http://www.amarillonet.com/stories/053002/new_onwater.shtml (last modified May 30, 2002) [hereinafter *CRMWA Wants*].

434. Email from Kent Satterwhite, General Manager, Canadian River Municipal Water Authority, to Dylan O. Drummond, 3L law student, Texas Tech University School of Law (June 6, 2002, 23:05 CST) (on file with the Texas Tech Journal of Texas Administrative Law); *see also* Hearing, *supra* note 433, ¶ 4; *CRMWA Wants*, *supra* note 433, ¶ 5-6.

435. The "50/50" rule is the rule mandated under Chapter 36 of the TEX. WATER CODE ANN. whereby no less than 50% of the 1998 saturated thickness of the HPA must be remaining in 50 years time. Friendswood Dev. Co. v. Smith S.W. Indus., Inc., 576 S.W.2d 21, 30 (Tex. 1978); *see also* WATER FOR TEXAS—2002, *supra* note 82, at 88.

436. *CRWMA Wants*, *supra* note 433, ¶ 11.

437. Email from C.E. Williams, General Manger, Panhandle Groundwater Conservation District, to Dylan O. Drummond, 3L law student, Texas Tech University School of Law (April 24, 2003, 15:56 CST) (on file with the Texas Tech Journal of Texas Administrative Law).

438. Rick Storm, *Pickens Ready to Deliver Water*, AMARILLO GLOBE-NEWS, August 23, 2002, ¶ 3, *at* http://www.amarillonet.com/stories/082302/tex_pickensready.shtml (last modified Aug. 23, 2002).

439. *Id.*

As part of the effort to finance the project, Mesa filed a petition with the Roberts County Commissioners Court to declare the land it owned a fresh water supply district under Texas law.[440] The proposed district would span the 46,507 acres that Mesa owned, and would enable the group the state-ordained power to impose taxes, "issue tax-free bonds, and assert eminent domain" against other landowners.[441] At the initial meeting of the county commissioners, the petition was tabled pending the completion of an environmental impact assessment by Mesa.[442] This petition was matched by a separate motion from a group of landowners in Roberts County that were seeking to create a fresh water supply district that would be administered countywide, and not just by Mesa.[443] In response to this petition, the commissioners court again recommended the completion of a takings impact study on the countywide motion.[444] The end result of all of the petitioning back and forth resulted in Mesa announcing in late March of 2003 that it was withdrawing its fresh water supply district petition.[445]

B. Implications of Panhandle Water Wars

The current trend playing out in the northern Panhandle raises several important implications for groundwater law in Texas. One immediate effect of the recent developments in the Panhandle has been to spawn other water speculating companies who are already working to acquire the remaining water rights in West Texas. Already, another Amarillo-based private development group has placed almost one hundred and ninety acres of Panhandle land under option for the purpose of water exploration.[446] Still another group has emerged as well, comprised of over one hundred and fifty undivided interests, and has been in contact with a Phoenix, Arizona based entrepreneur discussing the possibility of building a water-bottling plant in Roberts County.[447]

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440. Rick Storm, *Roberts County Tables Water Petition*, AMARILLO GLOBE-NEWS, November 13, 2002, ¶ 1, *at* http://www.amarillonet.com/stories/111302/new_tableswater.shtml (last modified Nov. 13, 2002).

441. *Id.* ¶ 2.

442. *Id.* ¶ 1.

443. Rick Storm, *Water Fight*, AMARILLO GLOBE-NEWS, March 2, 2003, ¶ 3, *at* http://www.amarillonet.com/stories/030203/tex_waterfight.shtml (last modified Mar. 2, 2003).

444. *Id.* ¶ 7.

445. Email from Rick Storm, Reporter, AMARILLO-GLOBE NEWS, to Dylan O. Drummond, 3L law student, Texas Tech University School of Law (March 30, 2003, 15:26 CST) (on file with the Texas Tech Journal of Texas Administrative Law).

446. Patoski, *supra* note 1, at 120.

447. Rick Storm, *Water Wars: Another Landowners' Group Eyes Roberts County Water*, AMARILLO GLOBE-NEWS, July 1, 2002, ¶ 9, *at* http://www.amarillonet.com/stories/070102/new_waterwars.shtml (last modified July 1, 2002) [hereinafter *Another Group*].

As the twenty-three rural and urban Panhandle municipalities[448] begin to compete with the private development groups for groundwater ownership, and groundwater appropriated under the rule of capture begins to be sold to far away communities in need of water resources, either the Texas courts or the GCDs will be forced to more directly confront the situation, perhaps even starting the "last great water war" in the state.[449]

Up to this point, the Texas Supreme Court has refrained from modifying the traditional rule of capture, instead favoring the newly enacted framework of S.B. 1.[450] Local GCDs have the authority to regulate such use under previous state supreme court decisions.[451] Once private withdrawal in the Panhandle counties begins to move toward exceeding the 50% limit imposed under the TWDB's state water plan,[452] either common law suits will reach the Texas Supreme Court again or the local GCDs will be forced to modify the rule of capture. After 98 years of fervent adherence to the rule of capture, whichever entity, the court or the GCDs, steps in to regulate the Panhandle groundwater situation, it will certainly face intense opposition, and because of the economic dependency of this region on groundwater,[453] a new round of Water Wars.

VII. CURRENT SOLUTION

A. Enforcement of Senate Bill 1

The primary solution to the current situation in the Panhandle is to do what the Texas Supreme Court has recommended and give the newly adopted framework of S.B. 1 time to cement itself into Texas jurisprudence and practice.[454]

Although S.B. 1 does not expressly preempt the rule of capture, it does enable GCDs and the TWDB much greater power and discretion in enforcing and monitoring groundwater use.[455] Under S.B. 1, the local GCDs form planning groups that submit their proposals directly to the TWDB for assimilation into the five-year state water plan.[456]

If the Panhandle and Llano Estacado GCD water plans are not adhered to nor enforced, the economic impacts on the region and the state could be staggering. The current economic benefit *per acre foot* of water in the High

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448. WATER FOR TEXAS—2002, *supra* note 82, at 88.
449. Patoski, *supra* note 1, at 120.
450. Sipriano v. Great Springs Waters of Am., 1 S.W.3d 75, 80 (Tex. 1999).
451. *See, e.g.*, Friendswood Dev. Co. v. Smith-S.W. Indus., Inc., 576 S.W.2d 21, 30 (Tex. 1978).
452. WATER FOR TEXAS—2002, *supra* note 82, at 88.
453. *See id.* at 122.
454. *Sipriano*, 1 S.W.3d, at 75.
455. *See* Act of June 19, 1997, 75th Leg., R.S., ch. 1010, 1997 Tex. Gen. Laws 3610.
456. Skillern, *supra* note 276, at 198.

Plains of Texas is $575,105.[457] Mining of the HPA will be measured in afy or maf, so the financial risk of allowing the drawdown of the HPA could well run into the trillions of dollars. Because of this possible result, strict judicial adherence to the framework established by S.B. 1 must be encouraged, so as to legitimatize the fledgling regulatory powers now vested in the GCDs statewide.

B. Correlative Rights Use Doctrine

Either by judicial fiat, or by legislative enactment, the rule of capture must be discarded as the controlling law of groundwater ownership in Texas. The most beneficial and equitable use doctrine employed today is the correlative rights use doctrine. The doctrine allows for the withdrawal of groundwater beneath one's property provided that the amount depleted does not exceed the proportionate size of the overlying property.[458] Correlative rights avoids the obfuscation of the reasonable use American and Restatement rule distinctions,[459] while preventing the injury to neighboring landowners due to depletion effects allowed under reasonable use.[460] Another major benefit to the adoption of the correlative use doctrine is that it encourages larger tract sizes, because the amount of water one can pump depends on the proportionate size of their overlying land.[461] Under the existing common law structure, a landowner can buy a tract of land just large enough to accommodate a pump and begin pumping as much as the landowner can capture.[462] Under the present-day rule of capture, future water speculators will not have to go to the trouble that Mesa has, gathering up one hundred and fifty thousand acres of water rights.[463] Under a correlative rights apportionment, the current, disturbing trend of habitat fragmentation[464] would be forestalled in large part due to the increased economic value of the water underlying one's land.[465]

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457. WATER FOR TEXAS—2002, *supra* note 82, at 122 tbl.12-1 (illustrating the direct economic benefit per acrefoot of water of different water uses for the Texas Panhandle (regions A & O represent the Panhandle)).

458. Castleberry, *supra* note 189, at 507-08.

459. Wright v. Goleta Water Dist., 219 Cal. Rptr. 740, 746-47 (Ct. App. 1985).

460. Castleberry, *supra* note 189, at 507-08.

461. *Id.*

462. S. Plains Lamesa R.R. v. High Plains Underground Water Conservation Dist. No. 1, 52 S.W.3d 770, 779 (Tex. App.—Amarillo 2001, no pet.) (holding that the prevention of pumping a "disproportionate amount of water as it relates to the tract size is *contrary* to the rule of capture as applied to underground water in Texas law") (emphasis added); *accord* Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 81 S.W. 279 (Tex. 1904).

463. *Water Wars*, *supra* note 390, ¶ 41.

464. SCHMIDLY ET AL., *supra* note 240, at 31.

465. Even under the rule of capture, which guarantees no vertical, appurtenant water right to underlying groundwater, land prices in otherwise unproductive Roberts County have soared from $85 per acre to over $350 per acre, a rise of almost 312 %. *Another Group*, *supra* note 447, ¶ 11.

VII. CONCLUSION

The history of groundwater law and knowledge has followed a tortuous path. While hydrology and society have progressed over the last ninety-eight years, the legal concepts governing groundwater ownership have remained constant.[466] Also increasing over the last ninety-eight years has been the inventiveness of private water developers and the need of municipalities to find and cultivate new sources of groundwater.

As the competition for the slowly renewing groundwater intensifies, so will the statewide effects of the increased pressure on these aquifers. If the TWDB does not enforce its management plans, there will be 1.9 million fewer jobs in 2009, 4.8 million fewer jobs in 2030, and 7.4 million fewer jobs in 2050.[467] Fewer jobs will affect the population growth rate, causing 3.8 million fewer residents in 2009, 9.1 million fewer people in 2030, and 13.8 million fewer Texans by 2050.[468] Loss of population growth will adversely affect statewide income by 16 percent ($62 billion) in 2009, by almost 30 percent ($155 billion) in 2030 and by around 38 percent ($238 billion) in 2050.[469]

The solution to this groundwater crisis is to zealously enforce and develop the S.B. 1 regulatory framework through the TDWB and the local GCDs. In addition, the Texas courts must allow either the legislative overthrow of the rule of capture, or discard it themselves in favor of a more ecologically sound and socially responsible use doctrine, such as correlative rights.

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466. *See* Sipriano v. Great Spring Waters of Am., 1 S.W.3d 75, 81-82 (Tex. 1999) (Hecht, J., concurring); *see also Houston*, 98 Tex. at 147-49, 81 S.W. at 280.

467. WATER FOR TEXAS—2002, *supra* note 82, at 123.

468. *Id.*

469. *Id.*