

AVAILABILITY AND DISTRIBUTION OF WATER AS IT AFFECTS GROWTH IN
HAYS COUNTY, TEXAS

THESIS

Presented to the Graduate Council of
Southwest Texas State University
in Partial Fulfillment of
the Requirements

For the Degree

Master of Applied Geography

By

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San Marcos, Texas
May 2001

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DEDICATION

This work is in dedication to all the low
water crossings of Central Texas.

CONTENTS

LIST OF TABLES.....	ix
LIST OF ILLUSTRATIONS.....	x
ABBREVIATIONS.....	xi
SECTION	
1. INTRODUCTION.....	1
2. METHODS.....	5
Community Level Observations	6
Description of Key Organizations and Individuals	6
Documents Analysis	7
Regulations Review	7
Interviews.....	8
3. HISTORICAL PERSPECTIVE	9
4. FACTORS DRIVING DEVELOPMENT	12
Increasing Population.....	12
Increasing Demand for Land Development	15
Land Available for Development.....	16
Summary	16
5. POTENTIAL LIMITATIONS TO DEVELOPMENT	17
Environmentally Sensitive Areas.....	17
Wastewater Disposal Options	19
Transportation Network	19
Summary	20
6. WATER RESOURCES IN HAYS COUNTY.....	23
Surface Water.....	23
Groundwater	25
Edwards Aquifer.....	25
Trinity Aquifer.....	28
Climate.....	30

Summary	32
7. REGULATORY CONTEXT	34
State Water Law	34
Surface Water Law	35
Groundwater Law	35
Key Regulatory Authorities	36
Texas Water Development Board.....	36
Texas Natural Resource Conservation Commission	37
Barton Springs/Edwards Aquifer Conservation District	37
Edwards Aquifer Authority	39
Hays Trinity Groundwater Conservation District.....	39
Texas Parks & Wildlife Department	40
U.S. Fish and Wildlife Service	40
County Commissioners Court	42
Hays County Environmental Health Department	42
Capital Area Planning Council	42
Capital Area Metropolitan Planning Organization.....	44
Regulations	44
Regional Water Regulations	46
Senate Bill 1	46
Edwards Aquifer Rules	46
Priority Groundwater Management Areas.....	48
Groundwater Conservation Districts	49
County Regulations	50
Subdivision and Development Regulations	50
Hays County On-Site Sewage Facilities Rules.....	52
Municipal Regulations.....	53
Summary	54
8. WATER SUPPLY ORGANIZATIONS	57
River Authorities.....	57

	Guadalupe-Blanco River Authority	57
	Lower Colorado River Authority.....	58
	Regional Authorities.....	61
	Canyon Regional Water Authority.....	61
	Hays County Water and Sewer Authority	63
	Water Suppliers.....	63
	City of Kyle	64
	City of Buda.....	64
	City of San Marcos	65
	Aquasource	65
	City of Austin	66
	Water Supply Corporations	66
	Summary	68
9.	WATER AVAILABILITY	70
	Groundwater Sources.....	71
	Trinity Aquifer.....	71
	Edwards Aquifer.....	73
	Barton Springs Segment.....	73
	San Antonio Segment.....	75
	Surface Water.....	77
	Rainwater	78
	Alternative Supply Enhancement Methods.....	79
	Summary	80
10.	WATER DEMAND FORECASTS	83
11.	KEY INTEREST GROUPS	87
	Land Trust Conservation Organizations	87
	City of Austin	88
	Hill Country Conservancy	89
	The Nature Conservancy of Texas.....	90
	Natural Area Preservation Association.....	90

American Farmland Trust.....	90
Advocacy Organizations.....	91
Hays County Water Planning Partnership	91
Save Barton Creek Association	91
Save Our Springs Alliance	92
Wimberley Valley Watershed Association.....	92
San Marcos River Foundation	93
Public Interest Organizations	94
Hill Country Roundtable	94
Hays County Parks Advisory Board	94
Summary	95
12. CURRENT ISSUES.....	97
Importing Surface Water.....	97
County’s Inability to Direct and Control Growth in Unincorporated Areas	102
13. SUMMARY AND CONCLUSIONS.....	106
APPENDIX	
A. MEETINGS ATTENDED.....	113
B. INTERVIEWS REQUESTED AND COMPLETED.....	114
C. SAMPLE INTERVIEW QUESTIONS	115
D. MAJOR WATER SUPPLY CORPORATIONS, HAYS COUNTY, TEXAS .	116
WORKS CITED.....	120
VITA	130

TABLES

Table	Page
1. Municipal Population Estimates, January 2000, Hays County, Texas.....	12
2. Average Monthly Temperature Extremes, 1961-1990, San Marcos, Texas.....	23
3. ETJ Designations in Hays County, Texas.....	35
4. Permitted Withdrawals, Barton Springs Segment, Edwards Aquifer.....	60
5. Permitted Withdrawals, San Antonio Segment, Edwards Aquifer.....	62
6. Projected Water Supply Shortages in Northern Hays County, Texas.....	70
7. Projected Water Supply Shortages in Southern Hays County, Texas.....	70
8. Total Projected Water Supply Shortages, Hays County, Texas.....	72

ILLUSTRATIONS

Figure	Page
1. Hays County, Texas.....	2
2. Population Trend in Hays County, Texas, 1850 - 1990.....	13
3. Historical Population and Projections for Hays County, Texas, 1850 - 2050.....	13
4. Edwards Aquifer Recharge and Contributing Zones, Hays County, Texas.....	18
5. Capital Area Metropolitan Planning Organization Study Area.....	21
6. Surface Water Features, Hays County, Texas.....	24
7. Groundwater Features, Hays County, Texas.....	26
8. The Edwards Aquifer.....	27
9. The Trinity Aquifer.....	29
10. Average Monthly Precipitation, 1961-1990, San Marcos, Texas.....	31
11. Barton Springs/Edwards Aquifer Conservation District Boundaries.....	38
12. Capital Area Planning Council Planning Region.....	43
13. Senate Bill 1, Regions K and L Water Planning Groups.....	47
14. The Guadalupe Blanco River Authority District Boundary.....	59
15. The Lower Colorado River Authority Service Area.....	60

ABBREVIATIONS

AFT	American Farmland Trust
BRC	Blue Ribbon Committee
BS/EACD	Barton Springs/Edwards Aquifer Conservation District
CAMPO	Capital Area Metropolitan Planning Organization
CAPCO	Capital Area Planning Council
CCN	Certificate of Convenience and Necessity
CRWA	Canyon Regional Water Authority
EAA	Edwards Aquifer Authority
EPA	Environmental Protection Agency
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ETJ	Extraterritorial Jurisdiction
GBRA	Guadalupe Blanco River Authority
HRO	House Research Organization
LCRA	Lower Colorado River Authority
LCRWPG	Lower Colorado Regional Water Planning Group, Region K
NRCS	Natural Resources Conservation Service
NWCC	National Water and Climate Center
PIRPS	Proposed Initial Regular Permits
PRP	Policy Research Project
SBCA	Save Barton Creek Association
SOS	Save our Springs (Applicable to Barton Springs in Austin)
SWT	Southwest Texas State University
SWTP	Surface Water Treatment Plant
TLC	Texas Legislative Council
TNRCC	Texas Natural Resource and Conservation Commission
TPWD	Texas Parks and Wildlife Department
TWC	Texas Water Code
TWDB	Texas Water Development Board

SCTRWPG South Central Texas Regional Water Planning Group, Region L
USFWS U.S. Fish and Wildlife Service
WVWA Wimberley Valley Watershed Association
WSC Water Supply Corporation

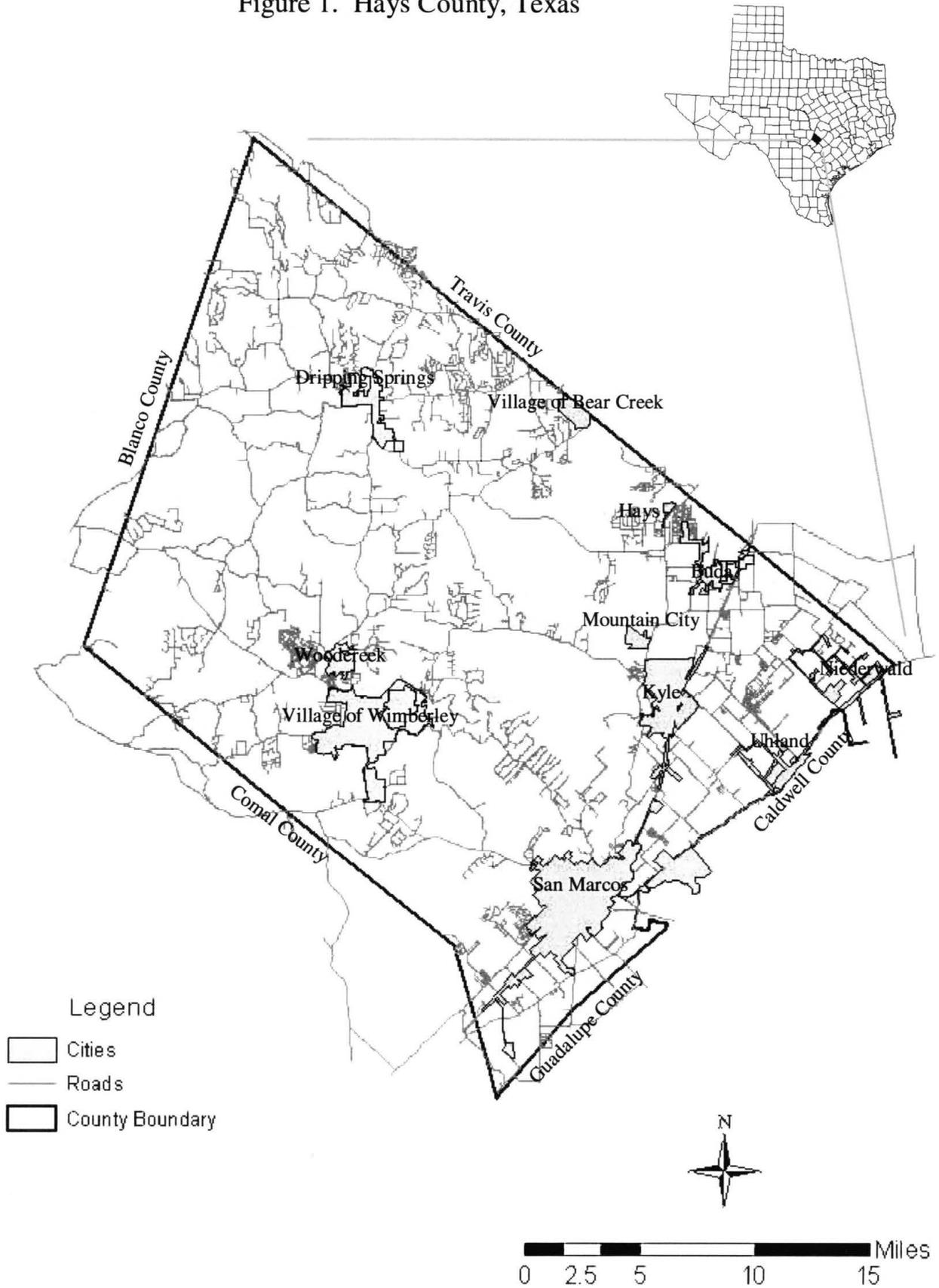
SECTION 1

INTRODUCTION

Recent migration trends show that the population in the United States is shifting to the south and west. By the year 2010, an estimated one-quarter of the U.S. population will reside in California, Florida, and Texas (PRP 1998). Between 1990 and 1998, Texas increased by approximately 2.8 million people. The Austin - San Marcos corridor, which includes Williamson, Travis, and Hays Counties, ranked third on the list of high growth areas for the state, with a thirty percent population increase during that same time period (Alford 1999). Hays County, the region being analyzed in this study, increased by an estimated forty-two percent between 1990 and 1999 (U.S. Census Bureau 2000). This rise in population has increased pressure on the development of rural areas within Hays County. With increasing urgency, two questions have emerged: 1) to what extent can this growth be supported by local water resources and 2) how are the availability and distribution of these resources affecting growth?

Hays County is geographically diverse. Its approximately 680 square miles (Ramos 1999) are marked with both natural and man-made divisions. It shares its border to the north with Travis County, to the south with Comal County, to the west with Blanco County, and to the east with both Guadalupe and Caldwell Counties (Figure 1). The

Figure 1. Hays County, Texas



county is divided between two river basins, with the northern half of the county draining to the Colorado River, and the southern half eventually draining into the Guadalupe River. Interstate Highway 35 (I-35), the main traffic corridor between the cities of San Antonio and Austin, dissects the county along its eastern border. The Balcones Fault zone, which stretches from northeast to southwest through the county just west of I-35, marks the boundary between the western edge of the Blackland Prairie with its rich fertile soils to the east, and the Hill Country with its thin rocky soils and scrub trees to the west. Beneath the surface, the geology contains two aquifers, both of which supply the residents of the county with water: the Edwards aquifer situated along the eastern portion of the county, and the Trinity aquifer underlying western Hays.

Physical geographic differences have played an important role in the development of the county. The Blackland Prairie has supported prosperous farming communities, notably raising cotton and cattle, throughout the last two centuries, while west of the fault zone ranching dominates (Woodruff 1979). This western portion of the county is only sparsely developed, and large-lot homesteads exist where there is residential development.

The geographic positioning between the Hill Country and the prairie lands has been cited for years as a basis for the growth of Hays County. In 1952, the county's position along the fault zone with the ranching prospects to the west, and farming potential to the east, was said to make it an "ideal economic location for cities and industrial activities" (Bybee 1952, 391). Hays County's proximity to rapidly growing Austin, and its location along the I-35 corridor make it a prime bedroom community for commuters. In addition, often referred to as the gateway to the Hill Country, Hays

County's open, undeveloped acreage in the western and northern portion make it a prime retirement destination for people who want the serenity and seclusion of rural life, but the conveniences of Austin and San Antonio.

Currently people are moving into the area at unprecedented rates. The population of Hays County has increased from 65,614 (U.S. Census Bureau 2000) to over 100,000 (Evans 2000b) just in the last decade. Moreover, the population is projected to grow to 174,000 by 2025 (Clark-Madison 2000). One of the major factors that may limit this growth is water. The rural areas that are the focus of developers' attention are highly dependent on groundwater sources that may be stressed past sustainable levels. For example, in 1990, Hays County used approximately 13,000 acre-feet of water (the amount of water it takes to cover an acre with one foot of water is 325,851 gallons).

Approximately 12,000 acre-feet came from groundwater. Based on precipitation data for 1990, this volume is 3,000 acre-feet more than the underlying aquifers could support on a renewable basis (HDR Engineering Inc. 1998). Due to this "overdraft", increasing less water is available for future withdrawals.

An ability to understand the relationship between available water and land development is imperative if growth is to be orderly and adequately supported. A reliable water supply is necessary for supporting development and the increasing populace. Current decisions about the supply will permanently affect the quality of life of the present and future citizens of Hays County, as well as the land use patterns of the area for years to come.

SECTION 2

METHODS

This research examines the relationship between the availability and distribution of water as it affects growth at the county level. Using a qualitative approach, it is possible to make sense of a social phenomenon by comparing, replicating, cataloguing, and classifying the object of one's study (Miles and Huberman 1984). For this research, the object of the study is this relationship.

The research used a case study format, a common research strategy in the social sciences. According to Yin (1984), a case study is the preferred strategy for examining contemporary events, in cases when the relevant behaviors cannot be manipulated. The strength of conducting a case study lies in its ability to incorporate a variety of evidence including documents, cultural and physical artifacts, direct observations, and interviews. The use of this varied evidence from multiple sources "allows the investigator to address a broader range of historical, attitudinal, and observational issues" (Yin 1984).

The method used to complete this research is outlined below. The following questions guided the research:

- 1) What is the current water supply situation in Hays County and what are the potential short-range water supply projects?

- 2) What are the key agencies and organizations involved in land and water availability, and what roles do they play?
- 3) What are the land development regulations and ordinances that influence and direct growth with relation to water availability and supply?
- 4) What are the local issues currently facing Hays County in this relationship?
- 5) What are the relationships between water supply and projected demand?
- 6) What steps are being taken to avoid future water shortages as population growth and development continue?

Community Level Observations

To gain a perspective on current issues and key entities, county and municipal level meetings relating to water availability and land development in Hays County were attended. This direct observation falls within the guise of casual data collection activities described by Yin (1984). The evidence gathered during these observations was used to provide information about the issues associated with water supply and growth. A complete list of the meetings attended during this effort is included as Appendix A.

The local newspapers, including the *San Marcos Daily Record* and the *Austin American Statesman*, provided information that identified current issues, trends, and events for further examination. They also confirmed and elaborated evidence from other sources.

Description of Key Organizations and Individuals

This part of the study identified the agencies and organizations that play roles in supplying water in the county, those that allocate or control the supply, and those that are affected by these issues. Agencies with authority to influence growth patterns were also

examined. Each organization's past and current involvement in Hays County water supply issues was summarized. Through our understanding of these key organizations influencing water supply and growth, the reader should be able to better synthesize the complexities of Hays County's water issues.

Documents Analysis

The documents analysis included a review of documents and reports pertaining to Hays County. These included both historical and technical reports that deal with the development of the county and water availability in the area. Analysis of this material assisted in creating a historical overview of Hays County with an emphasis on its development and how the availability of water has influenced that development. It also helped define the current situation of available water supply in the area and current real estate development trends. In addition, documents were researched that outlined future growth and population projections and the water demands that will accompany this projected growth.

Regulations Review

A list of the regulations and ordinances that influence and direct growth with relation to water availability and supply in Hays County was compiled. All identified regulations are documented with regard to their influence on water supply and growth at the county level.

Interviews

Interviews were conducted to solicit opinions on current issues and to define further specific roles of key organizations and individuals in the relationship between water availability and growth. All interviews conducted in person were tape-recorded when possible. A list of the interviews requested and completed for this research is included as Appendix B. A sample of the open-ended questions used to guide the interviews is included as Appendix C.

SECTION 3

HISTORICAL PERSPECTIVE

The availability of water has often influenced settlement patterns. Historically, Hays County has had abundant water from its rivers, creeks, springs, and wells. River and spring systems have attracted and supported generations of settlers and the Indians that lived in this area before them.

Hays County has a rich and long history. Artifacts found at the San Marcos Springs show that Paleo-Indians were in the area at least 8,000 years ago. From more recent times, evidence found east of Wimberley indicates that the Tonkawa Indians farmed these lands at least 800 years ago (Brune 1981).

The first explorers from outside the region arrived in 1689, when the Alonzo de Leon expedition of New Spain explored this area as part of an expedition to the lands north of the Rio Grande. These explorers named the natural springs they discovered San Marcos Springs, in honor of Saint Mark (McGown 1979). In 1755, the San Marcos mission was established near the springs. Plagued by Indian raids and the lack of a way to irrigate their crops during drought conditions, the mission was forced to move to Comal Springs within a year of its establishment. In 1807, a group of sixteen families established the Villa de San Marcos de Neve as a frontier outpost along the Camino Real.

Indian raids plagued their small village, and the community was flooded and eventually abandoned in 1812. Not until thirty-eight years later was a permanent residence established in Hays County. In November 1845, Thomas McGeehee and his family settled on the banks of the San Marcos River (McGown 1979).

The State Legislature formed Hays County in 1848 from former Travis County territory, and within five months, the first county officials were elected and San Marcos was established as the county seat. By 1850, the community of San Marcos had 387 residents (McGown 1979), and there were five other organized communities in the county. These early communities settled adjacent to the waterways and spring systems, along the banks of the Blanco and San Marcos Rivers and around the headwaters of Onion, Bear, and Slaughter Creeks (Hall 1935).

Water not only supported these growing communities, it also fueled much of the early industry, including numerous cotton gins, power plants, and grain mills (Brune 1975). There was a cotton gin on the San Marcos River in the early 1850's. Wimberley was established by 1855 with the construction of the cotton gin and gristmill situated between Cypress Creek and the Blanco River (Stovall et al. 1986). This community became the Village of Wimberley in the summer 2000.

Mountain City, one of the earliest settlements in Hays County, was established near the Blanco River and Onion Creek, with many nearby spring-fed streams. The first settlers in Dripping Springs were recorded in 1853. The settlement prospered around the nearby springs. Both Buda and Kyle were established in 1880 when the International and Great Northern Railroad line was completed between San Antonio and Austin. The unincorporated community of Driftwood was founded in the late 1800's and by 1886, had

an established post office. The city of Hays, which was initially built with the intent of becoming the county seat, was established in 1908 (Stovall et al. 1986).

The cities of Uhland and Niederwald are both located east of I-35, along the border with Caldwell County. These two farming communities are situated in the Blackland Prairie. Uhland, originally known as Live Oak, was founded in 1860 and Niederwald was founded around 1900 (Stovall et al. 1986).

In addition to the Village of Wimberley, Hays County has two other cities that have just recently incorporated. Woodcreek, a city located 2 miles northwest of Wimberley, incorporated in 1984 and Bear Creek incorporated in 1998.

SECTION 4

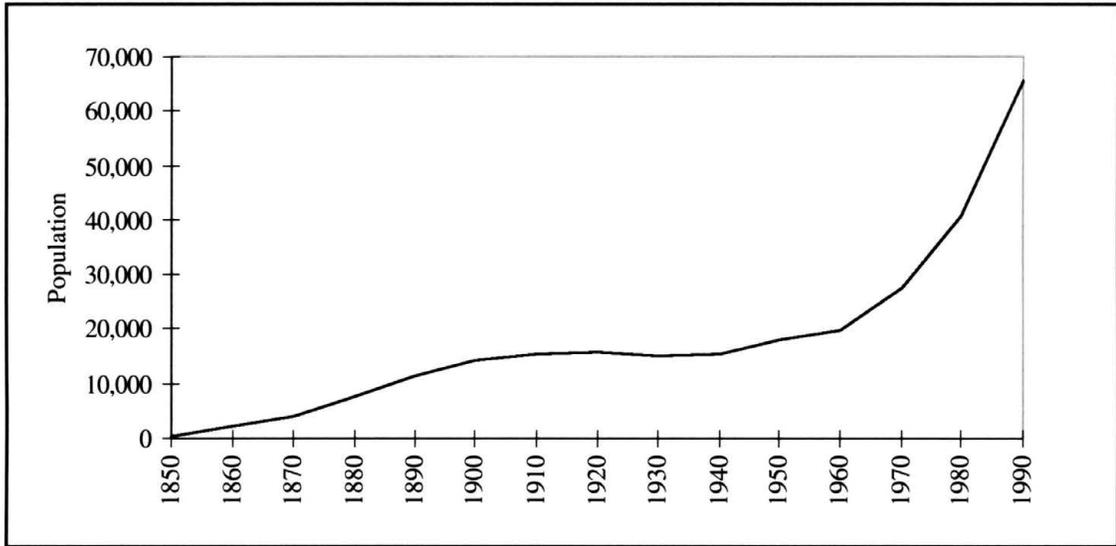
FACTORS DRIVING DEVELOPMENT

In economics, there are two essential factors that support a productive market: a demand and the supply to meet that demand. In Hays County, both of these factors coincide in land development. The demand is spurred by increased population and hence increased housing demand in Hays County. The supply is met with rural acreage that is available for residential development. This section outlines how these factors are driving the development market in Hays County.

Increasing Population

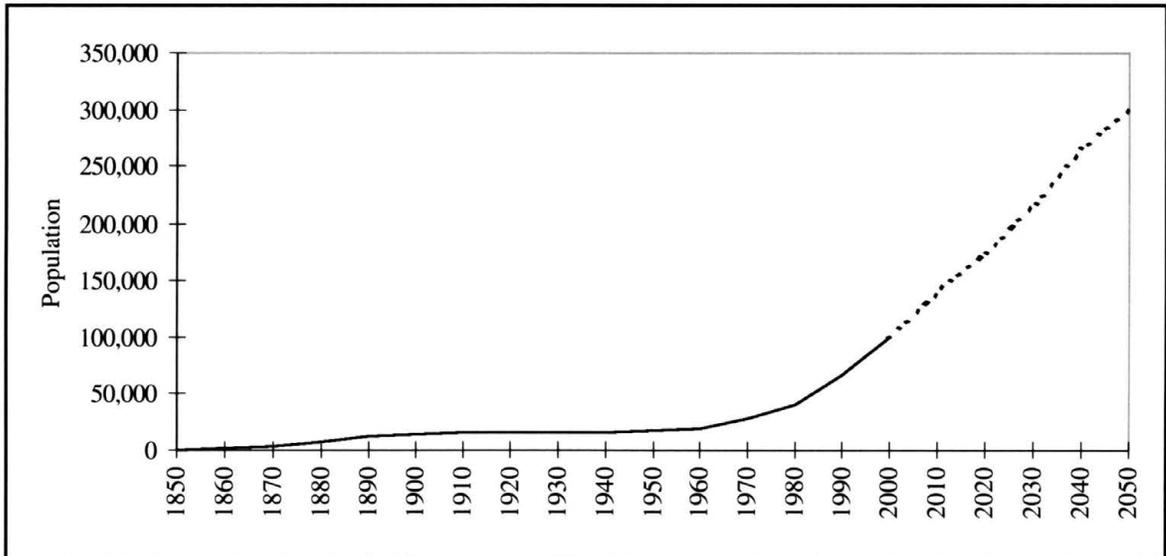
The U.S. Census Bureau first recorded the population of Hays County in 1850. At that time, 387 residents were counted. U.S. Census data depicts the growth of the county from those 387 residents in 1850 to 65,614 in 1990 (Figure 2). Based on new septic tank applications, it was estimated that population of Hays County rose above 100,000 during 2000 (Evans 2000b). The January 2000 population estimates for Hays County municipalities were obtained from the State Data Center (2000) of the Texas Department of Commerce (Table 1).

Figure 2. Population of Hays County, Texas, 1850-1990



Source: (U.S. Census Bureau. 2000).

Figure 3. Historic Population and Projections for Hays County, Texas, 1850-2050



Source: (HDR Engineering Inc. 1998).

Table 1. Municipal Population Estimates, January 2000, Hays County, Texas

Bear Creek	* 400	Niederwald	321
Buda	2,743	San Marcos	40,109
Dripping Springs	1,218	Uhland	461
Hays	324	Wimberley	** 2,922
Kyle	4,733	Woodcreek	1,283
Mountain City	461		

* 1998 Estimate (Ramos, 1999).

** The population of the newly incorporated Village of Wimberley is estimated to be greater than 5,000 (Turpine 2000).

Source: (Texas State Data Center 2000).

The Texas Water Development Board (TWDB) projects the population of Texas Counties for use in preparing the State Water Plan. These projections are the “most likely” population scenario estimated in 1996 as part of the 1997 Consensus Water Plan (HDR Engineering Inc. 1998). They show the population increasing from 117,201 residents in 2010 to over 250,000 in the year 2050 (Figure 3). This “most-likely” growth scenario is based on recent and prospective growth trends. For these estimates, the TWDB used census data from the Texas State Data Center at Texas A&M University which incorporates 1990 population data, projected fertility rates, projected survival rates, and the 1980 - 1990 migration trends (TWDB 1996). These projections assume no limitations on growth due to the availability of natural resources, such as water.

The projections from 1996 are presented here because the forecasted water use, outlined in Section 8, was estimated by the TWDB from these population numbers. The TWDB later published new population projections for use in the 2002 State Water Plan. These numbers reflect an even greater projected population increase in the area with more than 139,000 residents in Hays County in 2010 and over 300,000 in 2050.

Increasing Demand for Land Development

Nationwide, there has been a trend of population shift from the cities to the surrounding suburban areas. Between 1980 and 1994, in the nation's thirty-nine largest metropolitan areas, the corresponding suburban populations increased ten times more than the central city (PRP 1998). This same trend is occurring locally and the demand for residential development of rural land is increasing. The U.S. Census Bureau (2000) shows a twenty-three percent increase in the urban population in Hays County between 1980 and 1990. In comparison, the rural population increased by 115 percent during that same time period. Many of the old ranchlands in the northern and western portions of the county are being sold and subdivided into single-family homesteads. Between 1987 and 1997, there was a ten to twenty-five percent increase in rural landowners in central Texas, which is an indication of the rate of this fragmentation of large rural properties (Sorensen, Greene, and Russ 1997).

The demand for housing includes expected amenities such as golf courses, lawns, roads, and wastewater collection treatment and disposal facilities. As of December 2000, there were twenty-four proposed new developments on record at the Hays County Department of Environmental Health. These developments included a total of 1,382 lots (Thompson 2000).

Currently four golf courses are located in Hays County. A study conducted in 1998 proposed that there could be from three to twelve 18-hole equivalents in the county by the year 2020 (Linder 1998). Two courses (forty-five holes total) are planned near I-35 south of San Marcos (Gee 2000). Three or four additional courses are being planned for the Dripping Springs area.

Land Available for Development

Hays County Department of Environmental Health records show that there are currently over 22,000 acres of existing subdivisions in the county. As of 1999, there were approximately 20,000 additional acres available for potential development (D'Amico 1999).

Summary

The land development market in Hays County is currently fueled by the rapid population growth in the Austin – San Marcos corridor. This growth is increasing the demand for land development in the county, and the rural areas historically occupied by large acreage ranches are being subdivided to accommodate the trend. The development trend includes both residential housing and all the cultural and social amenities, such as golf courses, landscaping, road networks, and wastewater facilities that support it.

SECTION 5

POTENTIAL LIMITATIONS TO DEVELOPMENT

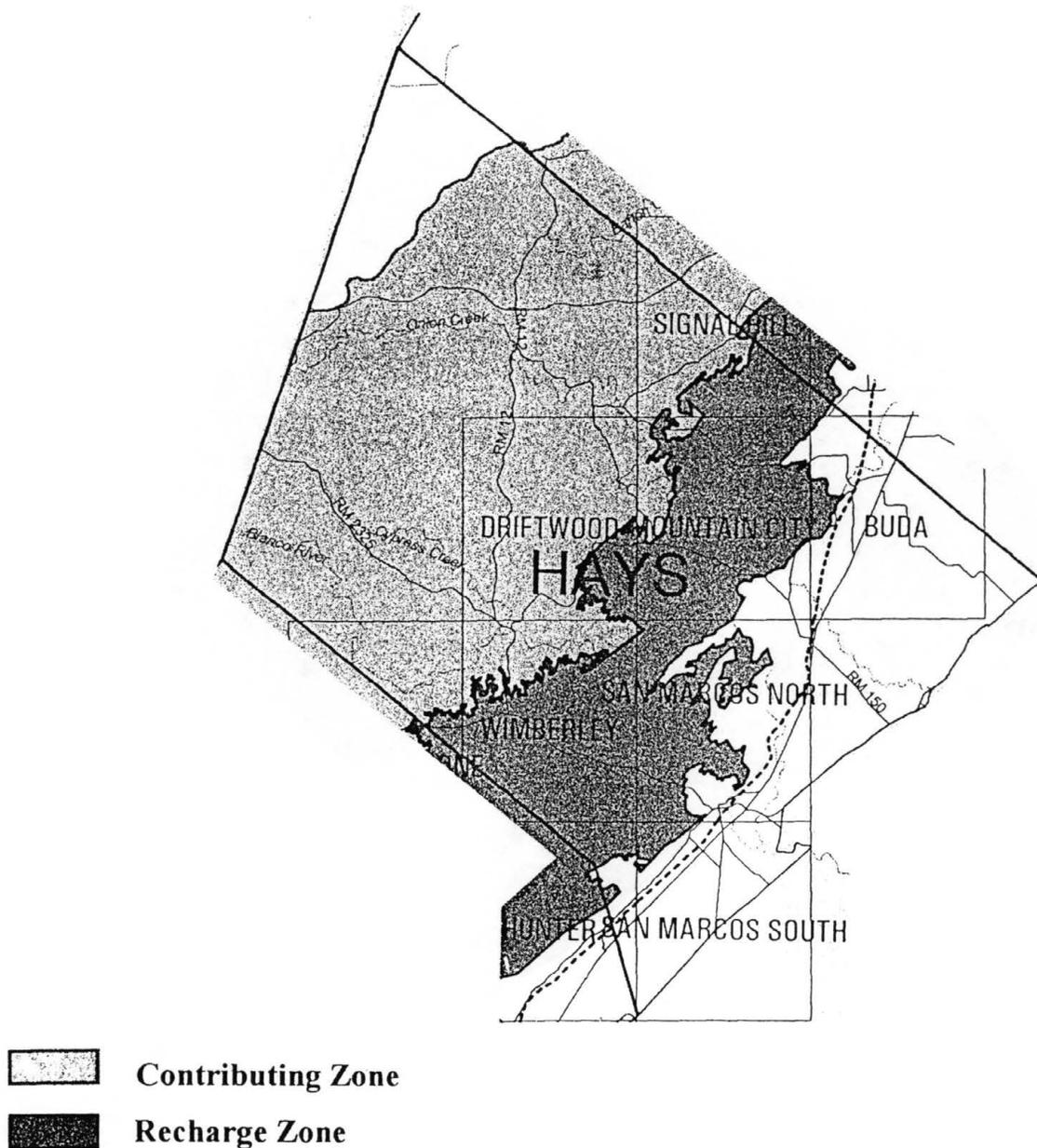
In addition to the availability of water, several factors affect land development. This section outlines some of these factors, including environmentally sensitive areas, wastewater disposal options, and the existing and proposed transportation network.

Environmentally Sensitive Areas

A large part of Hays County is located in the Edwards aquifer recharge and contributing zones (Figure 4). In the recharge zone, where the aquifer is exposed to the surface, water enters primarily through fractures and sinkholes in the creeks (BS/EACD 1998). The contributing zone is the area that lies west of the recharge area that contributes runoff to the recharge zone. In these two zones, runoff has a direct pathway into the Edwards aquifer.

The recharge zone for the Trinity aquifer is generally present in the western portion of the county, in the area depicted as the contributing zone to the Edwards aquifer (Bluntzer 1992) (Figure 4). The quality of the groundwater in this area is also susceptible to the detrimental effects of construction activities and runoff from impervious surfaces such as roads and parking lots to the quality of the groundwater.

Figure 4. Edwards Aquifer Recharge and Contributing Zones, Hays County, Texas



Source: modified from (TNRCC 1999).

Wastewater Disposal Options

With the exception of the cities of San Marcos, Buda, Kyle, and Woodcreek, other communities and residents in the county rely on on-site wastewater treatment facilities, e.g. septic tank systems. Developers must follow the on-site sewage facility rules adopted by Hays County. These rules, described in Section 7, are more stringent than those required by the Texas Natural Resource Conservation Commission (TNRCC) (Hays County Commissioners Court 1997).

Transportation Network

The transportation network plays a major role in the development of the county. With Hays County growing, proposed improvements and changes in the transportation network affect the landscape and contribute recharge and runoff of storm water in areas where development may be concentrated and supported. Available roadways and their accompanying rights-of-way are also corridors for utilities and service providers.

A Hays County Comprehensive Transportation Planning Study was produced in 1997. This study was commissioned by Hays County to assess the transportation system of the county. It identified a number of important elements to be considered when planning the county's long-range transportation system. These include the safety and efficiency of the system and the continued preservation of the rural character of the county (Prime Strategies Inc. 1997).

The Capital Area Metropolitan Planning Organization (CAMPO) produces a long-range transportation plan at least every five years for use as a planning tool for allocating

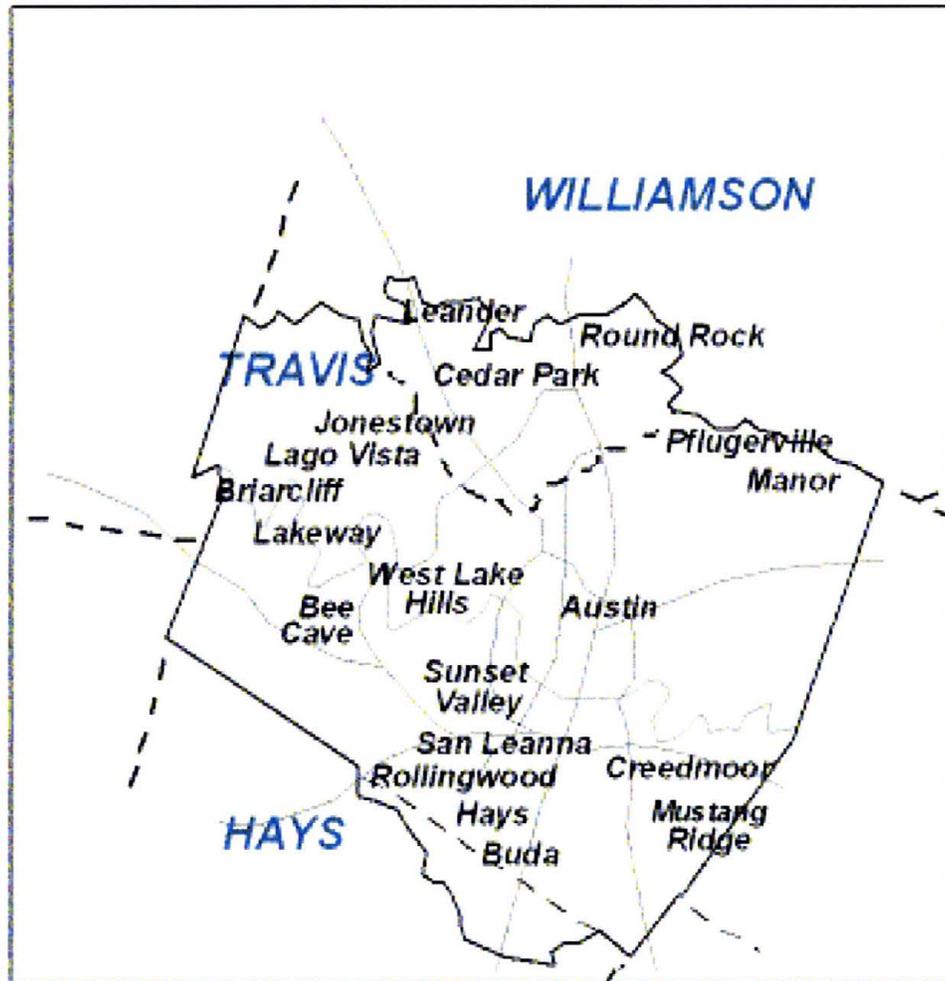
monies for federally funded transportation projects. The CAMPO study area includes Travis County and parts of Williamson and Hays Counties (Figure 5). The cities of Hays and Buda and their extraterritorial jurisdictions (ETJs) are included. The 2025 Transportation Plan was produced and made available to the public for comment in March 2000 (CAMPO 2000b).

In 2000, Hays County produced its own long-range transportation plan, the Hays County Multi-Corridor 2025 Transportation Plan. This plan prioritizes transportation projects in the county and is the official input to the CAMPO plan. A Blue Ribbon Committee, composed of representatives from various interest groups and different areas of the county, assessed the proposed plans and made recommendations to the Hays County Commissioners Court. Some of the recommendations included promoting road capacity improvements to the regional traffic corridors and encouraging mass transit. In environmentally sensitive areas, such as the Edwards aquifer recharge zone, the Committee recommended no new construction of major arterial highways, and only primary access provided to new developments (BRC 2000). The Committee also recommended low-density development in the western portion of the county to preserve ranch land and its rural and small-town character, while preserving open space and discouraging urban sprawl (BRC 2000).

Summary

Forecasting the current population trend fifty years into the future provides a benchmark for long-range planning efforts; however, the projections assume no limitations on the natural resources, such as water, in the county. The forecasts also do not take into account the growth that the county can physically support.

Figure 5. Capitol Area Metropolitan Planning Organization Study Area



Source: modified from www.ci.austin.tx.us/ats/study_ar.htm.

In Hays County, there are potential limitations to the projected growth outlined in Section 4. Over seventy percent of the county is situated in either the contributing or recharge zone of the Edwards aquifer. Measures prescribed to maintain the water quality of the aquifer control the activities, such as development, that can occur in those zones. The lack of centralized wastewater collection, treatment, and disposal facilities also affects development because residents must rely on on-site septic systems. This limits the possible lot sizes that can be incorporated into development plans. In addition, the transportation network plays a key role in where higher population density can be supported. The road network dictates the right-of-way corridors for utilities and service providers needed to support development.

SECTION 6

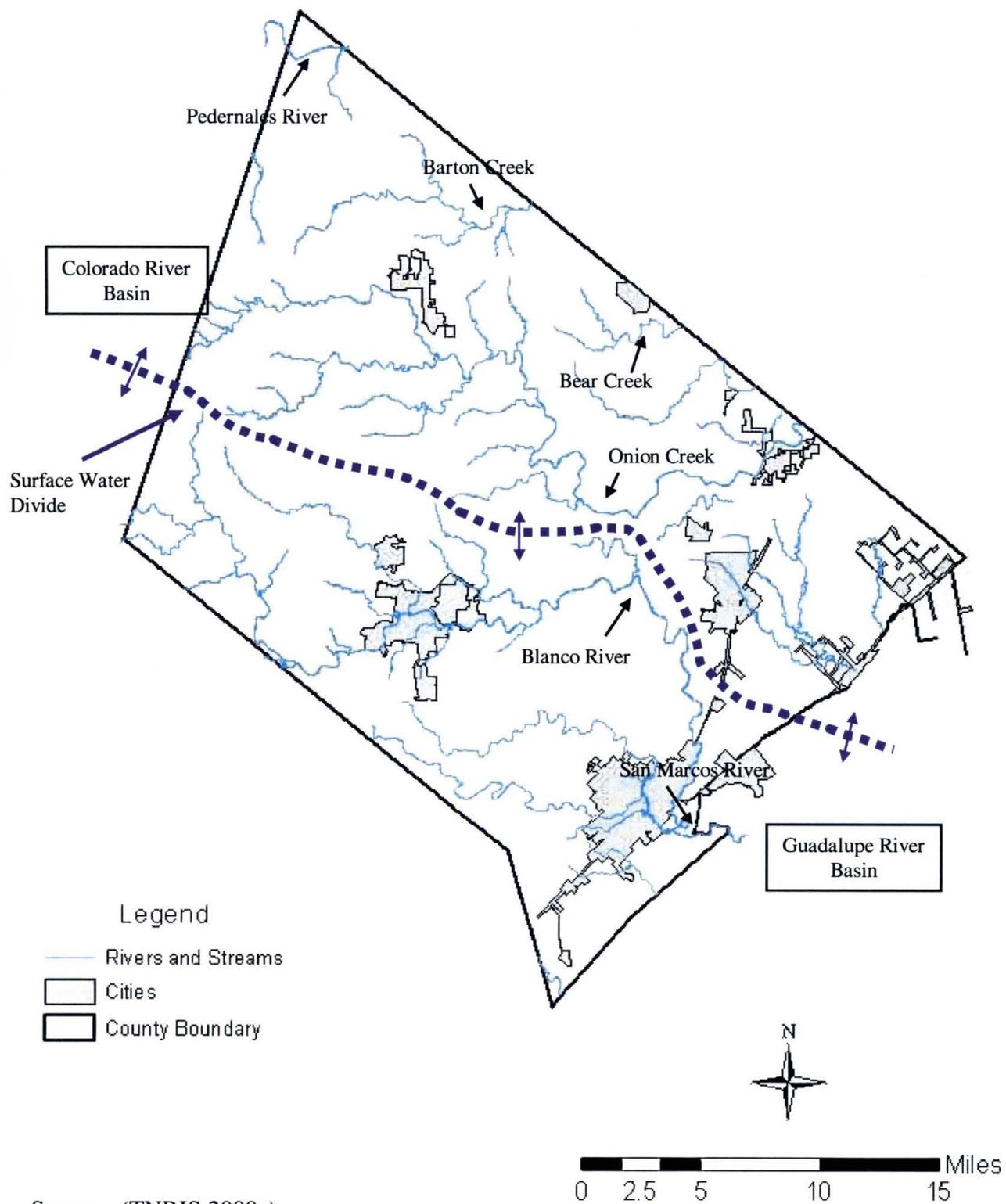
WATER RESOURCES IN HAYS COUNTY

The sources of water supply within the county include surface water, groundwater, and rainwater. This section examines these sources to provide a general understanding of their nature and physiography.

Surface Water

Surface water drainage in Hays County is divided between the Colorado and the Guadalupe River basins (Figure 6). The northern half of the county drains primarily northeasterly to the Colorado River in Travis County. The Pedernales River flows for two miles across the northern corner of Hays County and also eventually empties into the Colorado River. The Blanco River, which drains most of the southern portion of the county, enters the San Marcos River east of San Marcos and I-35, approximately two miles west of the eastern county line. The San Marcos River, with its headwaters at the San Marcos Springs, flows eastward through San Marcos and out of Hays County, joining the Guadalupe approximately forty miles downstream at Gonzales, Texas.

Figure 6. Surface Water Features,
Hays County, Texas



Source: (TNRIS 2000a).

Several creeks flow seasonally throughout the area. Barton, Bear, and Onion Creeks and their tributaries empty into the Colorado River. Cypress Creek flows into the Blanco River, and Sink and Purgatory Creeks drain into the San Marcos River.

Groundwater

Two aquifer systems underlie Hays County: the Trinity and the Edwards (Figure 7) (Barker, Bush, and E.T. Baker 1994). Both supply numerous wells and feed the many springs that flow into the rivers and creeks. The Edwards aquifer, a hydrologic unit of the Cretaceous Edwards Formation, underlies the eastern part of the county along the Balcones Fault zone. Western Hays County, where Hill Country topography dominates and the Edwards Formation has been incised, is underlain by members of the Glen Rose Formation which compose the Upper and Middle Units of the Trinity aquifer (Barker, Bush, and E.T. Baker 1994).

Edwards Aquifer

The Edwards aquifer spans ten counties (Figure 8). It is a limestone aquifer capable of yielding small to moderate amounts of water from wells and large quantities of water to area springs. Rapid recharge and groundwater movement occurs through an integrated network of conduits in the aquifer material. These flow channels formed through the continual dissolution of the material by groundwater flow. The Edwards aquifer is recharged through surface flow over the outcrop, caves, sinkholes and creek beds in the central portion of the county (Bluntzer 1992).

Figure 7. Groundwater Features,
Hays County, Texas

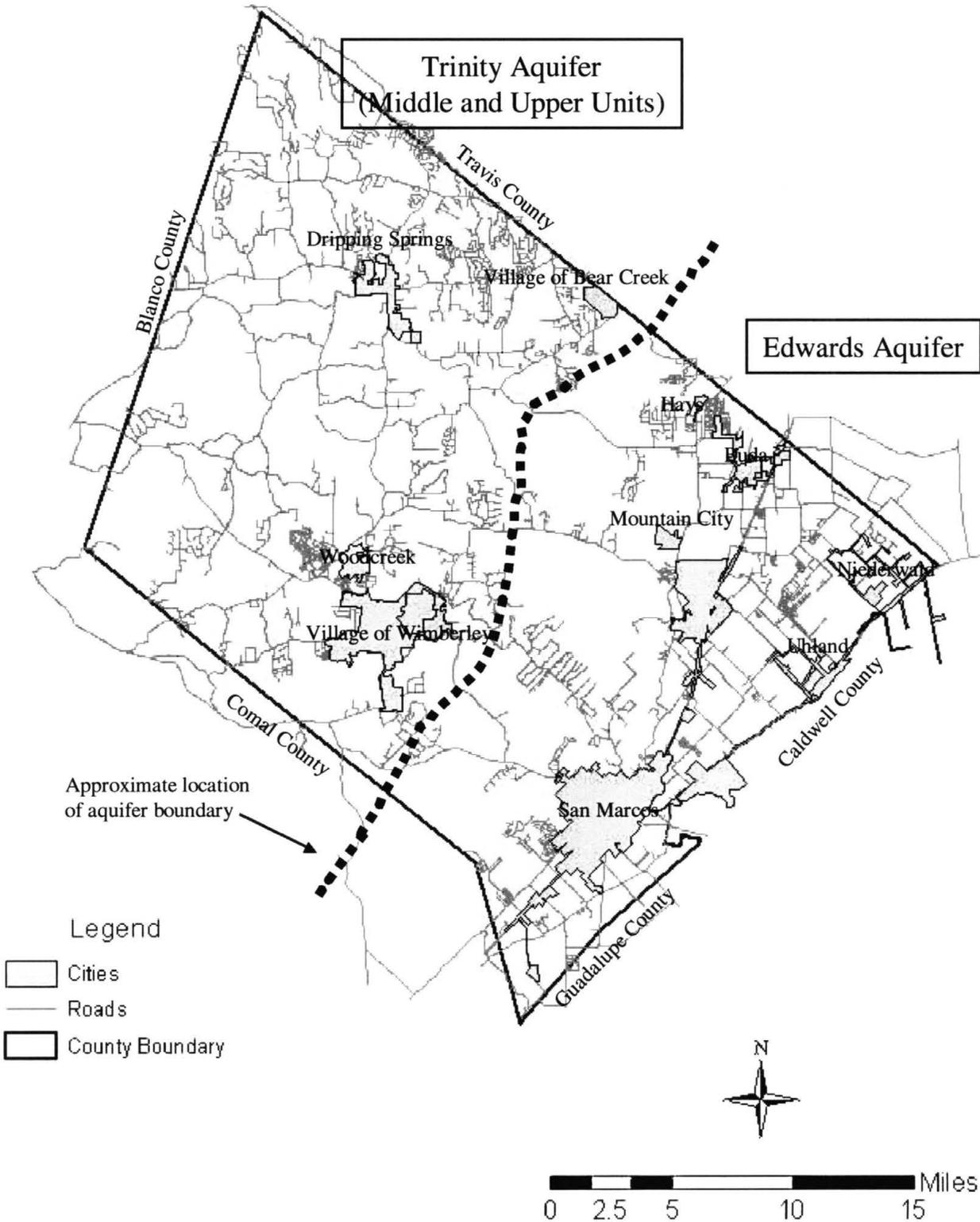


Figure 8. The Edwards Aquifer



Source: (TNRIS 2000b).

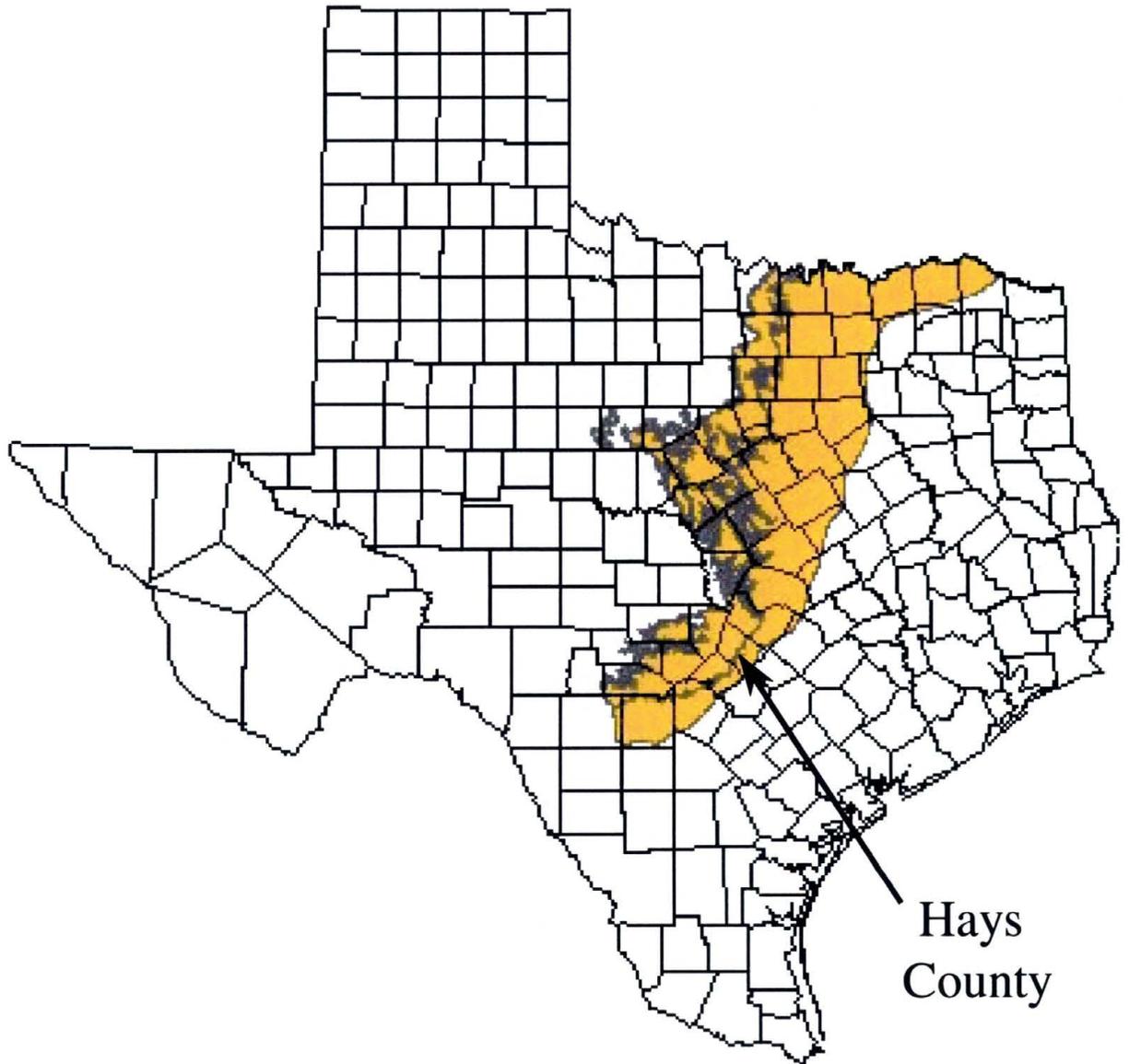
This aquifer is the sole source of drinking water for more than 1.3 million people. It supplies water to numerous cities including San Antonio, Hondo, New Braunfels, San Marcos, and Uvalde. It supports irrigation in the region, and is the source of Comal, San Marcos, and Barton Springs. It contributes flow to the Guadalupe and Colorado Rivers, and provides freshwater inflow to the Gulf of Mexico.

There is a groundwater divide located in the Edwards aquifer near the city of Kyle. North of this divide, the groundwater generally flows towards Barton Springs. Recharge north of this divide supports the Barton Springs Segment of the Edwards aquifer. South of the divide, the groundwater is hydrologically connected to the section of the Edwards aquifer extending southwest through San Antonio. This portion of the Edwards aquifer is referred to as the San Antonio Segment.

Trinity Aquifer

The geographic extent of the Trinity aquifer includes over forty-six counties (Figure 9). Both the Upper and the Middle Units of the Trinity aquifer are present in Hays County, and serve as a groundwater source. The Upper Trinity aquifer is composed of limestone, dolomite, and marl. It yields only small quantities of water to wells. The Middle Trinity aquifer, which lies stratigraphically below the Upper, is composed of massive limestone that can sometimes yield large quantities of water. Both units yield water to numerous springs, including Jacobs Well and Bassett Springs. They are hydrologically connected, and a distinction is usually made between them to differentiate the differences in water quality and quantity (Bluntzer 1992). In this study, both the Upper and the Middle Units of the Trinity aquifer will be referenced as the Trinity aquifer.

Figure 9. The Trinity Aquifer



Source: (TNRIS 2000b).

For the most part, the occurrence of groundwater in the Trinity aquifer is highly localized and provides only modest volumes of water. This is due to the poor hydraulic characteristics of the aquifer, which include its inability to store and transmit water. These deficiencies are evident in the large draw-downs and poor recoveries in water levels after extended periods of pumping. Primary sources of recharge for the Trinity aquifer include surface flow over the aquifer outcrop, seepage occurring from the creeks, and from ponding during high water levels (Bluntzer 1992). Approximately four to six percent of the precipitation infiltrates into the ground and recharges the aquifer (TWDB 2000).

Climate

Both surface and groundwater quantity and quality are dependent on precipitation. The physiography of the county plays a large role in the prevailing climate pattern and the amount of precipitation available to recharge the aquifers and replenish the surface watercourses.

Hays County is divided between two physiographic provinces. The western portion of the county is part of the Edwards Plateau and the eastern portion is part of the Gulf Coastal Plain (Swanson 1995). The Balcones Fault zone marks the boundary between these two provinces. These two distinct regions affect the climate and precipitation between the eastern and western parts of the county. The northwestern two-thirds of the county, with its greater altitude, may have slightly lower temperatures than the eastern part and may receive slightly higher levels of precipitation (DeCook 1963). The average monthly temperature extremes estimated from 1961 to 1990 for the weather

station located at San Marcos, Texas show the extreme low occurring in January (35.7 °F) and the extreme high in August (95.3 °F) (Table 2).

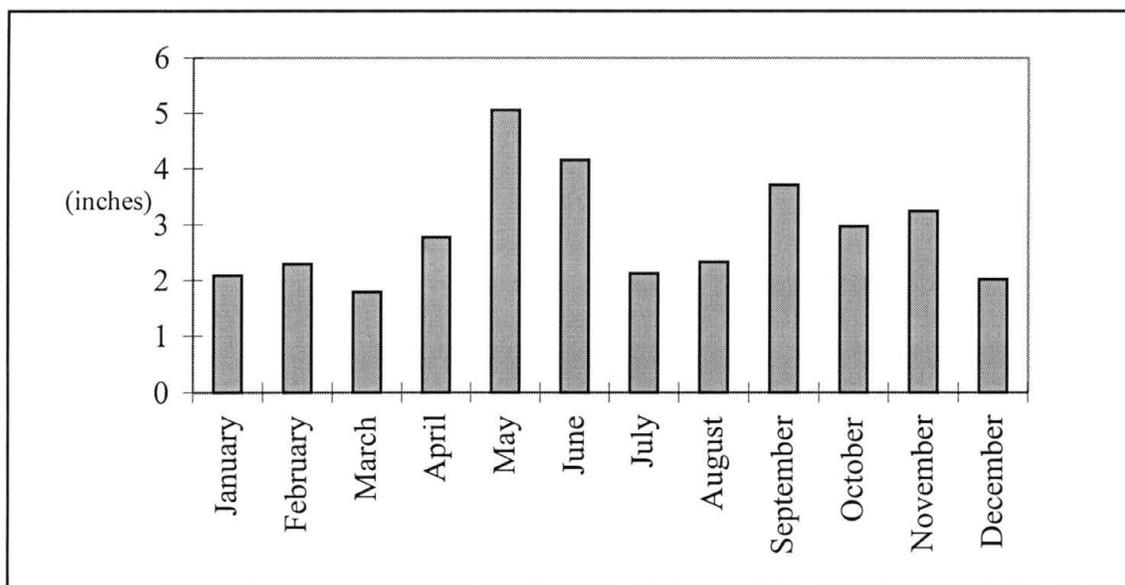
Table 2. Average Monthly Temperature Extremes, 1961-1990
San Marcos, Texas
(in °F)

	<u>High</u>	<u>Low</u>		<u>High</u>	<u>Low</u>
January	60.1	35.7	July	94.7	71.5
February	64.8	38.7	August	95.3	71.1
March	73.0	46.5	September	89.9	66.5
April	80.0	55.7	October	82.0	56.0
May	85.3	63.5	November	71.6	46.5
June	91.2	69.5	December	63.2	37.9

Source: (NWCC. 2000).

Average monthly precipitation for Hays County measured between 1961 and 1990 at San Marcos, Texas (Figure 10) shows the heaviest precipitation falling during the months of May, June, and September. San Marcos averages 34.55 inches of rainfall annually.

Figure 10. Average Monthly Precipitation, 1961-1990
San Marcos, Texas



Source: (NWCC 2000).

In central Texas, there is also the ever-present threat of drought. At least one part of Texas is plagued by a serious drought every ten years (Riggio, Bomar, and Larkin 1987). The 1950's drought, noted to be the worst on record, consisted of seven years of drought occurring between 1950 and 1956. By 1957, 244 counties in Texas were declared federal drought disaster areas. In 1956, Comal Springs stopped flowing from June to November, and from 1954 to 1956, the flow of the Guadalupe River dropped to four percent of its normal flow (TWRI 1996). This is the drought of record upon which all water planning efforts are based.

Summary

Hays County is commonly referred to as a county rich in water resources. Three rivers and their tributaries provide surface water through the area and also contribute to the recharge of the two underlying aquifers. Approximately one fourth of the county is within the recharge zone of the Edwards aquifer, and an additional fifty percent is within its contributing zone (Figure 4). In addition, some of the runoff and stream flow that infiltrates into the ground within that portion of the county recharges the Trinity aquifer. The Edwards and the Trinity aquifers both feed numerous springs that in turn contribute flow to the rivers and their tributaries.

Because the water resources in the county are hydrologically connected, an innate "natural balance" is maintained. Under natural conditions, with the exception of during extreme drought conditions, this natural balance maintains itself. The hydrologic cycle sustains the river flow by precipitation and runoff, and through discharges from the

underlying aquifers via springs, etc. The aquifer levels are maintained through recharge from the infiltration of precipitation and runoff and through recharge features in creeks and on the surface.

With the development of the county, two additional factors must be accounted for in this balance: (1) water supply wells, and (2) the loss of recharge to the aquifers from increasing impervious cover. Both aquifers support numerous water supply wells. For the Trinity aquifer, the effects of withdrawals are localized due to its geology. For example, the impact of activities in Blanco County, are not necessarily felt in Hays County. In contrast, the effects of withdrawals from the Edwards aquifer can be regional in scale. For example, groundwater withdrawals in the city of San Antonio impact the spring flow of the San Marcos Springs.

SECTION 7

REGULATORY CONTEXT

This section outlines the regulatory context of the issues surrounding the availability and distribution of water and its relationship with residential land development and growth. Texas water laws governing surface water and groundwater are outlined. The key regulatory agencies involved in regulating water use and land development are identified and a brief synopsis of each is provided. The key regulations that influence and direct growth with relation to water availability and supply in Hays County are documented to show their influence on water supply and growth at the county level. These key agencies and the regulations they are charged to enforce play a role in the natural balance of water resources in the Hays County.

State Water Law

The laws governing water in Texas are different depending on the source of the water. While surface water is owned by the state of Texas, groundwater is subject to capture by the individual owner of the overlying land.

Surface Water Law

Surface water as defined by state law and the Texas Natural Resource Conservation Commission (TNRCC) includes water in the rivers, streams, ordinary flow, underflow, creeks, tides, lakes, and every bay and arm of the Texas portion of the Gulf of Mexico (30TAC §297.1). Surface water is owned by the state in trust for the benefit of all the citizens of the state, subject to permits to use issued by the State.

Two concepts have governed the use of surface water in Texas: riparian law and the law of prior appropriation. Under riparian law, landowners with property adjacent to waterways were granted use of water. Under prior appropriation, specific authorization from the government is required to use the water (Kaiser 1985).

In 1967, the Texas Legislature passed the Water Rights Adjudication Act, which required riparian surface water users to file for a surface water use permit. This Act consolidated the surface water permit system that today is administered by the TNRCC. Anyone wanting to use surface water must apply for a permit (Kaiser 1985). The Texas Water Code (TWC) Section 11.027 states, “The first in time, is the first in right.”

Groundwater Law

Groundwater is defined in the TWC Section 35.002 as “water percolating below the surface of the earth.” Groundwater is contained in porous and permeable geologic formations called aquifers, which store and transmit water underground.

The law governing the use of groundwater in the state is derived from the English common law rule of “absolute ownership” (Kaiser 1985). This law, also known as the “rule of capture,” states that “a land owner has a right to take for use or sale all the water

that he can capture from below his land” and under any adjoining land so long as the groundwater is not wasted (Kaiser 1985, 32).

In certain areas of the state, the rule of capture has been replaced with a permit system for groundwater withdrawals. In Hays County, such withdrawals from the Edwards aquifer are restricted by two agencies, the Edwards Aquifer Authority (EAA) and the Barton Springs/Edwards Aquifer Conservation District (BS/EACD). The newly formed Hays Trinity Groundwater Conservation District will manage the Trinity aquifer in the county.

Key Regulatory Authorities

Texas Water Development Board

Created in 1957, the TWDB was established to approve loans of State funds to local communities for developing water supplies. The governor appoints the six-member board. It currently controls three funds that provide low-interest loans to all political subdivisions and non-profit water supply corporations for projects including water supply, wastewater, flood control projects, and purchase of efficient irrigation equipment by farmers. The TWDB currently focuses its energy on both planning and financing of water supply projects.

Part of the planning includes projecting state population increases and water demands for fifty years and planning the water supply to meet the forecasted demands. Along with the TNRCC and the Texas Parks and Wildlife Department (TPWD), the

TWDB has worked with the Regional Water Planning Groups created by Senate Bill 1 in 1997 to develop their regional water plans. Senate Bill 1 is outlined later in this section.

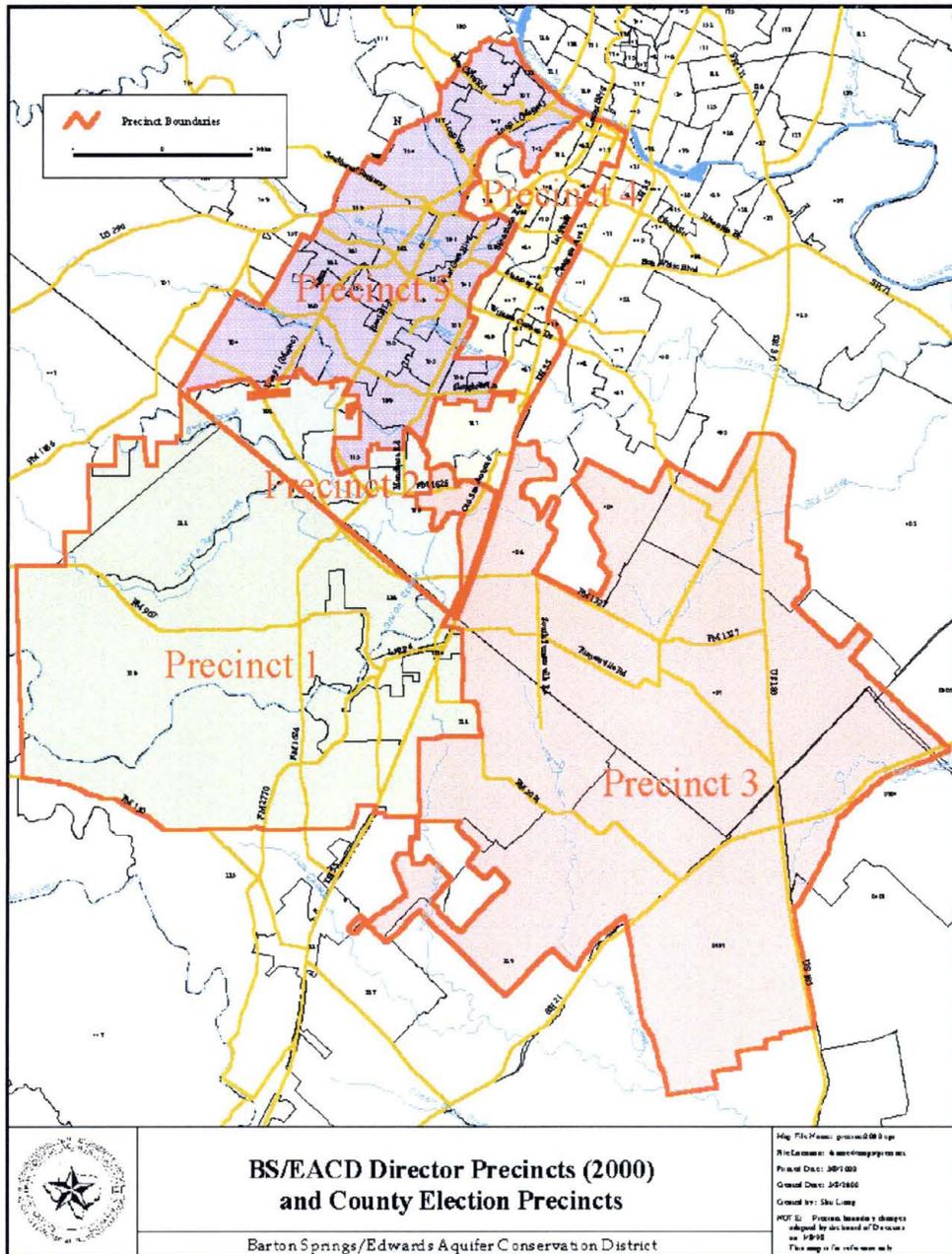
Texas Natural Resource Conservation Commission

The TNRCC is Texas' primary environmental agency that enforces water quality standards and permitting for wastewater discharges. It is also responsible for administering surface water rights in the State. It supervises the water districts and utilities, including the processing of applications to create new water districts and the approval of utility service areas, known as Certificate of Convenience and Necessity (CCNs). It also is responsible for protecting groundwater quality. The TNRCC has adopted construction activity standards, known as the Edwards Aquifer Rules, specifically for the area overlying the Edwards aquifer. These rules are discussed later in this section.

Barton Springs/Edwards Aquifer Conservation District

The BS/EACD was created by the 70th Legislature in 1987, following a petition filed by the cities of Buda, Hays, San Leanna, Sunset Valley, and Austin. The District encompasses 255 square miles (TWDB 1996) and is composed of portions of northern Hays County, southern Travis County, southwestern Bastrop County and northwestern Caldwell County that overlie the Barton Springs Segment of the Edwards aquifer south of the Colorado River (Figure 11). The District's goals are to conserve, protect, and enhance the groundwater within its jurisdictional boundaries (BS/EACD 1999).

Figure 11. Barton Springs Edwards Aquifer Conservation District Boundaries



Source: <http://www.bseacd.org>.

Edwards Aquifer Authority

The EAA was created in 1993 by the passage of Senate Bill 1477 in the Texas Legislature to replace the Edwards Underground Water District. It is charged with managing and regulating withdrawals from the San Antonio Segment of the Edwards aquifer. This includes the portion that underlies all or portions of Uvalde, Medina, Atascosa, Bexar, Guadalupe, Comal and Caldwell Counties, as well as the part of Hays County that is situated south of the groundwater divide located near Kyle.

Hays Trinity Groundwater Conservation District

Senate Bill 1911 created the Hays Trinity Groundwater Conservation District in 1999 (HRO 1999). The boundaries of this District were defined to include the portion of Hays County that is not included as part of the BS/EACD or the EAA. The bill called for the selection of temporary directors, and outlined their authority. While the five temporary directors were given some of the authority under TWC Chapter 36, they do not have the authority to hold elections, to exercise eminent domain and annexation, to develop a long-range management plan, to issue bonds and notes, or to impose taxes. They were given the authority to inspect water wells, regulate the transfer of groundwater out of the district, and impose user fees to pay for district operations. The District must be ratified by the upcoming 77th Legislature in order for it to assume full authority granted under TWC Chapter 36 (HRO 1999).

The District currently has three main responsibilities. First, it is charged with establishing the scientific basis for its operation. This includes collecting data to assess

the current status of the Trinity aquifer and determine its annual sustainable yield in western Hays County. The second charge is to provide education about groundwater to the public within its jurisdiction. The District is also responsible for exercising the management authority granted in Senate Bill 1911. Among other things, this includes the establishment of rules for permitting new wells, prescribing well construction standards, and well spacing (Hollon 2000). The District is also part of the Hill Country Alliance, the regional umbrella organization that includes all the local groundwater conservation districts formed over the Trinity aquifer in the region.

Texas Parks & Wildlife Department

The mission of the TPWD is to manage and conserve the natural and cultural resources of the state for the use and enjoyment of present and future generations. This charge includes protecting these resources from degradation and depletion. The Resource Protection Division reviews and provides input and recommendations on development projects that may affect fish and wildlife, and reviews wastewater discharge permits proposed by the TNRCC. Securing adequate freshwater inflows in Texas bays and estuaries is a major concern. Along with the TWDB and the TNRCC, the TPWD is working with the Senate Bill 1 Regional Water Planning Groups to develop their regional water plans.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS), in the Department of the Interior, is the federal agency responsible for administering federal laws protecting endangered species and their habitat. The Endangered Species Act (ESA) requires federal agencies to

consult with the USFWS before approving any federal permits or spending that may affect endangered species. This includes situations such as federal spending for highway construction and Environmental Protection Agency (EPA) storm water discharge permits, which are required for any project covering more than 5 acres (Scheibal 2000a).

The ESA regulates the “take” of an endangered species. Take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct” [16 United States Code § 1532 (19)]. While it is hard to prove “take” from just one development, it does become an issue for the USFWS when a major project, such as a water supply pipeline, is planned that has the potential to influence growth at a large scale in an area that could impact endangered species (Lecknor 2000). The USFWS also normally provides consultation to developers that have plans that may affect endangered species and their habitat. Developers are not mandated by law to abide by the guidelines set forth in these consultations; however, developers can be held liable if an endangered species habitat is destroyed.

Federally listed endangered species that may be affected by development in Hays County include the black-capped vireo, golden-cheeked warbler, Barton Springs salamander, Texas blind salamander, Comal Springs riffle beetle, and the Comal Springs dryopid beetle. In addition, endangered species that have critical habitats which may be affected by development in the county include the fountain darter, San Marcos gambusia, Texas wild-rice, and the San Marcos salamander (USFWS 2000).

County Commissioners Court

The Hays County Commissioners Court is composed of the County Judge who is elected by the entire county, and County Commissioners elected by residents of each of four precincts. The county is the functional agent of the state. For this reason, counties' powers are limited to those specifically outlined by the legislature. Historically, the delegated powers include the funding of county parks, building and maintaining county roads, providing public and emergency medical service, recording vital statistics, crime detection by sheriff's departments, burying paupers, and running the county court system and county attorney's office (Hill Country Roundtable n.d.).

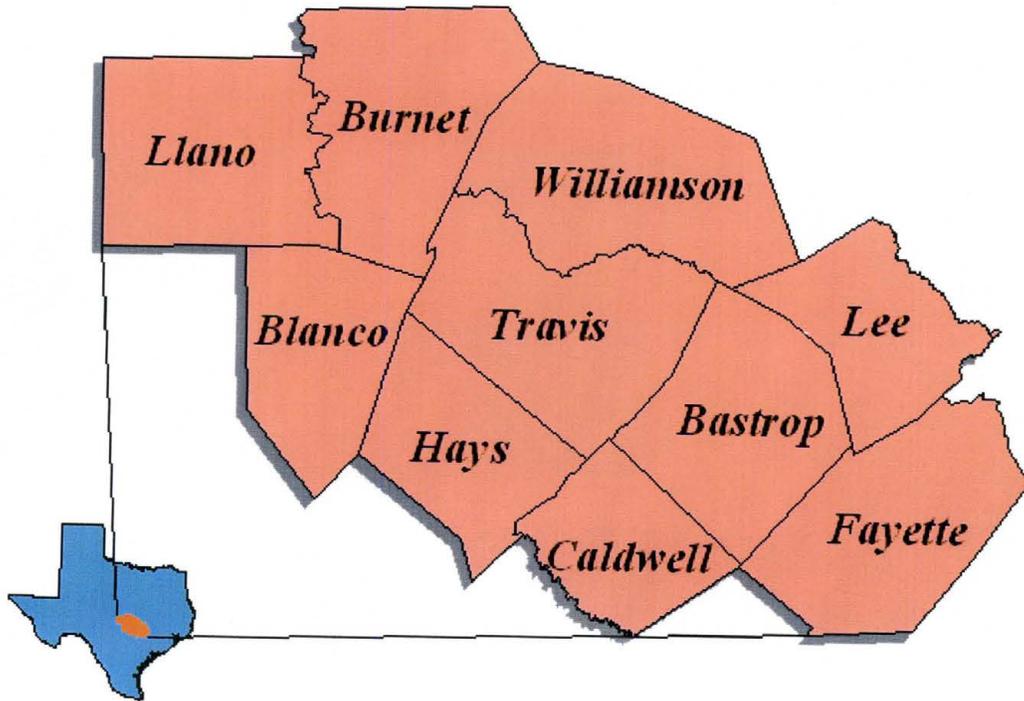
Hays County Environmental Health Department

The Hays County Environmental Health Department is responsible for enforcing regulations relating to development, natural resources, and the protection of health and safety of the residents of the Hays County. The Department's authority extends to all unincorporated areas in the county, and within some municipal boundaries. The Department handles the permitting of on-site sewage facilities (such as septic tanks) and oversees all residential property developments by enforcing the county's Subdivision and Development Regulations.

Capital Area Planning Council

Hays County is one of ten members of the Capital Area Planning Council (CAPCO) (Figure 12). Part of the Council's charter is to develop plans and establish priorities for regional growth. As part of this effort, CAPCO is involved in regional

Figure 12. Capital Area Planning Council Planning Region



Source: <http://www.capco.state.tx.us/capco.htm>.

planning for criminal justice, regional solid waste management, 911 emergency service, economic development, and programs related to aging (CAPCO 2000b).

Capital Area Metropolitan Planning Organization

CAMPO was established in 1973 as the Metropolitan Planning Organization for the Austin, Texas area. The twenty-one-member committee that governs CAMPO is composed of both state and regional officials. CAMPO is charged to oversee the planning of the regional transportation network within Travis and Hays Counties, the cities of Austin, Round Rock, Cedar Park, Leander, Hays and their respective extraterritorial jurisdictions (ETJs). In addition, it is authorized to approve the distribution of federal transportation funds within the Austin area (Austin City Connection 2000).

As outlined in Section 5, CAMPO released the 2025 Transportation Plan for the CAMPO area (CAMPO 2000a). This Plan was prepared in cooperation with the Texas Department of Transportation, Capital Metropolitan Transportation Authority, and Williamson, Travis, and Hays Counties. In addition to serving as a regional plan for the transportation needs of the area, this plan will be used to allocate federal funds for proposed transportation projects.

Regulations

In Hays County there are regulations, laws, and ordinances that influence and affect water availability, land development, and the relationship between the two at the regional, county, and local levels. Regional regulations may be defined by the boundaries

of natural resources such as river basins and aquifers. There are also three basic levels of jurisdiction at the local government level: municipal, extraterritorial jurisdictions (ETJs), and county. Municipal regulations are those laws and ordinances enforced within the corporate limits of a city. Municipalities have different regulations enforceable within their ETJs. The ETJ is defined in Chapter 42 of the Local Government Code, Section 42.021, as the unincorporated area that is contiguous to the corporate boundaries of the municipality. The extent of the ETJ is dependent on the population of the municipality. In Hays County, the extents range from 0.5 to 5 miles (Table 3). The ETJ expands to the prescribed distance when additional land is annexed or if the population of the municipality increases sufficiently to move it to a new category. The extent of the ETJ can also expand to include areas contiguous to existing ETJ boundaries, at the request of adjacent landowners. County level regulations pertain to all land within the county not inside the corporate boundaries of a municipality or its ETJ.

Table 3. ETJ Designations in Hays County, Texas

Extent of ETJ	Determining Population	Hays County Municipality
0.5 miles	< 5,000	Bear Creek, Buda, Dripping Springs, Hays, Mountain City, Niederwald, Uhland, Woodcreek
1 mile	5,000 to 24,999	Kyle, Village of Wimberley
2 miles	25,000 to 49,999	San Marcos
3.5 miles	50,000 to 99,999	None
5 miles	100,000 or more	Austin

* Dripping Spring's ETJ extends from 0.5 to approximately 15 miles, in some instances, from the municipal boundary (Fischer 2000).

Regional Water Regulations

Senate Bill 1

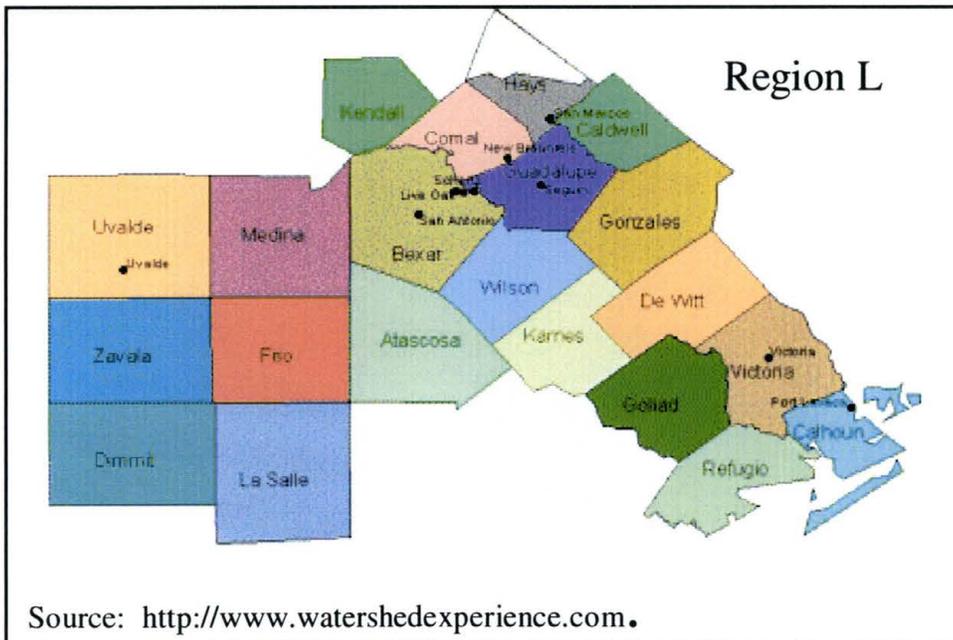
Senate Bill 1 became effective September 1997. It mandated a statewide fifty-year water supply planning effort and the preparation of a comprehensive water management plan for Texas. The bill directs the TWDB to delineate regional water planning areas (sixteen in all) to develop the local water management plans that will eventually be incorporated by the TWDB into the statewide plan due in September 2001. This comprehensive plan will be modified every five years to incorporate revised local and regional plans from these Regional Water Planning Groups (TLC 1997). Currently, draft versions of each of the region's plans are available for public comment. Information regarding projected water demands and shortages outlined in this report were taken from these draft documents.

Hays County is included in two of these planning groups. The Lower Colorado Regional Water Planning Group, Region K, includes the northern portion of Hays County that lies within the Colorado River Basin (Figure 13). The southern portion of Hays that lies within the Guadalupe River Basin is included in the regional plan being developed by the South Central Texas Regional Water Planning Group, Region L (Figure 13). The results of their forecasting efforts for water demands for the county are outlined in Section 10.

Edwards Aquifer Rules

The Edwards Aquifer Rules, contained in 30TAC §213 in accordance with TWC 26.401, are enforced by the TNRCC to protect groundwater quality in the Edwards aquifer region of the counties of Medina, Bexar, Comal, Kinney, Uvalde, Hays, Travis,

Figure 13. Senate Bill 1, Regions K and L Water Planning Groups



and Williamson. All three of the distinct geologic zones of the Edwards aquifer, the contributing zone, the recharge zone, and the transition zone, are covered by these rules (TNRCC 1999).

The rules are designed to regulate activities in the region that are related to construction and might degrade the existing quality of the groundwater or the streams that recharge it. The rules prohibit certain activities such as waste disposal wells, animal feeding operations, and land disposal of hazardous waste in certain zones. Regulated activities include all types of construction, excavation and clearing, and the installation of both above and below ground storage tanks used to store potentially contaminating liquids.

Edwards Aquifer Protection Plans include an assortment of plans that must be created when construction related activities are under consideration. The required plans include a water pollution abatement plan, an organized sewage collection system plan, an underground storage tank facility plan, and an aboveground storage tank facility plan (TNRCC 1999).

Priority Groundwater Management Areas

The Critical Area Program, House Bill 2, was established during the 69th Legislature in 1985. This program was created to identify areas experiencing critical groundwater problems, such as contamination, land subsidence, aquifer depletion or shortage of supply. The TNRCC and the TWDB identified sixteen areas in the state for further study.

In 1990, the TNRCC designated four of the original sixteen areas as critical. The portion of the Hill Country underlain by the Trinity aquifer was one of those designated

Critical Areas due to threats of decreasing water levels and deteriorating water quality in the underlying aquifers. Counties encompassed by this area include Bandera, Bexar, Blanco, Comal, Gillespie, Hays, Kendall, and Kerr.

Senate Bill 1, adopted in 1997, amended Section 35.007 of the Texas Water Code to redefine these critical areas as Priority Groundwater Management Areas. These areas are either experiencing, or expected to be experiencing within the next twenty-five years, critical groundwater problems including shortages, subsidence, or contamination.

Groundwater Conservation Districts

The purpose of groundwater conservation districts as stated in TWC Section 36.0015 is “to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions . . .”

Groundwater conservation districts are created in one of four ways:

- 1) Established by landowner petition with the approval of the TNRCC under TWC Section 36.013;
- 2) Created by the TNRCC in designated Priority Groundwater Management Areas through TWC Section 36.0151;
- 3) Established through special legislation; and
- 4) Established by adding territory to an existing district (Fipps 1998).

Establishment as a Groundwater Conservation District gives powers and duties to manage groundwater. The extent of the District’s authority depends on the manner in which the district was created and how much authority provided under TWC Chapter 36

is delegated to the district. It may be provided with the authority to regulate pumping and may be authorized to regulate groundwater quality.

Senate Bill 1174, adopted in 1999, amended the Chapter 232, Subchapter D of the Local Government Code. It established alternative subdivision platting requirements applicable only to subdivided land located within a Priority Groundwater Management Area under the jurisdiction of the county. In addition to meeting customary platting requirements, the developer must include certification by a registered engineer that verifies that there is an adequate (in quality and quantity) water supply to meet the needs of the number of proposed lots in the platted area.

County Regulations

For water availability and development, the county has been given limited authority to regulate certain aspects of the subdivision and development of lands, and to monitor and permit on-site sewage facilities. The county's Subdivision and Development Regulations and On-Site Sewage Facilities Rules are described below.

Subdivision and Development Regulations

Hays County Subdivision and Development Regulations are based on the Local Government Code Chapter 232. In Hays County, these rules were incorporated into the "Hays County Subdivision and Development Regulations" effective in June 1997, and amended in 1999. These county-specific regulations were drafted and are administered by the Hays County Environmental Health Department.

Senate Bill 1323, adopted in 1999, amended the Local Government Code Section 232.0031 to give the County Commissioners Court the authority to require subdivisions

for which groundwater would be the sole source of water, to include proof of adequate water availability as part of the plat application (TLC 1999). These regulations are included as Section 3.12 of the Hays County Subdivision and Development Regulations.

All applications for plat approval must meet the water availability requirements except for the following: subdivisions of five lots or less, where the lots average at least two acres each; subdivisions with ten or fewer lots, where the lots are all greater than ten acres; subdivisions that are not going to be dependent on groundwater; and special conditions related to family conveyances of property.

Plat approval is contingent on the applicant taking the following actions or supplying the following information to the Commissioners Court [Section 3.12(1)]:

- * Construct at least two wells to prove water availability, one of which is a monitor well, and the other the test well;
- * Map all wells within 1,000 feet of the subdivision boundary;
- * Measure the static water level of the wells;
- * Perform an aquifer pump test that lasts at least 24 hours in duration and demonstrates a sustained rate at least equivalent to the average pumping rate expected of the supply well;
- * From the pump test, calculate certain data so as to characterize the potential of the aquifer in the capture zone to support the proposed usage (transmissivity, hydraulic conductivity, and storage coefficient);
- * Calculate the influence the supply well will have on nearby wells (within 1,000 feet of the proposed subdivision boundaries); and
- * Analyze the water for bacteria and chemical constituents.

For subdivisions proposed to be serviced by permitted public water supplies, the applicant must document the proposed annual water usage for the subdivision, that the proposed supplier has the capacity to service the planned subdivision, and that the

subdivision falls within the supplier's certificate of convenience and necessity (CCN) [Section 3.12(2)].

In addition to these measures, the subdivision and development regulations require that the final plat contain the following notice: "... Due to declining water supply, prospective property owners are cautioned by Hays County to question the seller concerning ground water availability. Rain water collection is encouraged and in some areas may offer the best renewable water resource" [Section 6.1 (d)(2)].

Senate Bill 710, which amended Local Government Code Chapter 232, also became effective in September 1999. In addition to requiring landowners in unincorporated areas to submit plats when dividing their property under certain circumstances, counties are given the right to require reasonable specifications for certain utility services. They are empowered to regulate drainage and storm-water runoff plans and to coordinate subdivision drainage (Evans 2000c).

Hays County On-Site Sewage Facilities Rules

Hays County regulations for on-site sewage facilities are based on those outlined in the Texas Health and Safety Code Chapter 366, and the TNRCC's standards for on-site sewage systems contained in 30TAC §285.1-285.91. The rules are established to mandate certain minimal lot sizes depending on the type of wastewater application, the physical location of the lot, and the source of the water supply. According to the Hays County Rules Table 10.1 on minimum lot sizing, if a lot has a septic tank and is supplied water from a private well, the minimum lot size that can be developed is five acres for lots within the Edwards aquifer recharge zone, three acres for lots within the contributing zone of the aquifer, and two acres for lots in all other areas (Hays County 1997).

These rules allow for lot averaging within a subdivision, meaning that if the overall average of the lots is within the designated acreage, then the acreage of the individual lots may vary. This clause allows for more clustered development and promotes open space in developed areas. Note that these rules are most stringent on developments overlying the Edwards aquifer recharge and contributing zones.

Municipal Regulations

There are eleven municipalities located within Hays County. These include San Marcos, The Village of Wimberley, Woodcreek, Kyle, Buda, Mountain City, Hays, Dripping Springs, Bear Creek, Uhland, and Niederwald. Both Uhland and Niederwald are located on the Hays-Caldwell County line. In addition, Austin's ETJ extends just into the northern portion of the county in the vicinity of the city of Hays.

Municipalities are given various tools to manage growth and development within their boundaries. These include property and zoning authority and the ability to regulate subdivisions. A municipality's zoning authority is outlined in the Local Government Code Chapter 211. Municipalities may regulate the height, number of stories and sizes of buildings, the percent of a lot that may be occupied by buildings, the size of yards, courts, and open spaces, population density, the location of structures on a piece of property, and the use of the property. As outlined in the Local Government Code Chapter 212, cities also have the authority to regulate subdivisions and property within their limits and the limit of their designated ETJs. By ordinance, cities can extend their regulations within their ETJs.

In addition to these regulations, the city of San Marcos has enacted an Edwards Aquifer Ordinance. This ordinance, adopted in March 2000, and approved by the TNRCC, restricts development over 11,000 acres in the city's ETJ. It includes establishing impervious cover limits, critical water quality zones, percentage limits on roof areas, sidewalks and parking lots, best management practices for construction, and incentives for cluster development and dedication of open space. The critical water quality zones require a buffer of 400 feet around Sink, Purgatory, and other surface waterways (Evans 2000).

Summary

The key agencies and regulations outlined include those the regulatory focus of which is to insure water availability, secure water quality levels as they are affected by development, and those involved in guiding the general growth of the county. Senate Bill 1 was enacted to ensure planning for water availability for the State of Texas for the next fifty years. This consensus planning effort, coordinated by the TWDB, with the assistance of the TNRCC and TPWD, is attempting to assure that all users have adequate water supplies to fulfill future demands. As outlined in Section 4, the demand forecasts are based on population projections that are not limited by the availability of water to support the resulting population. In effect, Senate Bill 1 is planning to meet the future demands of the county so that growth will not be limited by the availability of water.

Water availability in Hays County is the concern of an additional five agencies. The EAA has placed withdrawal limits, which will be outlined in Section 9, to allow it to manage the Edwards aquifer to maintain the water balance of the systems and assure

adequate water for all users. The BS/EACD is also working to define such a limit on withdrawals. Currently, the Trinity aquifer is not under this type of management. But there are two agencies involved that have limited powers. The Hays County Commissioners Court, through its water availability requirements, provides limited management under the guise of ensuring adequate water supplies to new developments. Unfortunately, this authority is short-ranged and extremely localized. The Trinity aquifer needs to be under the management of an entity that can regulate its use for the benefit of all users and to maintain the water balance of the system. If ratified by the 77th Legislature in 2001, the newly formed Hays Trinity Groundwater Conservation District will be able to work towards establishing the knowledge and regulations necessary to do this. The fifth agency that regulates the availability of water in the county is the TNRCC, with their surface water permit program.

Both the TNRCC and the USFWS have regulations that affect land development over the Edwards aquifer contributing and recharge zones, and consequently the majority of the county (Figure 4). The TNRCC's Edwards Aquifer Rules affect development in the Edwards aquifer zones by regulating construction activities. The USFWS is responsible for the protection of the endangered species that may be affected by development in these zones. When involved, the USFWS establishes development guidelines such as impervious cover limitations.

In addition, the municipalities have development regulations that enforce minimum lot size and impervious cover requirements within their city limits and their ETJs. In the unincorporated areas of the county, county officials enforce minimum lot sizing when private water supply wells or on-site septic systems are installed.

Lastly, CAMPO and CAPCO are both planning organizations that influence growth in Hays County. While their focus is on issues such as transportation and economic development, the results of their planning play a significant role in the direction that the growth in the county takes. For example, decisions regarding the transportation network of the region will influence the parts of the county that will be able to support higher population densities and be privy to services brought in by road rights-of-way.

SECTION 8

WATER SUPPLY ORGANIZATIONS

This section outlines key water supply organizations in the county. These are two River Authorities, two regional water supply authorities, and numerous entities that provide water to customers in specifically designated service areas (CCNs).

River Authorities

River authorities are regionally based authorities with jurisdictions established by the legislature, generally within the geographic boundaries of the major river basins in Texas. There are eighteen river authorities in the state. They are responsible for managing the surface water supplies within their specified boundaries. If requested, river authorities can also provide drinking water and wastewater treatment for residents and communities within their service areas. Two river authorities cover Hays County. The whole county is part of the Guadalupe Blanco River Authority (GBRA), and the portion of northern Hays County located within the Colorado River basin is within the service area of the Lower Colorado River Authority (LCRA).

Guadalupe-Blanco River Authority

The GBRA was established to generate electricity and manage the water resources of the Guadalupe River Basin including the Blanco, San Marcos, Comal, and Guadalupe

Rivers from their respective headwaters to the San Antonio Bay. Hays County is included in the GBRA's statutory district (Figure 14).

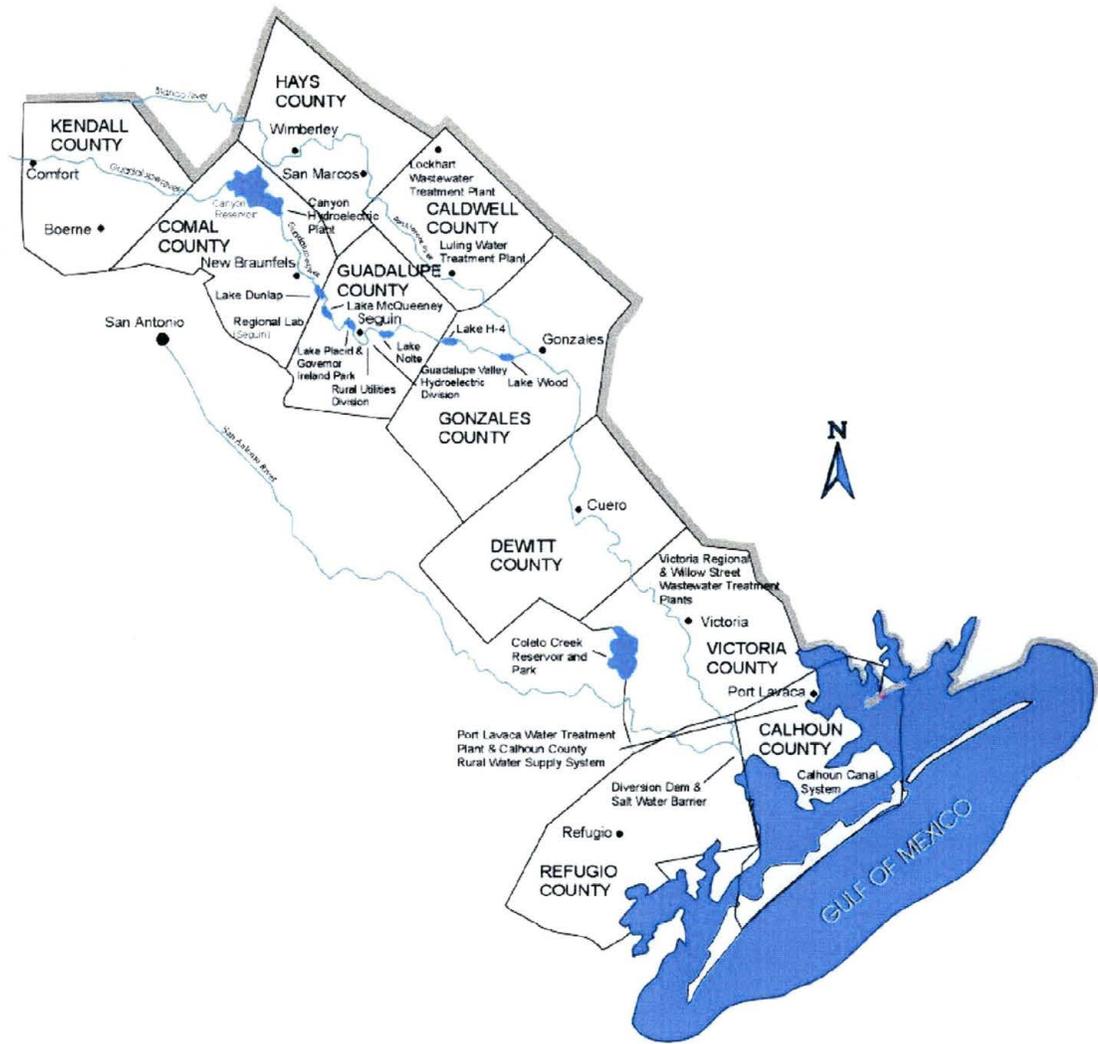
The GBRA provides 10,000 acre-feet/year of raw water to the San Marcos Surface Water Treatment Plant (SWTP) through a contract with the city of San Marcos. Currently, the city uses only 5,000 acre-feet/year (Hill 2000). The GBRA also operates the treatment plant under contract. Surface water is provided via a 30-inch, 20-mile pipeline from Lake Dunlap, the diversion point for GBRA's allocated Canyon Lake water.

The GBRA is currently developing an I-35 Project to supply the Kyle and Buda areas with surface water via a pipeline from the San Marcos SWTP. It is also currently considering whether to supply water from Canyon Lake to the Village of Wimberley and the Buda area. A pipeline would be required from Canyon Lake to the Village of Wimberley, continuing to the Buda area. The GBRA could then interconnect the Village of Wimberley, Buda, Kyle, and San Marcos (Welch 2000). The GBRA is also serving in an advisory capacity for the recently incorporated Village of Wimberley as they develop plans to address their water and wastewater treatment needs.

Lower Colorado River Authority

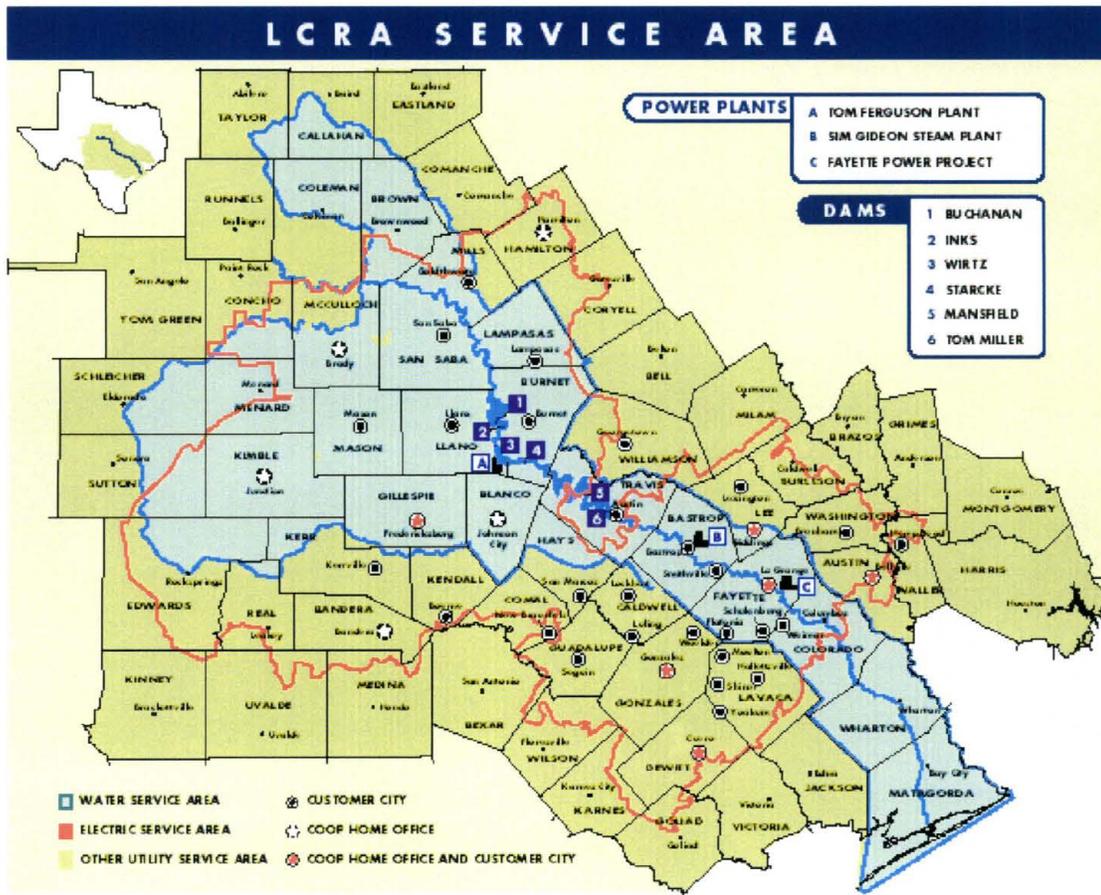
The LCRA has an eleven county district that includes counties along the lower Colorado River. The LCRA water service area, which covers thirty-five counties, includes the northern portion of Hays County within the Colorado River basin (Figure 15).

Figure 14. The Guadalupe Blanco River Authority District Boundary



Source: modified from <http://www.gbra.org>.

Figure 15. The Lower Colorado River Authority Service Area



Source: <http://www.lcra.org/about/srvareamap.html>.

The LCRA is authorized by the State of Texas to store, control, distribute, and sell the waters from the Colorado River (TWDB 1996). It also generates and distributes electricity from the Highland Lakes and operates steam electric power plants in a service area different from that for water supply. Since the northern portion of Hays County is within the Colorado River basin, it is within the LCRA service area.

The LCRA does not currently provide surface water to Hays County. It is in the process of planning and constructing a 24-inch water line that will run from its surface water treatment plant near the Village of Bee Caves to Dripping Springs. This line, with an ultimate capacity of 6.5 million gallons per day (mgd) (7,281 acre-feet/year), should be completed by January 2002. Initial delivery through the line will be limited to two mgd (2,240 acre-feet/year) by the intake system to the treatment plant from Lake Austin. As the demand for the LCRA surface water increases, the LCRA will consider constructing an additional intake system from Lake Travis (Parks 2000).

The LCRA also plans to provide surface water to the northeastern portion of Hays County in the Buda area. Only preliminary discussions on this potential project have occurred (Parks 2000).

Regional Authorities

Canyon Regional Water Authority

Canyon Regional Water Authority (CRWA) was created by the Texas Legislature in 1989, to wholesale quality water to its member water systems. It is composed of retail water suppliers in the San Antonio Region. The following CRWA Water Supply Corporation members have CCN areas that extend into Hays County: Maxwell Water

Supply Corporation (WSC), Crystal Clear WSC and County Line WSC. The CRWA service area is coterminous with the CCN areas of its member entities. The CRWA provides water to its members, which in turn distribute the water to their customers through their individual storage and distribution systems.

CRWA operates the two mgd (2,240 acre-feet/year) capacity water treatment plant located at Lake Dunlap, along the Guadalupe River southwest of New Braunfels (Davenport 2000). It is currently expanding the plant to include an additional eight mgd (8,961 acre-feet/year), which will be completed by February 2001. Members of the CRWA also have secured the option to take up to $\frac{1}{2}$ mgd (560 acre-feet/year) of treated water from the San Marcos SWTP (Miller 2000).

CRWA has plans to build another surface water treatment plant along the San Marcos River as part of its Hays County Water Supply Project. This will provide water to Maxwell, Martindale, Crystal Clear, and County Line WSCs. Funded through loans from the TWDB, the plant should be completed by April 2001. It will be located just downstream of Pecan Park Retreat, and will take a year to build once the necessary permits are secured. The plant will have a total capacity of two mgd (2,240 acre-feet/year). The plant was originally planned with a capacity for 1.5 mgd (1,680 acre-feet/year) but was modified when a larger plant was found to be economically feasible. Raw surface water permits for withdrawal from the San Marcos River, totaling 800 acre-feet/year, were purchased and 800 acre-feet/year was secured through the GBRA from Canyon Lake. CRWA has the option to modify its contract with the GBRA to secure additional water. The Canyon Lake water will be brought to the new plant via the pipeline running from Lake Dunlap to the San Marcos SWTP (Davenport 2000).

Hays County Water and Sewer Authority

In 1999, during the 76th Legislature, counties were given the authority to own, operate, or maintain a water or sewer utility system (Local Government Code Chapter 412.016). This allows counties to serve an unincorporated area of the county in the same manner and under the same regulations as a municipality. Based on this enabling legislation, the Hays County Water and Sewer Authority was established (Walther 2000).

Under this legislation, Hays County is given the same authority as cities to adopt regulations such as watershed protection. While the Commissioners Court established the Hays County Water and Sewer Authority to cover the entire county, their only current service area is in Sunset Canyon, a subdivision located near Dripping Springs. The county is under contract with the LCRA to provide surface water to the area through the proposed 24-inch pipeline to Dripping Springs (Walther 2000).

Water Suppliers

There are two types of water suppliers in Hays County. There are cities and rural water supply corporations, with designated Certificate of Convenience and Necessity (CCN) areas, and Water Districts. There are five Water Districts in the county. These include the Hays County MUD #1, #2, #3, the Friendship Ranch WCID, and the Saddletree WCID (TNRCC 2000). Forty-four organizations have registered CCN service areas in the county. The designation of a CCN by the TNRCC obligates the water supplier to provide service to properties within their CCN (TNRCC 1995). The municipal water suppliers and some of the larger Water Supply Corporations (WSC) are outlined below.

City of Kyle

The original water works system for Kyle dates from 1887 and pumped water from the Blanco River two miles west of the city (Stovall et al. 1986). The Municipal Water District for the city of Kyle currently has 2,149 customers, more than ninety-eight percent of whom are residential users (Haverda 2000). The city owns a total of four wells. Three are located within the San Antonio Segment of the Edwards aquifer. These wells have a historic record of pumping and an interim authorization to pump a total of 620 acre-feet annually. The city also owns one well within the Barton Springs Segment that is permitted to withdraw 55 million gallons (170 acre-feet/year) of water.

The city of Kyle is currently negotiating with the city of San Marcos to purchase water from the recently constructed San Marcos Surface Water Treatment Plant (SWTP). It hopes to connect to this new source of water by summer 2001. This will supply up to 500,000 gallons of water per day (560 acre-feet/year) (Haverda 2000). Once this project is complete, the city intends to reduce withdrawal from all four of its groundwater wells.

City of Buda

The city of Buda currently supplies water to 965 customers. Approximately ninety-five percent of these are residential users, and the remaining five percent are commercial. It owns three wells that withdraw water from the Barton Springs Segment of the Edwards aquifer. These wells are permitted for a total production of 100 million gallons a year (307 acre-feet/year). The city withdraws an average 18,000 gallons per day (1.7 acre-feet/month) in September, and 10,000 gallons a day (one acre-foot/month) in January, to support its current customers (City of Buda 2000).

The city is currently working with the GBRA to obtain surface water as part of the upcoming I-35 Project. This project involves the construction of a water pipeline from the San Marcos SWTP to the Buda area (Welch 2000).

City of San Marcos

In 1883, the first water works system was established in San Marcos providing water from a deep well (Stovall et al. 1986). The city currently has 7,094 customers within its city limits, with eighty percent being residential users. It also provides service to areas outside the city limits, within its ETJ. There are 961 customers in the ETJ, with ninety-three percent of these being residential users.

The supply is a mix of surface and groundwater. Surface water supplies come from Canyon Lake (up to 5,000 acre-feet/year) via a pipeline from the Lake Dunlap diversion to the San Marcos SWTP. The city also has interim authorization, by the EAA, to withdraw 7,615 acre-feet/year from the Edwards aquifer. An average monthly summer use of water for the city is 603 acre-feet, and for the winter is 486 acre-feet. To support future growth projections, the city is considering increasing its surface water rights, and increasing the treatment capacity of the San Marcos SWTP (City of San Marcos 2000).

Aquasource

Aquasource is a privately owned company. Unlike the other water suppliers in the county, it operates on a for-profit basis. Aquasource owns and operates twelve water supply systems in Hays County. Ninety-seven to ninety-nine percent of its customers are residential users. Ten of its systems obtain their water from thirty-nine wells in the Edwards aquifer. The number of customers supported by these systems ranges from

thirty-eight to 444, and the total 1999 production from all their Edwards aquifer wells was 737 acre-feet.

The remaining four water supply systems get their water supply through sixteen wells in the Trinity aquifer. A total of 1,247 customers are supported by these systems, for a total volume of 800 acre-feet in 1999. Aquasource plans to drill an additional well into the Barton Springs Segment of the Edwards aquifer to meet the future demands of one of its systems.

City of Austin

The city of Austin currently is under contract to supply two mgd (2,246 acre-feet/year) of water to the Hill Country WSC. The water comes from Lake Austin. Through a settlement with developer Gary Bradley, the city also has agreed to support the future developments on the Spiller and Pflueger Ranches, both located in the northern reaches of Hays County, with water and wastewater services. The volume of water will depend on the final development plans. Under the settlement with Mr. Bradley, 500 to 900 residences would need water service (Jennings 2000).

Water Supply Corporations

Water Supply Corporations (WSC) are non-profit, member-owned and controlled organizations, operated by a customer-elected board of directors. Water services are supplied to members of the corporation, who in turn pay a membership fee and are allowed voting privileges as a member/stockholder of the WSC. Funding for WSC plants and distribution systems usually comes from the Texas Water Development Board or the United States Department of Agriculture Rural Economic and Community Development

Service. Repayment of loans and the costs of maintenance and operation of the systems are paid from the revenues generated from water sales (TNRCC 1995).

Eight of the larger WSCs in Hays County were contacted for this research. These include Hill Country, Creedmoore Maha, County Line, Wimberley, Crystal Clear, Dripping Springs, Maxwell, and Goforth WSCs. For these WSCs, ninety to ninety-eight percent of their customers are residential. Detailed information regarding CCNs, customer base, current water sources, and future projects for these corporations is included as Appendix D.

The two WSCs contacted in the Dripping Springs area, Hill Country and Dripping Springs, are both considering the option of surface water from the proposed LCRA 24-inch pipeline. Hill Country WSC is currently supplied by the City of Austin, and Dripping Springs WSC gets its water from the Trinity aquifer.

Both WSCs in the Buda area currently withdraw water from wells into the Barton Springs Segment of the Edwards aquifer. While Goforth WSC is working with the GBRA and the LCRA to secure future water supplies, Creedmoore Maha WSC is applying for an additional permit to pump from the Barton Springs Segment of the Edwards aquifer.

The three WSCs in the Kyle – San Marcos area currently withdraw water from the San Antonio Segment of the Edwards aquifer. County Line, Crystal Clear, and Maxwell WSCs are members of the CRWA and plan eventually to receive water from its proposed SWTP.

The one WSC contacted in the Village of Wimberley area, Wimberley WSC, currently withdraws water from the Trinity aquifer. It does not have plans to change

water sources in the near future, but might work with the GBRA if a water line is constructed from Canyon Lake to the Wimberley area.

Summary

There are three levels to the water supply organization network in Hays County. The top level, the River Authorities, have secured allocations of surface water from the TNRCC. They are delegated to manage their surface water supplies within their district and service areas. They act as water purveyors by selling their allocated water to other entities. These entities include the regional authorities, municipalities, and the water districts and water supply corporations. LCRA and the GBRA are working with the Senate Bill 1 Regional Water Planning Groups and are involved in their planning efforts. Through Senate Bill 1, the LCRA and the GBRA are working jointly in the northern portion of the county that falls within both their boundaries.

The second tier to this water supplier network is the regional authorities. They act as wholesale water brokers, working to assure that their members have the supply of water they need. Only three of the water supply corporations that service the county operate under such an authority, the CRWA. The CRWA is planning to meet the demands of its members with the construction of its proposed SWTP.

The third tier is the water supplier who distributes water to a retail customer base. These suppliers include municipalities, water districts, and the water supply corporations. All of the suppliers contacted for this research, are working to meet the anticipated water demands within their designated service areas. Out of the four municipalities, the privately owned Aquasource, and the eight Water Supply Corporations contacted, only

Aquasource and Creedmoore Maha WSC are planning to meet future demands by increasing their supply with groundwater resources. Each has plans to drill an additional well into the Barton Springs Segment of the Edwards aquifer. The remaining suppliers are working with the GBRA, the LCRA, and through the CRWA, to secure surface waters from out-of-county sources.

SECTION 9

WATER AVAILABILITY

With the current and potential growth of the county, the ability of the available water resources to supply continued development is questionable: how many people can these water resources realistically support? To have a continuous, reliable future water supply, sources should provide a sustainable long term increasing quantity, or have the ability to maintain a certain level of supply indefinitely. For this to occur, the volume of water used from a source in one year cannot exceed the amount of water replenished to that source via precipitation, storage, and recharge even during periods of low rainfall and runoff.

There are three available sources within the county. These include groundwater, surface water, and precipitation. Each of these sources is discussed below in terms of the volume of water it can provide on a sustainable yearly level or the status of current research on the amount that might possibly be available in the future to supply water to Hays County. A discussion on alternative methods to enhance the availability of water from these sources is also included.

Groundwater Sources

Trinity Aquifer

The Trinity aquifer extends from south central Texas to the northern reaches of the state (Figure 9). As outlined in Section 7, the portion of Hays County underlain by the Trinity aquifer was declared a Priority Groundwater Management Area in 1990. This designation means the area was either experiencing, or expected to experience, critical groundwater problems within the next twenty-five years.

In a study conducted by the TWDB in 1992 (Bluntzer 1992), the groundwater resources of this aquifer in Hays County were evaluated. The sustainable yield of the Trinity aquifer in the county was estimated, with the annual sustained yield defined as “the approximate amount of groundwater that can be recovered by wells without adversely affecting baseflow (groundwater discharge) to area effluent streams, and without causing adverse water-level declines and related encroachment of poor quality water.” (Bluntzer 1992, 98) The amount estimated for Hays County was 1,800 acre-feet/year. Part of the legislated charge assigned to the newly formed Hays Trinity Groundwater Conservation District is to determine how much water is available for withdrawal on a renewable basis.

The TWDB (2000) produced a three-dimensional, numerical groundwater flow model to simulate groundwater availability in the Trinity aquifer in the Hill Country Area to estimate the availability of groundwater and aquifer water levels in response to potential future droughts and pumping. Water demand used to estimate future pumping rates was based on data provided by the Senate Bill 1 Regional Water Planning Groups.

The model predicts that as early as 2010, Hays County may experience moderate (50 to 100 feet) declines in the level of the Trinity aquifer in response to potential drought and projected demands. The model also predicts an even greater decline in the water levels of the aquifer in and around Dripping Springs (greater than 100 feet).

During the year 2000, two events indicated that increased use of the Trinity aquifer, coupled with drought-like conditions, can produce detrimental effects on water supply. The first occurred in April and May 2000, when residents of the Sunset Canyon subdivision, located near Dripping Springs, alerted the Hays County Commissioners Court that their personal water supply wells into the Trinity aquifer were failing and going dry. Based on these concerns, the Court adopted a resolution stating that, in its opinion, an emergency existed in the Sunset Canyon subdivision (Walther 2000).

Reports analyzing these concerns were drafted by both the LCRA and by the BS/EACD (in coordination and on behalf of the Hays Trinity Groundwater Conservation District). Both reports show there is a problem with water availability in the Sunset Canyon area. However, in defining the scope of the problem, questions concerning proper well construction, adequate well spacing, and conscientious wise water use were also raised (Hauwert 2000). A more detailed discussion on the court's resolution and the technical reports is included in Section 12.

Jacobs Well, an artesian spring located four miles northwest of the Village of Wimberley, went dry in summer 2000 for the first time in recorded history. This spring is fed by the Trinity aquifer system (DeCook 1963). The direct cause of the spring's reduction in flow is unclear, but inadequate recharge because of drought and increased pumping in the Village of Wimberley area are suspected.

Edwards Aquifer

While the total amount of water available for withdrawal from the Edwards aquifer on a sustainable level is also not known, there is a mandated annual limit to the volume that can be withdrawn from the San Antonio Segment, and researchers are currently working on establishing a limit for the Barton Springs Segment. Both segments of the Edwards aquifer are managed by regulating authorities. The Barton Springs Segment is under the control of the BS/EACD and the San Antonio Segment is under the control of the EAA.

Barton Springs Segment

All wells within the jurisdiction of the BS/EACD must be registered. A well does not have to be permitted if it produces less than 10,000 gallons per day (11.2 acre-feet/year), serves five or fewer households, is used solely for noncommercial agricultural purposes, or was permitted by the Texas Railroad Commission before a certain date for purposes related to hydrocarbon production, oil or gas well drilling, and injection (BS/EACD 1999).

The BS/EACD estimates that a total volume of 300,000 acre-feet of water is stored in the Barton Springs Segment of the Edwards aquifer. Barton Springs is fed by the gravity flow of the water located stratigraphically higher than the spring openings. If the water table drops below the spring openings, they cease to flow. Of the total estimated volume of water, an estimated 94,000 acre-feet is situated stratigraphically above the springs (Mathis 2000) and provides for their continual flow. The BS/EACD manages this volume to maintain spring flow and ensure adequate water to other

groundwater users. Research is currently underway to establish what volume of water can be withdrawn from this segment of the aquifer without causing detriment to spring flow. Until this limit is established, the BS/EACD is still issuing new permits to wells that meet its aquifer test requirements.

Even though the jurisdiction of the BS/EACD encompasses portions of four counties, approximately ninety-five percent of the wells registered with the Conservation District are located in Hays County (Mathis 2000). Of these wells, in 2000, fifty-eight are permitted to withdraw water from the Edwards aquifer for an approximate total volume of 4,526 acre-feet annually. The number of permitted wells varies yearly, as does the actual pumping volume. Listed below are the records from the BS/EARD for the last three years, based on the fiscal year of September through August.

Table 4. Permitted Withdrawals
Barton Springs Segment, Edwards Aquifer

Year	# of Permitted Wells	Permitted Volume (acre-feet)	Actual Volume Pumped (acre-feet)	Difference (acre-feet)
1998	69	4,465	3,833	632
1999	66	4,647	3,562	1,085
2000	58	4,526	4,389	138

Source: (BS/EACD 2000a).

These totals are based on the combined yearly volumes of all the permit holders. The difference between the amount permitted and the actual volume pumped shows that, over the last three years, the permittees have not been pumping their fully allocated volumes.

San Antonio Segment

The Legislature has given the EAA the responsibility to create a market-based allocation system for managing the San Antonio Segment of the Edwards aquifer. This charge includes establishing a permit system that requires all water pumpers to obtain a permit, and the placement of an overall cap on the amount of permits issued (Ellis n.d.). With the issuance of permits for withdrawals from the Edwards aquifer, it is possible to develop a water bank where permitted water is treated as an economic commodity that can be traded, sold and leased. Applicants are entitled to permits if they have “perfected” the groundwater right by putting a quantity of pumped water to a beneficial use sometime between 1972 and 1993 (Ellis n.d.). The amount permitted is based on this proven historical use but modified to a proportioned amount that fits within the legislated overall withdrawal limit of 450,000 acre-feet/year, until December 31, 2008 and 400,000 acre-feet annually thereafter until 2012, when the amount must be whatever is required to protect endangered species. Irrigators are limited to a maximum permit of two acre-feet/year per acre of irrigated land. Single residential well owners who pump 25,000 gallons or less per day (twenty-eight acre-feet/year) are not required to be permitted.

Under this system, which functions like a water bank, water initially permitted for agricultural irrigation can be sold on the water market to meet future municipal and commercial water needs. This process is already occurring with Edwards water in the agricultural counties of Uvalde and Medina where permitted water is being sold or leased to the city of San Antonio (Votteler 2000).

There are limits to this water bank. The transfer of rights is regulated by Senate Bill 1477, Article 1, Section 1.34. This section states that water withdrawn from the San

Antonio Segment of the Edwards aquifer, must be used within the boundaries of the EAA. It also limits the sale or lease of permitted water rights for irrigation to only fifty percent of permitted amounts. The water gained through trading of rights would only be available to supplement supply within the southeastern portion of Hays County that is under the jurisdiction of the EAA.

Of the people who applied for permits, Table 5 shows for the types of water users, total amount claimed, and total interim authorization amount.

Table 5. Permitted Withdrawals in Hays County
San Antonio Segment, Edwards Aquifer
(in acre-feet/year)

User Type	Maximum Claimed	Interim Authorization
Municipal	10,823	10,785
Industrial	6,195	6,195
Irrigation	1,260	1,260
Total	18,278	18,240

Source: (EAA 2000).

Of the thirty-eight applications for permits from Hays County currently before EAA for authorization, thirteen are industrial, eight are irrigation, and twenty-one are municipal users. The discrepancy between the interim authorization and the maximum claimed is due to cases where the maximum amount claimed was not proven.

In *The San Antonio Express-News* dated November 19, 2000, the EAA published a legal “Notice of Proposed Initial Regular Permit [PIRPs] and Technical Summaries.” The actual proposed permits include conditions such as withdrawal amount, purpose of use, location of points of withdrawal, place of use, meters, maximum rate of withdrawal, statutory minimums, proportionally adjusted amounts, equal percentage reduction amounts, transfers, reporting fees, waste, termination, interruption and suspension of withdrawal amounts, registration of wells, water use reporting, well construction,

operation, maintenance and closure, etc. The EAA contemplates action by the Board on these proposed permits within sixty days of the published notice unless a request for contested case hearings is filed for a proposed permit. Directions for filing such a request are detailed (EAA 2000).

Surface Water

While surface water is available, it is not utilized as a major source for consumption in the county. Consumptive water use involves using the water in a manner that does not return the water to the source, and the water is lost for immediate further use (Kaiser 1985). As of November 2000, there are fourteen water rights permits, and twenty-four certificates of adjudication for the surface waters in Hays County, for a total of approximately 77,800 acre-feet/year. The water is designated for five different uses including municipal and domestic (1,285 acre-feet), industrial (10,594 acre-feet), irrigation (2,176 acre-feet), hydroelectric (64,370 acre-feet), and recreation (700 acre-feet). Major surface water sources include the Blanco River, Onion Creek, and the San Marcos River (Hopkins 2000).

There are two major entities that hold 77,317 acre-feet (ninety-nine percent of the total permitted volume) of the surface water rights in Hays County. Southwest Texas State University (SWT) is permitted for the use of a total of 67,317 acre-feet of water. Of this amount, 64,370 acre-feet are designated for non-consumptive hydroelectric uses. Of the total quantity permitted to SWT, more than 40,000 acre-feet annually has recently been placed in perpetual trust to assure in-stream flows in the San Marcos River and freshwater inflow to the San Antonio Bay under a contract with the TPWD governing

construction of the Texas Rivers Center at San Marcos Springs on the SWT Campus (Supple 2000). The other major entity is the TPWD that has a total of 10,000 acre-feet under permit for industrial use to run the State's Fish Hatchery. Of this amount, only 500 acre-feet are designated for consumptive use.

Rainwater

The collection of rainwater for domestic water needs is not a new concept, but in Hays County, it is not a common practice. There has been a recent effort to educate the public about the benefits of collecting rainwater. In an effort to reduce rural homeowners' reliance on groundwater, the Hays County Commissioners Court approved a tax incentive program for rainwater collection systems in October 2000. The tax incentive excludes the cost of installing a collection and treatment system from the taxable value of a property. New homes will also get a \$100 rebate from the cost of development permits. The abatement will be issued for systems designed to be insect and sunlight proof with a holding capacity of at least 2,500 gallons. This abatement will not be granted until 2001, and only affects county property taxes and not those for schools or municipalities (Evans 2000d).

The TWDB (1997), in cooperation with the Center for Maximum Potential Building Systems produced a guide to rainwater harvesting in Texas. This guide serves as an information resource for persons interested in rainwater harvesting as a water supply option. This guide outlines the general rule of thumb for how many gallons of rainwater can be collected from a catchment area (in most cases the roof of a home). The rule of thumb is:

$$\frac{\text{Catchment Area (ft}^2\text{)} \times \text{Average Annual Rainfall (inches)} \times 600}{1,000}$$

For example, with a 1000 ft² roof, a system can collect 600 gallons of rainwater with every inch of rain (TWDB 1997). As outlined in Section 6, the average annual rainfall for Hays County is 34.55 inches. Based on this amount, the system could collect an average 20,730 gallons (.06 acre-feet) of water a year. This would provide the household with a rationed fifty-six gallons of water a day.

A common concern with the capture of rainwater is the loss of recharge to the underlying aquifers. In the western portion of the county underlain by the Trinity aquifer, only about five percent of the precipitation and runoff that falls and flows through the recharge area reaches the aquifer (Bluntzer 1992). Similarly, only a small part of the precipitation that falls within the recharge zone of the Edwards aquifer will directly infiltrate into the aquifer (DeCook 1963). A large percentage of the precipitation is consumed by evapotranspiration, and only during extended periods of precipitation does it account for an appreciable percentage of recharge to the aquifer system.

Alternative Supply Enhancement Methods

As part of Senate Bill 1, various alternative methods for increasing water availability were identified. Many of these include modifying the natural environment to enhance the locally available sources of water. Two such methods that can be used to augment the volume of water from currently available sources are brush management and weather modification. Both of these methods are discussed below.

Brush management as a method to enhance surface water supplies and increase recharge is included in both Region L's and K's water plans. Studies have shown that reducing the acreage of ashe juniper (commonly known as cedar) and establishing native vegetation can produce significant water savings and increased aquifer recharge. It is estimated that an acre of land covered with ashe juniper consumes 0.18 acre-feet of water a year more than a parcel covered with native vegetation (NRCS 1995).

The practice of weather modification, or cloud seeding, is also included as an alternative in both of the regional water plans. Also referred to as weather supply yield enhancement, it is a component of the TWDB's Water for Texas Plan. To date, the effectiveness of cloud seeding has not been conclusively established. Cloud seeding involves flying a plane over an appropriate cloud structure and releasing plumes of silver iodide particles. These particles trigger the formation of raindrops and ice crystals when they encounter the cool moisture held in the clouds (Jensen 1994).

Summary

An important component of managing water resources is the knowledge of not only the amount of water available from a particular source, but also, more importantly, the volume of water available for use without detriment to maintaining the water balance of the system. Historically, Hays County has relied on groundwater to fill its water supply needs. Until recently, groundwater availability was determined only by the size of the pump and the productivity of the formation. With the increased growth and pressures on the aquifer systems, other factors are beginning to determine water availability.

For the property owner, the amount that can be withdrawn may be limited by how much a new neighbor is pumping, or by how much a regulatory agency says can be pumped. Local groundwater sources cannot fill the projected demands of the future. In the Trinity aquifer, increased use is limited by the physical properties of the aquifer, while in the Edwards, under the jurisdiction of the EAA and the BS/EACD, regulatory limits, which serve to protect other users, including endangered species, restrict increased use.

As to whether these limits, physical and regulatory alike, are actually affecting growth in the county is questionable. In the portion of the county historically reliant on the Edwards aquifer, the answer is no. The BS/EACD is still giving permits within the Barton Springs Segment of the aquifer. For example, Aquasource and Creedmoore Maha WSC, as discussed in Section 8, are currently planning the addition of new wells to meet anticipated future demands. For the area overlying the San Antonio Segment of the aquifer, there is surface water available for some of the water supply corporations through the San Marcos SWTP. The short-term projects including the construction of the CRWA SWTP, and the GBRA's I-35 Project will cover any shortfalls that could have been experienced through the EAA's withdrawal limitations or even the anticipated cap on withdrawals within the jurisdiction of the BS/EACD.

This leaves the question for the portion of the county currently supported by the Trinity aquifer. Are the physical limitations of the Trinity aquifer, and consequently the amount of water available from it, affecting growth in the county? The area's designation as a Priority Groundwater Management Area, the TWDB model showing long-range declines in the water table, the establishment of the Hays County Groundwater District, and Jacobs Well going dry for the first time in recorded history all indicate that there is a

water availability problem in this part of the county. But is this problem affecting growth? The answer is yes by the fact that the availability of water dictates well spacing. But there are developments planned in this portion of the county, that include homes and even golf courses, which are expecting to rely on the Trinity aquifer. In effect, it is not so much that the availability of water in this area is currently limiting growth, but that it is maintaining growth patterns similar to those the aquifer has historically been able to support. If current development trends continue and other water supplies are not imported into the county, the natural balance (as described in Section 6) of the water system in the county will suffer. There are already indications that the system is under pressure. If the current trend continues, the water level declines projected from the TWDB model will become a reality, and Jacobs well will not be the only water source in the county to go dry.

SECTION 10

WATER DEMAND FORECASTS

The Senate Bill 1 Regional Water Planning Groups made projections for all current water uses in the county. These forecasts are based on the population projections derived by the TWDB outlined in Section 4. Projected water use is calculated from the “most likely” population projections and water use forecasts. Total projected water demand is not limited to the available supply and includes irrigation, industrial (manufacturing), mining, municipal, steam-electric power production, and livestock uses.

An example of a “most likely” municipal water demand scenario assumes normal water use adjusted for expected water conservation and below normal rainfall (TWDB 1996). Normal water use includes laundry, lawn and shrub maintenance, swimming pools, etc. All projections incorporate anticipated water uses from growth and economic development.

As mentioned in Section 7, Hays County is part of two of these Planning Groups. The Lower Colorado Regional Water Planning Group, Region K, includes the northern portion of Hays County that lies within the Colorado River Basin. This group identified water shortages for the northern portion of Hays County (Table 6).

Table 6. Projected Water Supply Shortages in Northern Hays County, Texas
(in acre-feet/year)

	<u>2010</u>	<u>2030</u>	<u>2050</u>
Portion of Hays County w/in Region K	162	1,914	3,958

Source: (LCRWPG 2000).

In its initially prepared plan (LCRWPG 2000), the Region K Planning Group identified various options to supplement current sources in order to meet these projected shortfalls. These include obtaining surface water from the West Travis County Regional System (up to 3,360 acre-feet/year), obtaining surface water from the GBRA/San Marcos Regional System (up to 1,680 acre-feet/year), obtaining surface water from the city of Austin (up to 1,100 acre-feet/year) and/or building recharge enhancement dams along Onion Creek (up to 4,000 acre-feet/year) (LCRWPG 2000).

The southern portion of Hays County within the Guadalupe River Basin is included in the regional plan developed by the South Central Texas Regional Water Planning Group, Region L. This group compared the available supply with the projected demands of the southern portion of the county and also projected water supply shortages (Table 7).

Table 7. Projected Water Supply Shortages in Southern Hays County, Texas
(in acre-feet/year)

	<u>2000</u>	<u>2010</u>	<u>2020</u>	<u>2030</u>	<u>2040</u>	<u>2050</u>
Portion of Hays w/in Region L	(6,938 surplus)	(1,092 surplus)	2,324	7,835	14,931	26,388

Source: (SCTRWPG 2000).

In the draft version of its interim report, the Region L Planning Group identified options to supplement current sources in order to meet these projected shortfalls

beginning in 2020. The proposed projects vary from aquifer recharge to building reservoirs to seeding clouds.

The proposed projects for the portion of southern Hays County relying on the Edwards aquifer include various aquifer recharge enhancement projects such as river diversions and the capturing of floodwaters by dams, exchanging reclaimed wastewater for Edwards aquifer water, and purchasing/leasing of Edwards aquifer irrigation water for municipal and industrial use (SCTRWPG 2000).

Some of the more regionally specific recommended options include:

- * Diverting water from the Guadalupe River to the CRWA to supply its members;
- * Supplying Wimberley and Woodcreek with water from Canyon Lake;
- * Constructing reservoirs along Plum Creek (near Lockhart) and on the Blanco River at Cloptin Crossing (2 miles southwest of Wimberley);
- * Diverting/storing flood waters to enhance the recharge of the Trinity aquifer; and
- * Constructing well fields into the Trinity aquifer to support cities underlain by that aquifer.

Other recommended options include demand reductions, brush management, rainwater harvesting, desalination, and weather modification (cloud seeding).

The combined total shortages projected for Hays County from Regions K and L are shown below (Table 8). The projected water supply shortfall for Hays County by 2050 is 30,346 acre-feet/year based on demand forecasts for the projected 250,000 residents of the county.

Table 8. Total Projected Water Supply Shortages, Hays County, Texas
(in acre-feet/year)

	<u>2010</u>	<u>2030</u>	<u>2050</u>
Hays County (complete)	no shortage	9,749	30,346

Both planning groups identified water supply projects that could be implemented to meet these projected demands. As part of planning process, Region K and Region L planning groups worked in coordination to address the water supply needs of Hays County.

SECTION 11

KEY INTEREST GROUPS

Numerous public interest and community-based organizations are monitoring, and in some instances actively participating in, the growth and development of Hays County and the issues related to the availability of water. These include:

- Land Trust Conservation Organizations that focus on the conservation of lands from development;
- Advocacy Organizations that concern themselves with the environment or the development of the county; and
- Public Interest Organizations.

Land Trust Conservation Organizations

A tool useful for both public and private conservation organizations to control land development and growth in perpetuity involves establishing land trusts and conservation easements. Once established, they are legally binding agreements between a landowner and a conservation organization that protect natural and/or historical resources on the property by restricting development. In effect, the landowner relinquishes some or all of the development rights for his or her property in exchange for benefits such as tax incentives or outright payments.

The Texas Land Trust Council, sponsored by TPWD, is a statewide organization that maintains a network of public and private conservation groups. Its mission is to promote and sustain conservation efforts through Texas' land trusts. According to the Land Trust Council, there are thirty-four active conservation groups within the state that arrange conservation easements and land trusts (Scheffer 2000). Some of these are focusing their efforts in the Hill Country. While varying in specific missions, they are dedicated to preserving land resources from development. Organizations active in Hays County include the Hill Country Conservancy, the Nature Conservancy of Texas, the Hill Country Land Trust, and the Natural Area Preservation Association. Currently, 158 acres are under conservation easements of some kind in Hays County (Texas Land Trust Council 2000).

City of Austin

The city of Austin is also purchasing environmentally sensitive areas in northern Hays County. In 1998, the city passed "Proposition 2," a \$65,000,000 tax supported general obligation bond authorization (Windhager 2000). Proceeds from bond sales will provide monies to improve existing parks and recreation areas and to purchase additional land for preservation.

With some of this bond money, the city of Austin plans to secure critical sections of property in Hays County that lie within the recharge zone of the Barton Springs Segment of the Edwards aquifer. These purchases are intended to maintain the current level of water quality in this segment of the Edwards aquifer by securing these sensitive areas to prevent development. An example of this effort occurred in June 2000 when the

city purchased the 1,740-acre Wood track of the Rutherford Ranch (Scheibal 2000b). This ranch, once consisting of 13,000 acres, is located in northern Hays County almost entirely over the recharge zone of the Barton Springs Segment of the Edwards aquifer. Approximately 5,000 acres of the original track are still owned by the Rutherford family. This purchase was made possible with Proposition 2 funds and a loan from the Nature Conservancy of Texas.

Hill Country Conservancy

The Hill Country Conservancy was formed in January 2000. Its focus is conservation of prime lands that overlie the contributing and recharge zones of the Barton Springs Segment of the Edwards aquifer in Blanco, Hays, and Travis Counties (Hill Country Conservancy 2000a).

The formation and continuance of this Conservancy is a cooperative effort by the Greater Austin Chamber of Commerce, the Austin Real Estate Council, and the SOS Alliance. It plans to raise from \$200 to \$300 million over the next few years to meet its goal of preserving as much as 50,000 acres of land during the next five years (Hill Country Conservancy 2000). The Conservancy is currently negotiating the purchase of development rights for the 5,800-acre Storm Ranch located in northern Hays County (Scheffer 2000). It is also raising funds to purchase 2,700 acres (the centerpiece track) of the Rutherford Ranch. The Conservancy will be receiving financial assistance for a portion of the down payment for this track of land from the City of Austin. Once purchased, the city will be reimbursed for their loan in equivalent land (Scheibal 2000c).

The Nature Conservancy of Texas

The Nature Conservancy of Texas is a nonprofit organization that focuses on species and habitat conservation. By buying property or creating conservation easements the Conservancy attempts to curb development over the Edwards Aquifer Recharge Zone and other sensitive species habitats in Texas.

The Conservancy currently has one preserve in Hays County: Ezell's Cave, a two-acre property located in the city of San Marcos. It is a fissure cave in the Edwards limestone of the Balcones Fault Zone. It provides a "window" into the San Antonio Segment of the Edwards aquifer and is connected to the aquifer through nearby Purgatory Creek (The Nature Conservancy of Texas 2000).

Natural Area Preservation Association

The Natural Area Preservation Association is a nonprofit organization the mission of which is to preserve and conserve wildlife and native ecosystems. The Association operates statewide and holds two conservation easements in Hays County. One property is located along the Pedernales River and the other is located northwest of Wimberley, near Jacob's Well (Scheffer 2000).

American Farmland Trust

Founded in 1980, American Farmland Trust (AFT) is a private, non-profit organization the mission of which is to stop the loss of productive farmland and to promote farming practices that produce and maintain a healthy environment. In 1999, AFT opened an office in San Marcos, Texas. This move was spurred by the fact that Texas ranked first in the nation in the number of acres developed for urban uses between

1982 and 1992. The Blackland Prairie region, the western boundary of which begins within the eastern portion of the county, ranked fourth among the most threatened agricultural area in the country (Sorensen, Greene, and Russ 1997).

Advocacy Organizations

Hays County Water Planning Partnership

The Hays County Water Planning Partnership is a citizen's advocacy group formed in July 1999 and based in Dripping Springs. The impetus for its formation was the proposal of the LCRA to bring surface water into the Dripping Springs area via a pipeline from their water treatment facilities near the Village of Bee Caves. The group is concerned about the lack of planning for the pipeline (Foster 2000). It is also involved with other issues related in part to the growth and development of the northwestern portion of the county.

Save Barton Creek Association

Save Barton Creek Association (SBCA) is a non-profit organization formed in 1979. This citizen-based group focuses its conservation efforts on the six watersheds that recharge the Barton Springs Segment of the Edwards aquifer. These include the Barton, Bear, Little Bear, Onion, Slaughter, and the Williamson Creek watersheds (SBCA 2000).

The SCBA is involved in a variety of activities that concern the area, including representation on issue-based task forces that address aquifer issues. It also funds public environmental education, and provides general and scientific information. SBCA

supports the city of Austin's Earth Camp Program, the "Splash! Into the Edwards Aquifer" exhibit, and the Zilker Park Conservancy.

Save Our Springs Alliance

The Save Our Springs (S.O.S.) Alliance is dedicated to the protection of Barton Springs and support of the Austin Comprehensive Watershed Ordinance. The ordinance passed in 1992 as a City of Austin initiative. Citizens wanted stronger water quality requirements enacted to protect the Barton Springs watershed than had been adopted by the Austin City Council.

The S.O.S. Alliance often gets involved in issues about development over the Edwards aquifer recharge zone (S.O.S. Alliance 2000). For example in June 2000, it filed suit in federal court with the EPA and the USFWS, in an effort to force these agencies to strengthen development regulations in the Barton Springs watershed. In the settlement arrived at in December 2000, both federal agencies will reassess the permit requirements for developments greater than five acres that lie within the watershed (Scheibal 2000d).

Wimberley Valley Watershed Association

The Wimberley Valley Watershed Association (WVWA) is a non-profit organization dedicated to the preservation of water quality and quantity in the Hill Country. Its efforts are currently focused on the preservation of Jacob's Well, an artesian spring located northwest of the Village of Wimberley, and the Cypress Creek watershed. The WVWA formed in response to the increased development of the Hill Country and its threat to the rural character and natural resources of the area. Its mission is "To protect

our valley's water quality and quantity by promoting sustainable watershed management through community education and action." One of the WVWA's main objectives is to encourage sustainable practices in areas such as subdivision development, land use planning, recreation, and infrastructure design (Baker 2000).

WVWA is working to establish the Jacob's Well Preserve. The Preserve will include a nature preserve and education center in the vicinity of Jacob's Well. The WVWA is currently developing a land protection program.

San Marcos River Foundation

The San Marcos River Foundation is a nonprofit organization the charge of which is to assure the flow, natural beauty, and purity of the San Marcos River. The Foundation testifies about and publicizes permit applications that it believes are, or will be, detrimental to the environmental integrity of the San Marcos River (Wassenich 2000).

A large component of the Foundation's activities focuses on public education, by providing mini-grants to teachers for environmental curriculum, furnishing information to the media via press releases and articles, hosting special events, and supporting a volunteer water quality monitoring group that samples locations along the San Marcos River (Wassenich 2000). It is also involved in the conservation easement movement, in that it is trying to interest other organizations in preserving riverside land which it believes is key to preserving stream and river flow.

Public Interest Organizations

Hill Country Roundtable

The Hill Country Roundtable, sponsored by the Texas Center for Policy Studies, is a four-year-old, non-partisan, volunteer organization composed of a diverse representation of residents and local officials from twelve Hill Country counties, including Hays. The founding principles are that there needs to be community planning and that the residents of the community must be involved in the planning process (Texas Center for Policy Studies 2000).

The Hill Country Roundtable has promoted legislation providing natural resource protection, defining land use controls, and strengthening county governments. It hosts workshops, seminars, and conferences on issues common among the represented counties, including such topics as land development, growth in the Hill Country, and land and brush management. The Roundtable works with landowners, residents, river authorities, groundwater districts, architects, realtors, and politicians bringing everyone to the table to address common issues (Sanger 2000).

Hays County Parks Advisory Board

The Hays County Parks Advisory Board, formed in 1999 by the Hays County Commissioners Court, is composed of individuals from around the county with a mission to establish a county master plan for parks and open space. It sponsored a countywide survey of Hays County residents to identify their expectations for future recreational opportunities, parks acquisition and open space preservation. The survey, conducted by the Scripps Howard Texas Poll (2000), was mailed to a random sample of 2,000 Hays

County residents. The survey received a forty-seven percent response rate with 943 residents completing and returning the survey. Of the respondents, seventy-one percent were concerned that Hays County “will lose its rural character because of the county’s current level of growth” (Scrips Howard Texas Poll 2000). Responses to the survey will be used in developing a master plan for the County.

Hays County currently owns one park. The Dudley Johnson Park is located approximately four miles north of San Marcos and consists of thirty-two acres along the Blanco River. Originally only fifteen acres, an additional seventeen acres adjacent to the park were purchased in September 2000, to upgrade the park with hike and bike trails and a picnic area.

Summary

Some of the key interest groups in the county are affecting growth and, as a consequence, the availability of water. By placing land under development restrictions, designating it for conservation or parkland purposes, land trust organizations and the Hays County Parks Advisory Board are working effectively to create no or low growth areas in the county. Currently only a very small percentage of county land is held in trust or under easement and with its thirty-two acres, the county park system is virtually nonexistent. With additional funding and public support, these efforts could become a more prominent measure for protecting land from development, and these organizations could begin to play a more key role in affecting the growth of the county.

The SBCA and the S.O.S. Alliance are both focused on protecting the water quality of the Barton Springs watershed. To this end, they are active in issues that

minimize development in the contributing and recharge zones of the Barton Springs Segment of the Edwards aquifer. These efforts, in turn, affect the availability of water in the area because additional strain is not placed on the water resources through development of additional the property. It also minimizes impervious cover that would potentially limit recharge to the underlying aquifers and thereby lessening the volume of water available from that resource.

The Hays County Water Planning Partnership formed because members of the Dripping Springs community were concerned that the consequences of the LCRA's plans to assist the area with their water availability problems were not thoroughly addressed. Through their, and other local interest group's efforts, the plans for the LCRA's 24-inch water pipeline into the area were altered to include an assessment of the environmental effects that may accompany the new water source. Without these efforts, this new source of water might have facilitated the growth of the area in an unplanned manner.

Both the Wimberley Valley Watershed Association and the Hill Country Round Table are serving as resource for information and education on the issues concerning water availability and growth in the county. These organizations are providing a forum for community members and other entities to come together and discuss the problems facing the area. While the Wimberley Valley Watershed Association is focused on the Village of Wimberley area and Jacob's Well, the Hill Country Roundtable works to coordinate their efforts for the benefit of the entire Hill Country area.

SECTION 12

CURRENT ISSUES

“Whisky’s for drinking, water’s for fighting” –Mark Twain

This section brings together some of the local issues currently facing Hays County about the relationship between water availability and growth. The main issues identified during this research surround importing out-of-county surface waters to accommodate future demands, and the county’s inability to direct and control growth in its unincorporated areas.

Importing Surface Water

In an interview conducted in November 2000, Hays County Judge Jim Powers (2000) explained that surface water was the best solution for dealing with the water needs of the county. He stated that he would like to “bring surface water to Hays County so that the existing residents in some of these areas where they are experiencing a large amount of growth will have a dependable resource of water.” Portions of the eastern part of the county are already receiving surface water supplies from Canyon Lake through the San Marcos SWTP. In addition, the city of Austin supports the Hill Country WSC with

surface water from Town Lake. Additional proposed projects, identified during this research, that incorporate out-of-county surface waters to supply projected water needs include:

1. The 24-inch pipeline from the LCRA SWTP located near the Village of Bee Caves to the Dripping Springs area (now being challenged in federal court for an alleged inadequate environmental analysis);
2. The CRWA SWTP near San Marcos;
3. The GBRA's I-35 Project to support Kyle and Buda with surface waters from the San Marcos SWTP; and
4. The GBRA's pipeline from Canyon Lake to the Wimberley area with the potential to connect with the I-35 Project pipeline in Buda.

These options are in various stages of consideration. The proposed 24-inch pipeline from the LCRA SWTP to the Dripping Springs area provides a good example of issues surrounding the importation of surface water into the northwestern portion of the county. In spring 2000, drought-like conditions were occurring across central Texas. As mentioned earlier, residents of Sunset Canyon subdivision were notifying the Hays County Commissioners Court that they had no water and that their wells, which were located in the Trinity aquifer, were going dry.

In April 2000, the LCRA (2000) published a report that described their investigation into the water supply situation of the Sunset Canyon subdivision. This investigation included the collection of water level measurements at two local wells that had historical water level measurement records with the TWDB. The report summarized the investigation, the results of a March 2000 petition signed by 114 area residents

requesting the LCRA to provide surface water to existing residents in the area and future developments after the completion of the environmental survey, and the results of a community survey conducted by the Sunset Canyon Water Committee in April 2000. Ten percent of the surveyed residents had either had to deepen existing wells or drill new ones. Of the three wells identified with historical records in the area, the water level in only two of the wells was measured during the LCRA's investigation. Both wells showed a general trend in decreasing water levels, with a decrease of 120 feet over the last twenty-three years in one well, and a decrease of ninety-five feet over the last twenty-five years in the other. These trends are based on only four water level measurements for each well. Without additional measurements, it is impossible to establish that these trends are due to a continually decreasing water table resulting from increased use, or if they are more related to current climatic conditions such as the recent drought.

On May 2, 2000, the Hays County Commissioners Court adopted a resolution stating that in its opinion, an emergency existed in the Sunset Canyon subdivision (Walther 2000). The declaration was based on the county's responsibility to assure the health and safety of its residents (Walther 2000). On May 24, 2000 the LCRA Board unanimously approved the pipeline (Scheibal 2000e). By August 23, the LCRA Board had approved agreements with the Dripping Springs WSC and Hays County, as well as contracts with three construction firms, an environmental consultant, and a facilitator (News Wire Staff 2000).

In July and August 2000, the BS/EACD (2000b), at the request of the Hays Trinity Groundwater Conservation District, performed an assessment of the water level conditions in the Sunset Canyon area. From a field survey conducted by BS/EACD

personnel, no indication was found of any well going dry or experiencing insufficient water. Collected water level measurements indicated the need for additional research to establish the relationship between water level trends and climatic conditions (Hauwert 2000). The BS/EACD's study did not confirm the emergency situation proposed by the LCRA's limited investigation. While the District's report supports the idea that the Trinity aquifer in this area probably cannot support large amounts of growth, it recommends additional research, and emphasizes planning, regulation, and conservation measures.

This proposed water supply pipeline would extend for fourteen miles from the LCRA SWTP located near the Village of Bee Caves to the city of Dripping Springs. The 24-inch pipeline was projected to be complete by January 2002. The ultimate capacity of the line is 6.5 mgd (7,281 acre-feet/year), but deliveries will be limited by the current intake system from Lake Austin to two mgd (2,240 acre-feet/year). The LCRA will consider constructing a new intake on Lake Travis as the demand in the area increases (Parks 2000). The piped surface water would provide retail service to homes via the Hays County Water and Sewer Authority and wholesale back-up service to homes through the Dripping Springs WSC (Scheibal 2000e).

When the pipeline was initially proposed in 1999, many of the local advocacy groups were concerned that the pipeline would spur development in the area. The Hays County Water Planning Partnership organized over this particular issue, because they wanted to see the pipeline planned properly (Foster 2000). At that time, the Partnership, Save Barton Creek Association, and SOS Alliance joined to delay the construction of the pipeline until research could be conducted on its potential impacts on the environment

and the area in general. Both the Partnership and SOS Alliance threatened to sue if the pipeline proceeded without conducting an Environmental Impact Statement (EIS) (Scheibal 2000e). In December 1999, the LCRA announced that it would commission such a study before constructing the pipeline (Haurwitz 1999). The impact statement would examine the effects of the pipeline on the environment including potential effects upon endangered species habitats.

The USFWS also wanted an Environmental Impact Study performed due to the potential impact on the sensitive habitat areas of the federally listed endangered golden-cheeked warbler and the Barton Springs salamander (Parks 2000). It, however, was sensitive to the emergency situation and proposed that the LCRA proceed with construction of the line so that existing businesses and residences could connect to it, but no additional hookups would be allowed until the environmental study was complete.

The LCRA and the USFWS signed a Memorandum of Understanding (MOU) for the construction of the pipeline in May 2000. They agreed that any new development served by the water pipeline would incorporate water quality protection measures to be established by the USFWS after the completion of the Environmental Impact Study (LCRA and USFWS 2000). Examples of such measures include establishing buffer zones for stream drainage and sensitive environmental features, implementing low-impact development designs, establishing best management practices for construction activities and instituting environmental education programs. In the MOU, existing development was defined as homes and businesses that exist or were under construction when the MOU was signed, as well as platted lots or approved residential developments with

readily available electric utility service and direct access to existing streets or roads then in place (LCRA and USFWS 2000).

On December 6, 2000, the HCWPP, the S.O.S. Alliance, and the SBCA announced a plan to give notice of intent to sue under the Endangered Species Act over the construction of the pipeline. On December 22, the suit was filed in federal court against the LCRA, the U.S. Army Corps of Engineers, and the Department of the Interior (USFWS). The organizations contend that the LCRA must abide by its previous commitment to conduct the EIS prior to the construction of the pipeline (Evans 2000f).

County's Inability to Direct and Control Growth in Unincorporated Areas

Most of the growth in Hays County is occurring in its unincorporated areas. Outside the reach of zoning and subdivision requirements of the municipalities and their ETJs, the County Commissioners Court is the only entity that has jurisdiction, and its powers are limited. One of the tools available is to require developers to prove that they have sufficient water available for at least the average rate of pumping expected for any proposed supply well or wells. In doing so, developers must calculate the influence that the well or wells would have on nearby wells that are up to 1,000 feet from the proposed subdivision boundaries.

As explained in Section 7, only one test well is required per proposed development. The results of the aquifer characterization tests performed on this well are used to calculate the effects of the proposed pumping for the full subdivision water supply needs. However, the cumulative effect on nearby wells can be somewhat different when multiple supply wells, for example one for each residence, are constructed. Allen

Walther (2000), the Director of the Hays County Department of Environmental Health explains that even though the water availability tests can show there is adequate water to supply a single family residence, there is no way of really knowing the impact a single well will have on a neighbor's well.

The problem is complicated when the water availability tests prove that there is enough water to support a proposed development, but a neighboring community is concerned about the detrimental effects it may have on their wells. At this juncture, the only thing that the Commissioners Court can do is place notification on the plat map advising of expected conditions when future supply well or wells are drilled (Walther 2000).

The Hays County Commissioners Court will attempt to secure authority for imposing stronger county regulations on development during the next Legislative session (77th) to ensure protection of water quality and quantity, and to aid local government in managing the anticipated growth rates. These requests for expanded authority could result in providing counties with more power to adopt impervious cover limits, pollution and zoning controls, the ability to charge impact fees for proposed subdivisions, and the establishment of a planning commission to help guide development in counties adjacent to counties with populations over 500,000. Also included would be the establishment of a direct mail system for notifying property owners near proposed new subdivisions. A resolution to seek this authority was adopted by the Hays County Commissioners Court September 5, 2000 (Hays County 2000).

Senator Wentworth of San Antonio is also sponsoring a proposed amendment to the Texas Constitution for high growth counties. His amendment would establish local-

option zoning control in the unincorporated areas of the county. Counties would be allowed to implement county zoning ordinances. Proposed zoning ordinances, introduced on a case-by-case basis, would have to be approved by county voters (Evans 2000e).

Both the House Committee on Land and Resource Management and the Senate Intergovernmental Relations Committee have been charged with studying the effectiveness of legislation giving counties power to control growth and development in the unincorporated areas (Evans 2000c). In a list of recommendations to the State of Texas, a conservation task force assembled by Governor George W. Bush included a recommendation to the legislature to grant Texas counties more authority for planning and managing growth within the unincorporated areas (Task Force on Conservation 2000).

If the areas to be supplied by surface water are outside the boundaries of a municipality or its ETJ, the County Commissioners Court is the only entity with jurisdiction. Under the Court, the only available regulations to manage growth are the Hays County Subdivision and Development Regulations and these were established to ensure available groundwater to support development, i.e. well spacing and minimum lot sizing. If a water supply is guaranteed from surface water, there are few existing limits to development. As discussed in Section 5, an increase in development could have detrimental effects to the water quality of the aquifers.

Despite its current lack of regulating authority, the Hays County Commissioners Court has the geographical jurisdiction to bring the various key organizations and individuals together to communicate concerns and coordinate their efforts. To this end, Judge Powers is working to create a forum for the various elected officials, interest

groups, and community members to discuss common issues such as growth and water availability. Beginning in January 2001, a committee composed of three representatives appointed by each mayor of Hays County will meet on a monthly basis. If successful, this forum could provide the open communication necessary to guide the growth of the county. An important aspect that will influence its success is the input and attention that elected officials place on this committee.

SECTION 13

SUMMARY AND CONCLUSIONS

Hays County is part of one of the fastest growing regions in Texas and is growing at an unprecedented rate. This growth reflects the economic prosperity of this region, and the popularity of this part of central Texas as a place to live and work. But the population growth needs the support of the county's natural resources to sustain the resulting populace. Water is essential to this growth.

Hays County is commonly referred to as a county rich in water resources. These resources are hydrologically connected and an innate natural balance is present. Precipitation and runoff that flows into the Blanco, Colorado, and San Marcos Rivers and their tributaries provide surface water through the area and also contribute to the recharge of the underlying Trinity and Edwards aquifers. The aquifer levels are maintained by this recharge and through infiltration of precipitation and runoff. Both aquifers feed numerous springs that in turn contribute surface water flow to the rivers and their tributaries. Additional factors that must be accounted for in this balance, because of the increased growth of the county, include water supply wells, and the loss of recharge due to increasing impervious cover. Both aquifers currently support numerous water supply

wells, and seventy percent of the county lies within the recharge and contributing zones of the Edwards aquifer.

An important component of managing the county's water resources to accommodate growth is the knowledge of not only the amount of water available from a particular source, but also, more importantly, the volume of water available for use without detriment to maintaining the natural water balance of the system. Historically, Hays County has relied on groundwater for its water supply. Until recently, groundwater availability was determined only by the size of the pump and the productivity of the formation. With the increased growth and pressures on the aquifer systems, other factors are beginning to determine water availability. In the Trinity aquifer, increased use is limited by the physical properties of the aquifer, while in the Edwards, under the jurisdiction of the EAA and the BS/EACD, regulatory limits, which serve to protect other users, including endangered species, restrict increased use. As to whether these limits, physical and regulated alike, are actually affecting growth now in the county is questionable.

In the portion of the county historically reliant on the Edwards aquifer, the answer is no. The BS/EACD is still giving permits within the Barton Springs Segment of the aquifer. For the area overlying the San Antonio Segment, there is surface water available for some of the Water Supply Corporations through the San Marcos SWTP. The short-term projects, including the construction of the CRWA SWTP, and the GBRA's I-35 Project, will cover any shortfalls that could be experienced through the EAA withdrawal limitations or the anticipated cap on withdrawals within the jurisdiction of the BS/EACD.

This leaves the question for the portion of the county currently supported by the Trinity aquifer. Are the physical limitations of the Trinity aquifer, and consequently the amount of water available from it, affecting growth in the county? The area's designation as a Priority Groundwater Management Area, the TWDB model showing long-range declines in the water table, the establishment of the Hays Trinity Groundwater District, and Jacobs Well going dry for the first time in recorded history all indicate that there is a water availability problem in this part of the county.

But is this problem affecting growth? The answer is yes, by the fact that the availability of water dictates well spacing. But developments planned in this portion of the county include homes and even golf courses, which are expecting to rely on the Trinity aquifer to support their water supply needs. So in effect, it is not so much that the availability of water in this area is currently limiting growth, but that it is maintaining sparse population patterns similar to those the Trinity aquifer has historically been able to support.

If the current development trend continues, and other water supplies are not imported into the county, the natural balance of the water system in the county will suffer. Like the Edwards, the Trinity aquifer needs to be under the management of an entity that can regulate its use. This includes permitting and monitoring groundwater use to assure that benefits to all users relying on the aquifer are not impaired by single uses, such as golf courses, aesthetic ponds, or high water consuming landscaping. The focus should be on maintaining the water resource balance that includes assuring recharge, in-stream flow in creeks and rivers, and the continual flow of the springs. The ratification of the newly formed Hays Trinity Groundwater Conservation District in the 77th Legislative session in

2001 will enable it to secure the knowledge and establish the regulations necessary to achieve these results.

Some of the key interest groups in the county are affecting growth and, as a consequence, the availability of water. By placing land under development restrictions or designating it for conservation or parkland purposes, land trust organizations and the Hays County Parks Advisory Board are working effectively to create no or low growth areas in the county. The SBCA and the S.O.S. Alliance are both focused on protecting the water quality of the Barton Springs watershed. To this end, they are active in issues that minimize development in the contributing and recharge zones of the Barton Springs Segment of the Edwards aquifer. These efforts, in turn, affect the availability of water in the area, because additional strain is not placed on the water resources through development. It also minimizes impervious cover that could potentially limit recharge to the underlying aquifers and thereby lessen the volume of water available from that resource. Advocacy groups should exercise care that their efforts are founded on scientific bases that can be verified. They cannot afford to appear as outright opponents of all growth; if they appear to be motivated solely by the selfish motive of preventing any newcomers from enjoying the amenities that attracted them to the area, overruling or ignoring their concerns will be easier.

A key to sustained, healthy population and economic growth is providing adequate water in the county without detrimentally affecting the quality of life and the natural resources. Local sources cannot fill the projected demands of the future. Totaling currently available sources, estimated shortfalls of 30,346 acre-feet/year are projected by 2050. Through the efforts of the Senate Bill 1 Regional Water Planning Groups, the

LCRA, and the GBRA, potential sources of water for the county are being identified. Their plans contain a sufficient number of alternatives to fulfill the projected shortages. Implementation of some of the Senate Bill 1 alternatives may prove unnecessary and impossible: however, the repetitive process of reviewing these plans every five years will hopefully allow for adequate adjustments over time. A majority of these plans involve importing surface water into the county. Not only do these efforts provide new sources of water to support the current and projected demands, they also provide a source of conflict for the current residents. The growth patterns in the Trinity aquifer area have historically been dictated by the availability of water. Bringing in other supplies has the potential to alter these patterns and affect the natural resources in the areas where increased growth will consequently occur. In addition, the only authority with geographical jurisdiction to manage growth in these areas, the Hays County Commissioners Court, does not have the necessary authority to resolve the issues.

It is essential to remember that just because the TWDB forecasts the population to increase to 250,000 residents by 2050, does not mean that the county can support this number of residents or that the county must support them. There must be a balance between supporting new development and maintaining an acceptable quality of life, and the quality of the county's natural resources. This balance can be achieved successfully only through proper long-range planning with goals that not only support the continued economic prosperity of the county, but also include the health of its natural resources.

Most importantly, planning efforts should be realistic about how much growth the county can support and how much the current residents of the county wish to support. For example, over seventy percent of the county lies within the environmentally sensitive

contributing and recharge zones of the Edwards aquifer. This fact alone should dramatically limit the amount and kind of development that can take place in the county. The planning efforts must also be consistent with the kind of county its residents want Hays County to be fifteen, twenty, or even fifty years from now. To this end, a forum must be provided for all the key players to come to the table and discuss the future of the county. Educational efforts such as those sponsored by the Hill Country Roundtable and the WVWA should be supported and encouraged.

Concerted efforts should be made to address the problems of water availability in the portion of the county supported by the Trinity aquifer. Decisions about securing additional water require full participation by the residents whose way of life will be affected by the growth new water will surely bring. These efforts also must include effectively managing the currently available resources. This includes such measures as requiring the installation of rainwater collection systems on all homes built outside the designated service areas of water suppliers. Within areas where there is a standard water supply system, special incentives like the county's newly developed rainwater collection system tax incentive program should be supported and promoted. Tax incentives or rate reductions should also be offered for wise-water landscaping. Taxes or higher rates should be levied on high water-consumption features, such as swimming pools, aesthetic ponds, and golf courses. Any additional golf courses constructed in Hays County should be designed for minimal water use, or wastewater reuse with appropriate landscaping and watering schedules.

There also should be an increased emphasis in the county on education about water resources. The residents must understand the water resource balance that supports

the availability of water for the whole system including those who depend on aquifer water levels in their wells, the spring flow that supports the in-stream flow of the creeks and rivers, etc. These educational efforts could be funded through the taxes or higher rates levied on high water-consumption activities.

Historically in Texas, water has always been treated as an unlimited resource and its availability a guaranteed right to be used as determined by the property owner, or the individual. To support future generations of residents, a cultural change is needed. The Hays County community as a whole must eventually understand that water is in fact a limited resource that must be shared equitably. Whether this understanding is reached through community education, increased regulations, or increases in the price of water, it must occur to maintain the balance in the water resource system and continue to provide water to all users of the system for the years to come with minimal damage to landscape that is the fundamental attraction for the influx of new residents.

APPENDIX A

MEETINGS ATTENDED

27 October 2000	Conservation-based Land Development in Central Texas and the Hill Country, sponsored by the Hill Country Roundtable, Austin, Texas.
23-24 September 2000	Water for Texas, 2000 and Beyond, sponsored by Texas A&M University, College Station, Texas.
11 September 2000	The Village of Wimberley Council Meeting, Water and Wastewater Workshop, Wimberley, Texas.
28 August 2000	Trinity Aquifer Symposium --- Groundwater Level Monitoring Activities in Central Texas Aquifers, San Marcos, Texas.
24 August 2000	Edwards Aquifer Rules Hearing, sponsored by the EAA, San Marcos, Texas.
17-18 May 2000	Texas Groundwater Conference, sponsored by the National Groundwater Association and the TWDB, Austin, Texas.
19 April 2000	Water 2000 Plus, San Marcos, Texas.
29 March 2000	Senator Ken Armbristor, sponsored by the Edwards Aquifer Research and Data Center, San Marcos, Texas.
16 February 2000	Hays County Transportation Blue Ribbon Committee, Kyle, Texas.
15 February 2000	Hays Trinity Groundwater Conservation District Meeting, Wimberley, Texas.
2 February 2000	Hays County Transportation Blue Ribbon Committee, Kyle, Texas.
31 January 2000	Wimberley Valley Watershed Association Board Meeting, Wimberley, Texas.
3 December 2000	Innovative and Practical Tools for Promoting What We Value; our Community, Ranch, and Natural Environment, sponsored by the Hill Country Roundtable, Bamberger Ranch, Texas.

APPENDIX B

INTERVIEWS REQUESTED AND COMPLETED

Interviews Completed:

- Baker, David, executive director of the Wimberley Valley Watershed Association
- Foster, Erin, president of the Hays County Water Planning Partnership
- Hauwert, Niko, hydrogeologist formerly with the Barton Springs/Edwards Aquifer Conservation District
- Hollon, Jack, president of the Hays Trinity Groundwater Conservation District
- Parks, Steve, manager of design and contracts for the Lower Colorado River Authority
- Powers, Jim, Hays County Judge
- Sanger, Mary, director of the Hill Country Roundtable, Texas Center for Policy Research
- Scheffer, Carolyn, director of the Texas Land Trust Council, Hays County Parks Advisory Board
- Walther, Allen, director of the Hays County Department of Environmental Health
- Wassenich, Dianne, president of the San Marcos River Foundation
- Welch, David, director of project development for the Guadalupe Blanco River Authority

Interviews Requested, but not Obtained:

- Beall, John, Save Barton Creek Association
- Bunch, Bill, Save Our Springs Alliance
- Bradley, Gary, Bradley Development Corporation
- Savoy, Phil, Take Back Texas
- Wiegell, Jeff, The Nature Conservancy of Texas

APPENDIX C

SAMPLE INTERVIEW QUESTIONS

- What are the main issues you see concerning Hays County with regard to growth and development and water supply?
- What role do you see your organization playing in relation to these issues?
- What are the main goals of your organization now in regards to this?
- What do you see as the main obstacles to achieving these goals?
- What is your opinion on constructing surface water pipelines from sources outside the county to supplement the local groundwater supplies.
- Do you feel counties should be given more powers to regulate growth (like zoning controls)?

APPENDIX D

**MAJOR WATER SUPPLY CORPORATIONS,
HAYS COUNTY, TEXAS**

Appendix D. Major Water Supply Corporations
Hays County, Texas

Supplier	CCN within Hays County	Approx. Connections	Current usage	Future Projects
Hill Country WSC	North central, along the Hays/Travis County line	600	<ul style="list-style-type: none"> • Holds 25-year contract with the City of Austin to supply 2,246 acre-feet/year of surface water from Town Lake. • Peak use occurred in August, 1999 with 53 acre-feet/month (Jennings 2000). 	Potential source of water in the future is the proposed 24-inch LCRA pipeline to Dripping Springs (Harvey 2000).
Dripping Springs WSC	Downtown Dripping Springs	1,021	<ul style="list-style-type: none"> • The water supply is withdrawn from four wells into the Trinity aquifer. The average withdrawal is 840 acre-feet/year. • In September, 2000 it reached its all time maximum monthly withdrawal of over 93 acre-feet. 	Dripping Springs WSC is currently working with the LCRA to secure a portion of the water that will be brought into the Dripping Springs area in the proposed pipeline (Gallaway 2000).
Goforth WSC	Northeast corner of Hays County, east of I-35 and Buda	2,362	<ul style="list-style-type: none"> • Owns four wells into the Edwards aquifer, permitted by the BS/EACD to withdraw 675 acre-feet/year. • The average use in the summer months is 65 acre-feet/month, and in the winter it drops to around 42 acre-feet/month. The peak daily usage experienced in the summer, 2000 was 4 acre-feet/day. 	Goforth is currently applying for another well permit to cover a fifth well that will be capable of pumping an additional 215 acre-feet/year. This permit is pending approval from the BS/EACD. It also expects to install a 450,000-gallon water tower in the Railyard Subdivision to provide storage for its system (Tobias 2000).

Appendix D. Major Water Supply Corporations, cont.
Hays County, Texas

Supplier	CCN within Hays County	Approx. Connections	Current usage	Future Projects
Creedmoore Maha WSC	North of Buda along the Hays/Travis County line	1,874	<ul style="list-style-type: none"> • Owns six wells located west of I-35. Permitted by the BS/EACD for a total withdrawal of 631 acre-feet/year. • Withdraws an average of 617 acre-feet/year. The monthly average usage of water for a summer month is 94 acre-feet, and for a winter month is 44 acre-feet. 	Currently working with both the GBRA and the LCRA to secure surface water supplies. With the GBRA, it is asking for from 560 - 1,680 acre-feet/year from the proposed I-35 Project. With the LCRA, there is the potential of a surface water pipeline to the Buda area. If this occurs, it hopes to secure 11,201 -16,802 acre-feet/year (Laws 2000).
County Line WSC	Northeastern portion of Hays County, east of Kyle and I-35	640	<ul style="list-style-type: none"> • Owns two wells with a combined historical use and an allotted interim authorization from the EAA for 123 acre-feet/year. Also leases water from another permitted EAA pumper in the amount of 150 acre-feet/year. • In 2000, the monthly average usage of water was 12 acre-feet in January and 23 acre-feet in September. 	It is currently leasing 274 acre-feet/year from CRWA and will use this to supplement its groundwater sources when the new CRWA SWTP comes on line (Heideman 2000).

Appendix D. Major Water Supply Corporations, cont.
Hays County, Texas

Supplier	CCN within Hays County	Approx. Connections	Current usage	Future Projects
Crystal Clear WSC	Southeastern quadrant of Hays County		<ul style="list-style-type: none"> Crystal Clear WSC has been given the interim authorization to withdraw 1,228 acre-feet/year from the San Antonio Segment of the Edwards aquifer 	It hopes to supplement supply with surface water from both Canyon Lake, via Lake Dunlap, and the San Marcos River. As of September, 2000, it has not contracted to purchase water from the San Marcos SWTP, but this is a potential option (Speed 2000).
Maxwell WSC	North and northeast of the City of San Marcos	1,505	<ul style="list-style-type: none"> Maxwell WSC currently pumps water from the Edwards aquifer from one well with a historical and interim EAA authorized use of 412 acre-feet/year, and additional Edwards wells with an authorized use of 305 acre-feet/year. 	Maxwell WSC is currently a partner with the CRWA for 2,240 acre-feet/year from the proposed CRWA SWTP. It expects to receive forty percent of that plant's treated water. When this is operational, it plans to discontinue production from the Edwards aquifer (Vaughn 2000).
Wimberley WSC	General vicinity of the Village of Wimberley	1,513	<ul style="list-style-type: none"> Owens five wells that withdraw water from the Trinity aquifer. In July, 2000, it pumped 80 acre-feet/month of water to meet the demands of its customers. In comparison, in November, 1999, the corporation pumped 40 acre-feet. 	Wimberley WSC does not have any planned projects that will affect their source of water supply in the short range (Cooper 2000).

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