*Area Study: Williamson and Parts of Adjacent Counties*

# *Evaluation of Selected Natural Resources within Williamson and Parts of Adjacent Counties, Texas*

**South San Gabriel (Blue Hole), Williamson County, Texas.**

TEXAS PARKS & WILDLIFE


**RESOURCE PROTECTION DIVISION:**
**WATER RESOURCES TEAM**

# *Evaluation of Selected Natural Resources within Williamson and Parts of Adjacent Counties, Texas*

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**January 1999**

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## EXECUTIVE SUMMARY

This report is an evaluation of selected natural resources of the Williamson and parts of adjacent counties area. Senate Bill 1 (75th Legislature, 1997) mandated the completion of pending Priority Groundwater Management Areas (PGMA) studies that were called for by House Bill 2 (69th Legislature) in 1985. The purpose of the PGMA is to identify and evaluate areas of Texas that are experiencing, or are expected to experience, critical groundwater problems within a 25-year planning horizon. The PGMA process is intended to encourage local and regional governments to address identified groundwater problems and consider appropriate management options.

The area covered by this report includes most of Williamson and parts of Travis, Burnet, Bell, Milam, and Bastrop Counties. The area, which is located in the Colorado and Brazos River basins, is bounded on the south by the Colorado River; on the west by the updip limit of the outcrop of the Travis Peak formation just west of Burnet, Texas; on the north by the Lampasas-Burnet County line, then along the Lampasas River, Stillhouse Hollow Lake, and Little River; and on the southeast by the downdip limit of slightly saline water in the Trinity Group aquifer.

The study area is located within the Edwards Plateau and the Blackland Prairies natural regions except for the northwestern section of the boundary line in Burnet County, which is located in the Llano Uplift natural region. Within the study area, TPWD operates one state park, Bright Leaf State Park, and one wildlife management area (WMA), Granger WMA. Granger WMA surrounds Granger Reservoir, which is owned and operated by the Corps of Engineers. The reservoir itself provides water based recreational activities, and in conjunction with the WMA, a rich habitat for waterfowl.

Human changes to the landscape are extensive and accelerated. The human population of the study area is projected to more than double by 2050. Stresses on the different ecosystems come from the number of people, their location, and the nature and scale of their activities.

The selected natural resources covered in the report are facing an uncertain future, a future that depends on the quality and quantity of the water resources, both surface and ground, within the study area. The five species of *Eurycea* salamanders found in the study area are all endemic to local springs and caves. Therefore, their fate is tied to groundwater levels.

The protection of riparian habitats fringing rivers, streams, and lakes should be priority in land-use planning processes. These habitats are not only very important to wildlife; they are also important in preventing erosion and in protecting water quality.

# Evaluation of Selected Natural Resources within Williamson and Parts of Adjacent Counties, Texas

## INTRODUCTION

### Purpose

The Texas Natural Resource Conservation Commission (TNRCC), working with the Texas Water Development Board (TWDB) and the Texas Parks and Wildlife Department (TPWD), is charged with identifying Priority Groundwater Management Areas (PGMAs) - areas in the State that are experiencing, or are expected to experience in the future, critical groundwater problems. The purpose of the PGMA program is to assist local and regional interests to address groundwater management issues; including quantity and quality of surface water and groundwater, contamination issues, and land subsidence.

Senate Bill 1 (75th Legislature, 1997) mandated the completion of pending PGMA studies that were called for by House Bill 2 (69th Legislature) in 1985. The TNRCC and TWDB identified parts of Williamson, Travis, Burnet, Bell, Milam, and Bastrop Counties for continued monitoring. The study area in Central Texas was not designated as a critical area for a PGMA study in 1991, but TWDB and TNRCC were to continue monitoring groundwater levels and local groundwater management initiatives. In 1990, the TNRCC requested a groundwater resources and availability study from TWDB. The TWDB completed the report *Evaluation of Water Resources in Bell, Burnet, Travis, Williamson and Parts of Adjacent Counties, Texas* (TWDB Report No. 326, Duffin and Musik) in January of 1991.

### Location and Extent

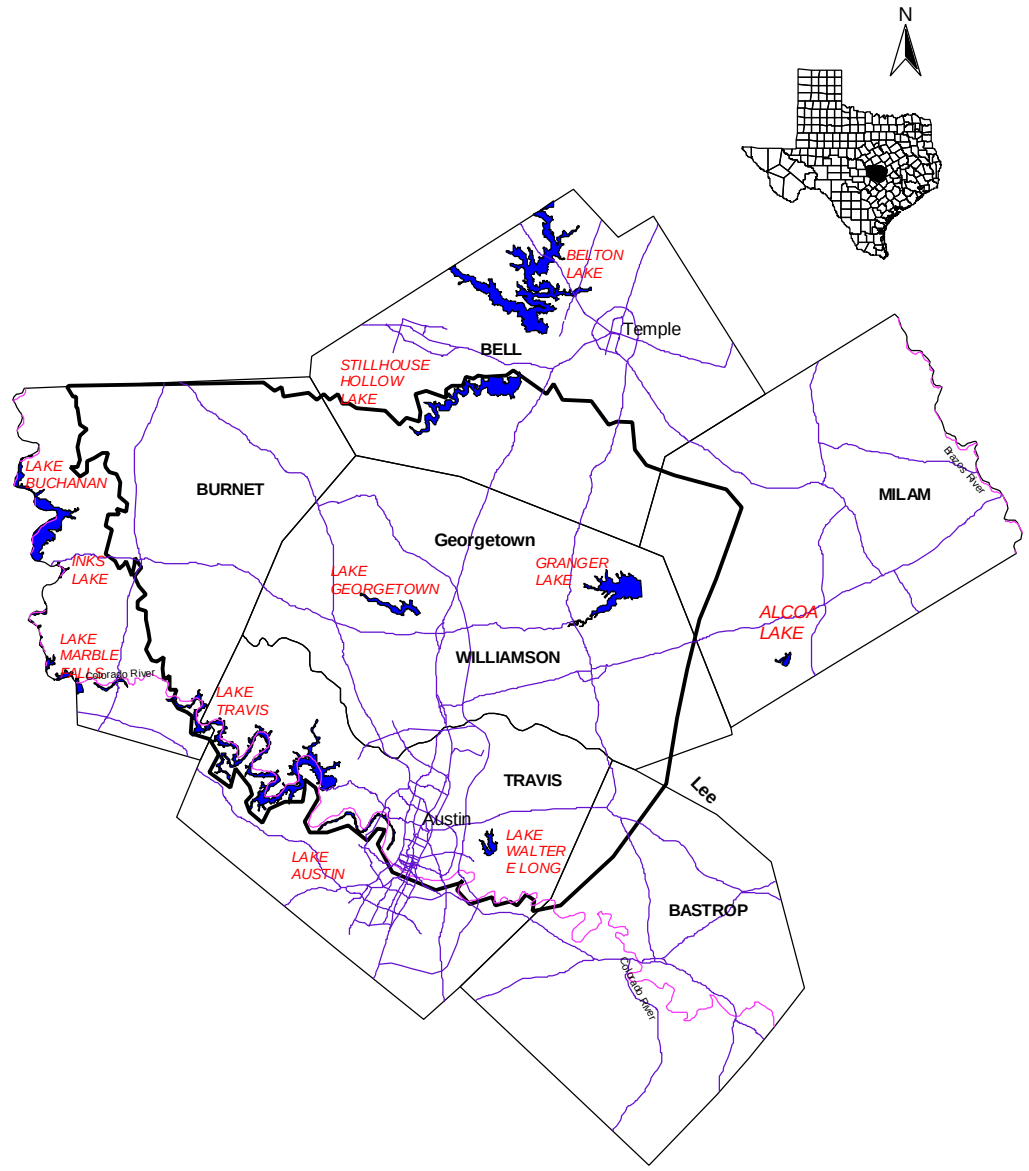
The area covered by this report includes most of Williamson and parts of Travis, Burnet, Bell, Milam, and Bastrop Counties (Fig. 1). The area is bounded on the south by the Colorado River; on the west by the updip limit of the outcrop of the Travis Peak formation just west of Burnet, Texas; on the north by the Lampasas-Burnet County line, then along the Lampasas River, Stillhouse Hollow Lake, and Little River; and on the southeast by the downdip limit of slightly saline water in the Trinity Group aquifer ( Duffin and Musik 1991).

### Geography and Ecology

The study area is located within the Edwards Plateau and the Blackland Prairies natural regions (Fig. 2) except for the northwestern section of the boundary line in Burnet County, which is located in the Llano Uplift natural region (LBJ School of Public Affairs 1978; Fig. 2).

The Edwards Plateau region is in west central Texas and is commonly known as the Hill Country. It is bounded on the east and south by the Balcones Fault. To the north it extends to the Western Cross Timbers of the Oak Woods and Prairies region and grades into the Plains regions. The Llano Uplift region also forms part of the northern border (McMahan et.al 1984).

## Figure 1. Map of the Study Area

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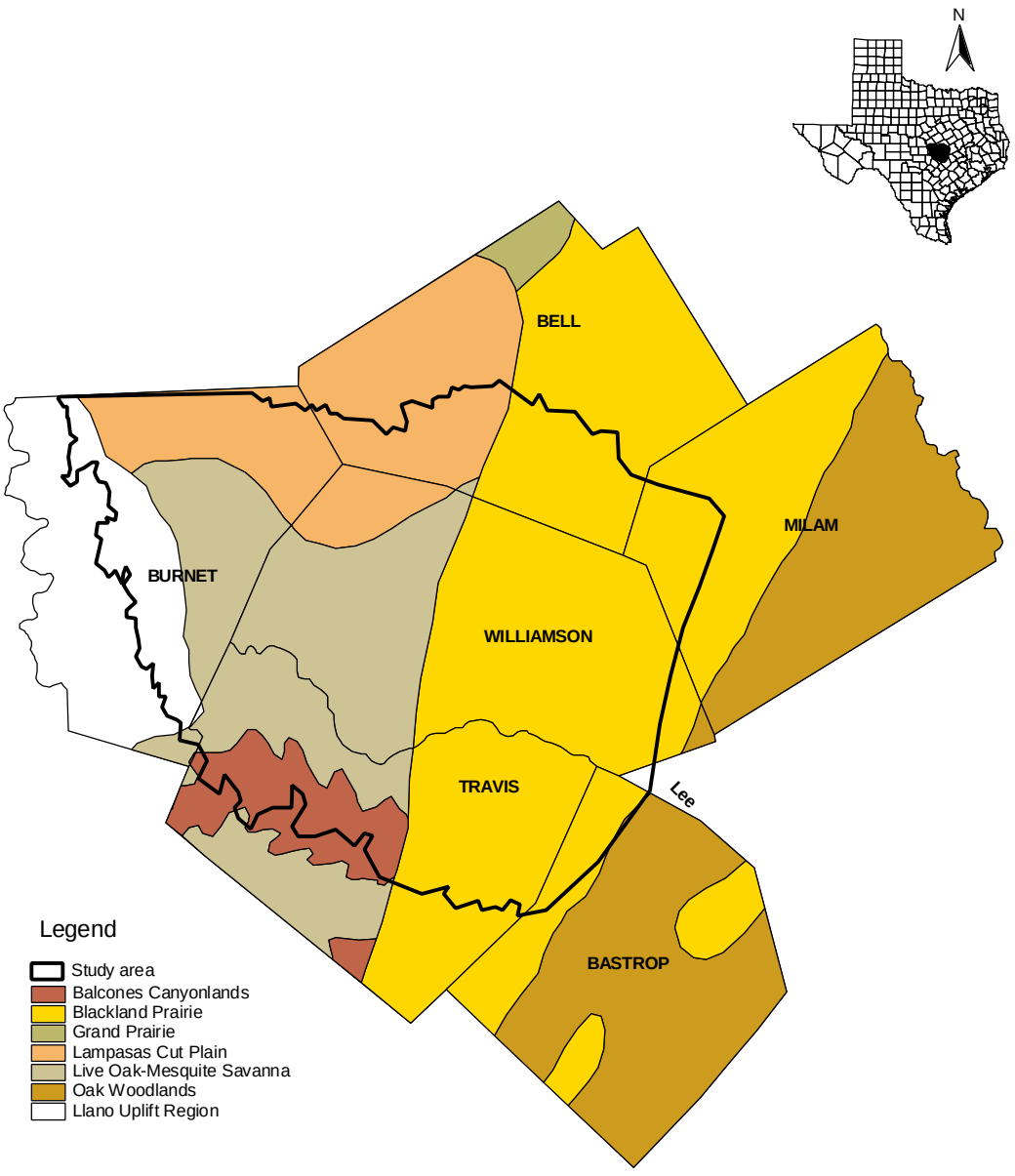
Produced by the TPWD Water Resources Team, July 1998. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Sources:
TPWD GIS lab archives data 1998.

Projections:
Texas Statewide Projection
(Lambert Conformal Conic)

## Figure 2. Natural Subregions of the Study Area

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Produced by the TPWD Water Resources Team, July 1998. No claims are made to the accuracy of the data of the data or the suitability of the data for a particular use.

Sources:
Preserving Texas' Natural Heritage. LBJ School of Public Affairs Policy Research Project, Report 31, 1978.

Projections:
Texas Statewide Projection

Soils of the Edwards Plateau are usually shallow with a variety of surface textures and are underlain by limestone.

Scrub forest is the most characteristic plant association of the area. Ashe juniper, Texas oak, and stunted live oak are dominant in the more dissected southern and eastern canyonlands of the region. Mesquite occurs throughout the Edwards Plateau; together with live oak, it dominates the woody vegetation in the west. Some savanna type vegetation also occurs and was formerly more widespread.

Topography of the Blackland Prairies region is gently rolling to nearly level and well dissected for rapid surface drainage. Fairly uniform dark-colored alkaline clays, often referred to as "black gumbo," interspersed with some gray acid sandy loams, characterize the area. Blackland Prairie soils once supported a tall-grass prairie dominated by bluestems, sideoats, and switchgrass. Mesquite, blackjack and post oak have invaded some areas severely. The fertile soils of this region makes it ideal for crop agriculture, although some hay meadows and few ranches remain (McMahan et al. 1984).

Elevations range from slightly under 350 feet along the Little River in Milam County to the southeast to slightly over 1,500 feet above mean sea level in Burnet County to the northwest. Drainage is to the southeast by the Lampasas, Little, San Gabriel, and Colorado Rivers (Duffin and Musick 1991).

The study area is characterized by long, hot summers and short, mild winters. The average minimum temperature for January ranges from 37 degrees Fahrenheit (°F) in the northwest to 41 °F in the southeast. The average maximum temperature for July is 96 °F. The average annual precipitation ranges from about 28 inches in the west to 35 inches in the east. The average annual lake-surface evaporation for the period 1940-1965 ranged from 60 inches in the east to 80 inches in the northwest (Kane 1967 in Duffin and Musick 1991).

**Population**

The population of whole counties that are partially within the study area is shown in Table 1, and the population of major urban areas within the study area is shown in Table 2.

**Table 1.** Population Projections for Study Area Counties (TWDB 1998)

| *Year Þ Locality ß* | *1990* | *2000* | *2010* | *2020* | *2030* | *2040* | *2050* |
|---|---|---|---|---|---|---|---|
| **Bastrop** | 38,263 | 47,917 | 59,430 | 71,679 | 83,583 | 90,915 | 98,331 |
| **Bell** | 191,088 | 231,977 | 254,642 | 279,238 | 297,304 | 308,139 | 324,850 |
| **Burnet** | 22,677 | 28,055 | 34,010 | 40,536 | 45,936 | 47,834 | 49,810 |
| **Travis** | 576,407 | 744,080 | 892,047 | 1,096,329 | 1,288,441 | 1,413,420 | 1,550,521 |
| **Williamson** | 43,735 | 47,194 | 49,939 | 54,285 | 58,722 | 61,532 | 63,245 |

**Table 2.** Population Projections for Cities within the Study Area (TWDB 1998)

| *Year Þ Locality ß* | *1990* | *2000* | *2010* | *2020* | *2030* | *2040* | *2050* |
|---|---|---|---|---|---|---|---|
| **Austin** | 463,178 | 616,478 | 743,040 | 916,934 | 1,080,959 | 1,187,665 | 1,304,904 |
| **Bartlett** | 621 | 757 | 831 | 911 | 970 | 1006 | 1060 |
| **Burnet** | 3,423 | 3,960 | 5,005 | 5,764 | 6,419 | 6,613 | 6,813 |
| **Cedar Park** | 5,161 | 9,740 | 14,596 | 22,714 | 26,733 | 30,615 | 35,059 |
| **Elgin** | 4,846 | 5,553 | 6,499 | 7,612 | 8,734 | 9,395 | 11,405 |
| **Georgetown** | 14,842 | 24,584 | 37,970 | 57,148 | 67,262 | 77,037 | 88,233 |
| **Granger** | 1,190 | 1,574 | 2,021 | 2,548 | 3,091 | 3,540 | 3,947 |
| **Leander** | 3,398 | 5,279 | 8,231 | 12,809 | 15,076 | 17,264 | 19,768 |
| **Manor** | 1,041 | 1,424 | 1,862 | 2,208 | 2,523 | 2,728 | 2,950 |
| **Round Rock** | 30,963 | 53,504 | 84,181 | 128,044 | 150,729 | 172,622 | 197,694 |
| **Taylor** | 11,472 | 16,025 | 22,028 | 30,886 | 35,597 | 41,021 | 48,996 |

## Economy and Land Use

The principal economic activities in the study area are education, research and science-oriented industries, recreation, government, and agriculture. The University of Texas main campus and several other colleges are located within the study area.

The principal manufacturing industries revolve around computer equipment. Tourism, agribusiness, stone, sand, and gravel, as well as cattle businesses constitute the rest of the growing economy of the study area (Dallas Morning News 1997).

## Acknowledgements

The authors wish to thank the numerous individuals who provided information on the selected natural resources in the study area. Additional thanks are given to those individuals whose comments and proofreading allowed us to put this report out. We appreciate and acknowledge the help and expertise of Jackie Poole, Peggy Horner, Andy Price, Craig Farquar, Gordon Linam, John Maresh, and Dorinda Scott.

## SELECTED NATURAL RESOURCES*

### TPWD Regional Facilities

Within the study area, TPWD operates one state park (Fig. 3), Bright Leaf State Park (SP), and one wildlife management area (WMA), Granger WMA. Granger WMA surrounds Granger Reservoir, which is owned and operated by the Corps of Engineers. The reservoir itself provides water based recreational activities, and in conjunction with the WMA, a rich habitat for waterfowl.

### Vegetation and Soil

The natural regions of Texas were delineated largely on the basis of soil type (Godfrey et al. 1973) and major vegetation types (McMahan et al. 1984). The study area soils vary from dark calcareous clays, sandy loams, and clay loams in the uplands, to dark gray to reddish-brown calcareous clay loams and clays in the bottomlands.

The vegetation type map (Figure 4) shows the Crops type as the major land cover in the study area, followed by Oak-Mesquite-Juniper-Parks/Woods, Live Oak-Ashe Juniper Parks, and Live Oak-Mesquite-Ashe Juniper Parks. The scientific names of the plants mentioned in this section are listed in Appendix A (McMahan et al. 1984). Commonly associated plants with the Crops type are: cultivated cover crops or row crops providing food and/or fiber for either man or domestic animals. This type may also portray grassland associated with crop rotations.

The Oak-Mesquite-Juniper-Parks/Woods occurs centrally and north in the study area. Commonly associated plants: post oak, Ashe juniper, shin oak, Texas oak, blackjack oak, live oak, cedar elm, agarito, soapberry, sumac, hackberry, Texas pricklypear, Mexican persimmon, purple three-awn, hairy grama, Texas grama, sideaots grama, curly mesquite, Texas wintergrass.

Live Oak-Ashe Juniper Parks and Live Oak-Mesquite-Ashe Juniper Parks types occur extensively in the western part of the study area. Commonly Associated Plants (Edwards Plateau) include: Texas oak, shin oak, cedar elm, netleaf hackberry, flameleaf sumac, agarito, Mexican persimmon, Texas pricklypear, kidneywood, saw greenbriar, Texas wintergrass, little bluestem, curly mesquite, Texas grama, Halls panicum, purple three-awn, hairy tridens, cedar sedge, two-leaved senna, mat euphorbia, rabbit tobacco.

### Rivers and Reservoirs

The study area is part of the Colorado and Brazos River basins. Creeks and rivers are abundant in the study area (Fig. 5). During heavy rains, flooding occurs at nearly every major creek and river. The Colorado River forms the southwest boundary of the study area, the Lampasas River flows down the north boundary, and the San Gabriel River with

* The fauna and flora described in this report represent those species that are riparian, semi-aquatic, and aquatic, unless otherwise noted.

its north and south forks flows in the center of the study area. The major reservoirs (Figs. 1 & 5) in the study area store water from these rivers and/or their tributaries.

**Springs**

Most springs in the study area emanate from the Northern Edwards (Balcones Fault Zone) Aquifer. Major springs include Leon, Salado, and Berry Springs. The distribution and size, as of 1980, of those springs and seeps that are of some importance within the study area are listed in Table 3 (Brune 1981). Most springs emanate from the top of the groundwater reservoir, so changes in the water table elevation generally have immediate impact upon spring discharge rates.

**Table 3.** Distribution and Estimated Size (in 1980) of Springs and Seeps in the Study Area ( Brune 1981)

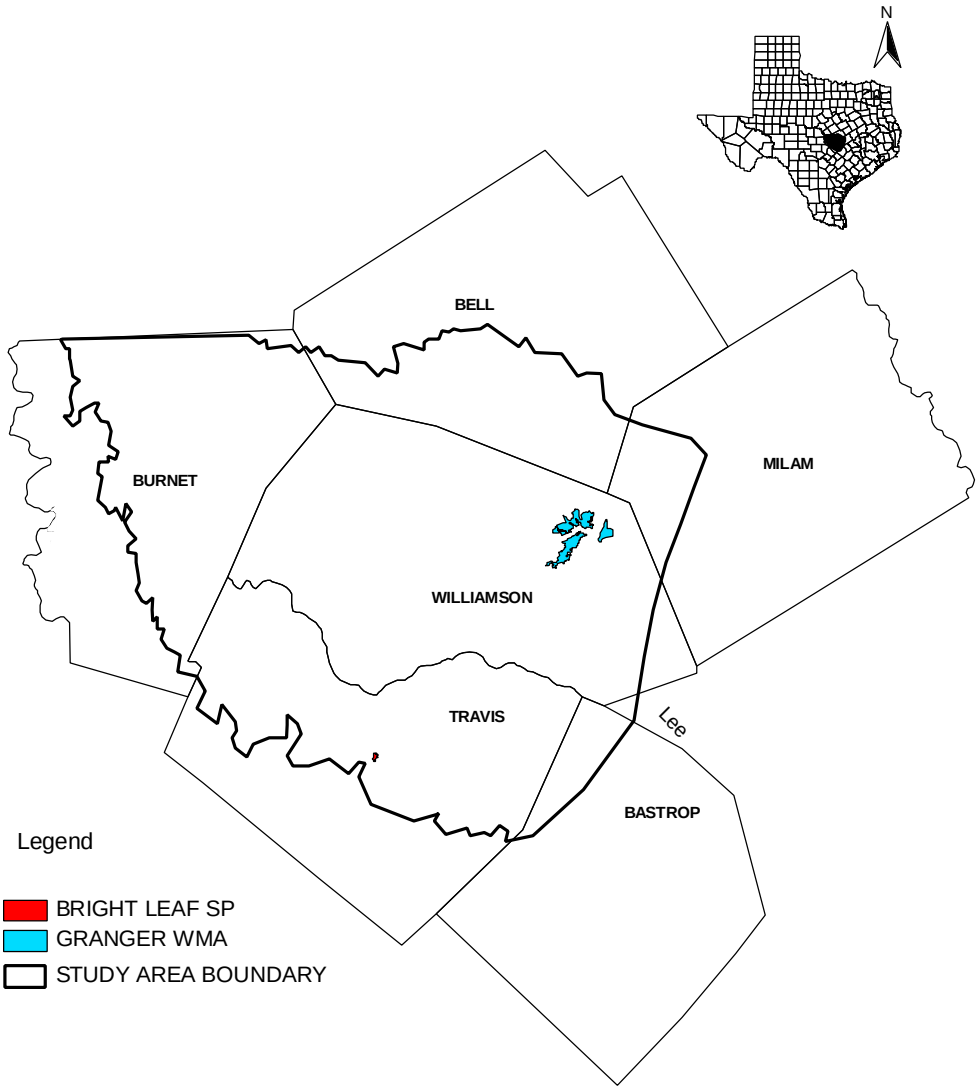
| County | Large | Moderately large | Medium | Small | Very small | Seep | Former |
|---|---|---|---|---|---|---|---|
| Bastrop | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Bell | 1 | 0 | 2 | 0 | 0 | 0 | 1 |
| Burnet | 0 | 0 | 2 | 1 | 1 | 1 | 0 |
| Milam | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Travis | 1 | 0 | 2 | 2 | 2 | 0 | 1 |
| Williamson | 0 | 2 | 8 | 5 | 0 | 1 | 0 |

The numbers above are a reflection of either a spring or a group of springs.
Codes:
Large = 280 to 2,800 cfs
Moderately large = 28 to 280 cfs
Medium = 2.8 to 28 cfs
Former = no flow or inundated
Small = 0.28 to 2.8 cfs
Very Small = 0.028 to 0.28 cfs
Seep = less than 0.028 cfs

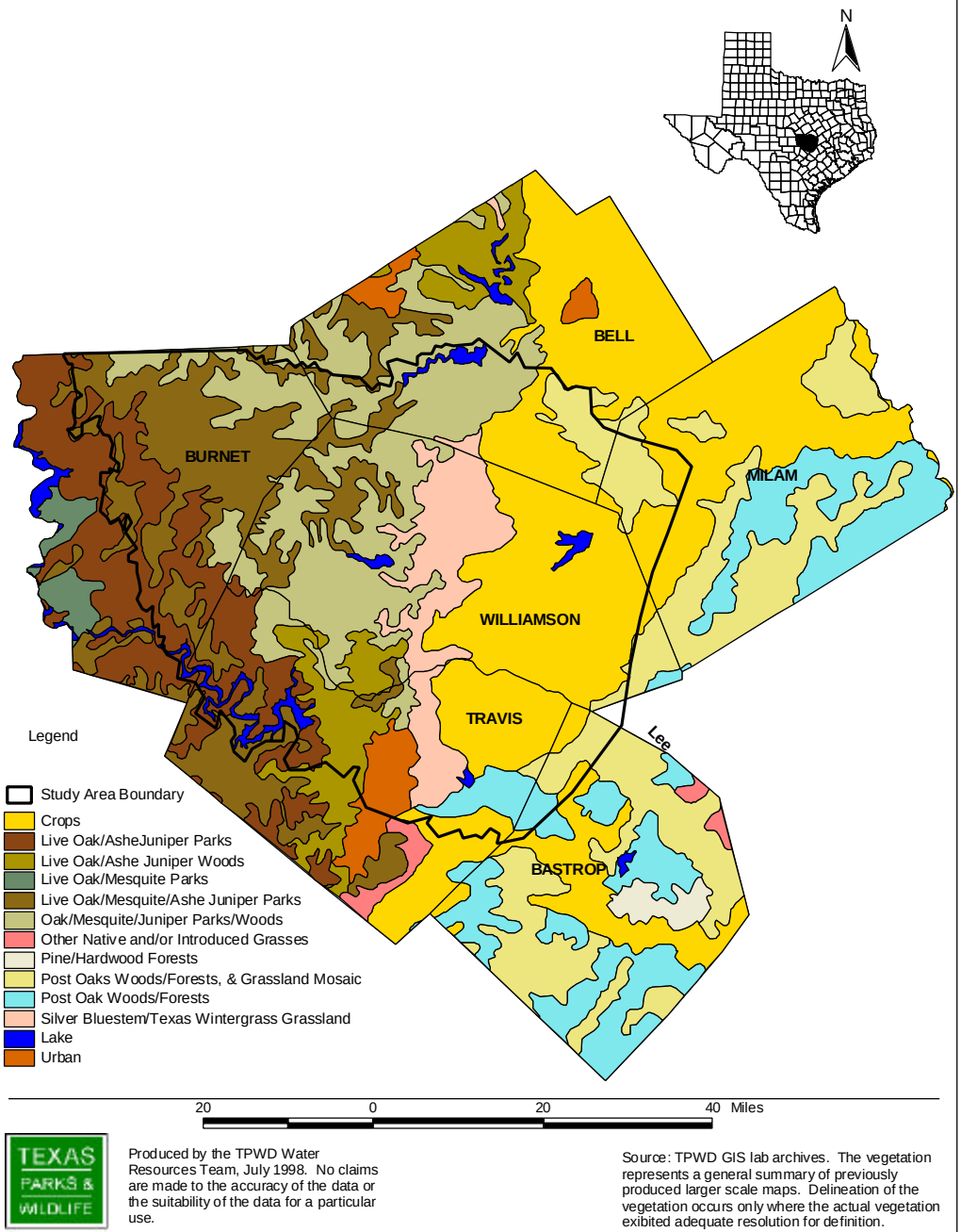
In Travis and Williamson Counties, the springs issue from Edwards and associated limestones along the Balcones fault zone. Most of the spring waters in Williamson County, as well as Bell County (within the study area) pass through underground caverns. These caves and associated springs are the home of several species of unusual invertebrates. "As they can live nowhere else, it is important to preserve the springs in order not to destroy the species (Brune 1981)."

The implementation of a PGMA in this region could regulate groundwater resources. In general, a flowing spring indicates the fact that ground water supplies are not depleted.

Figure 3. Location of TPWD Facilities in the Study Area



## Figure 4. Vegetation Types of the Study Area

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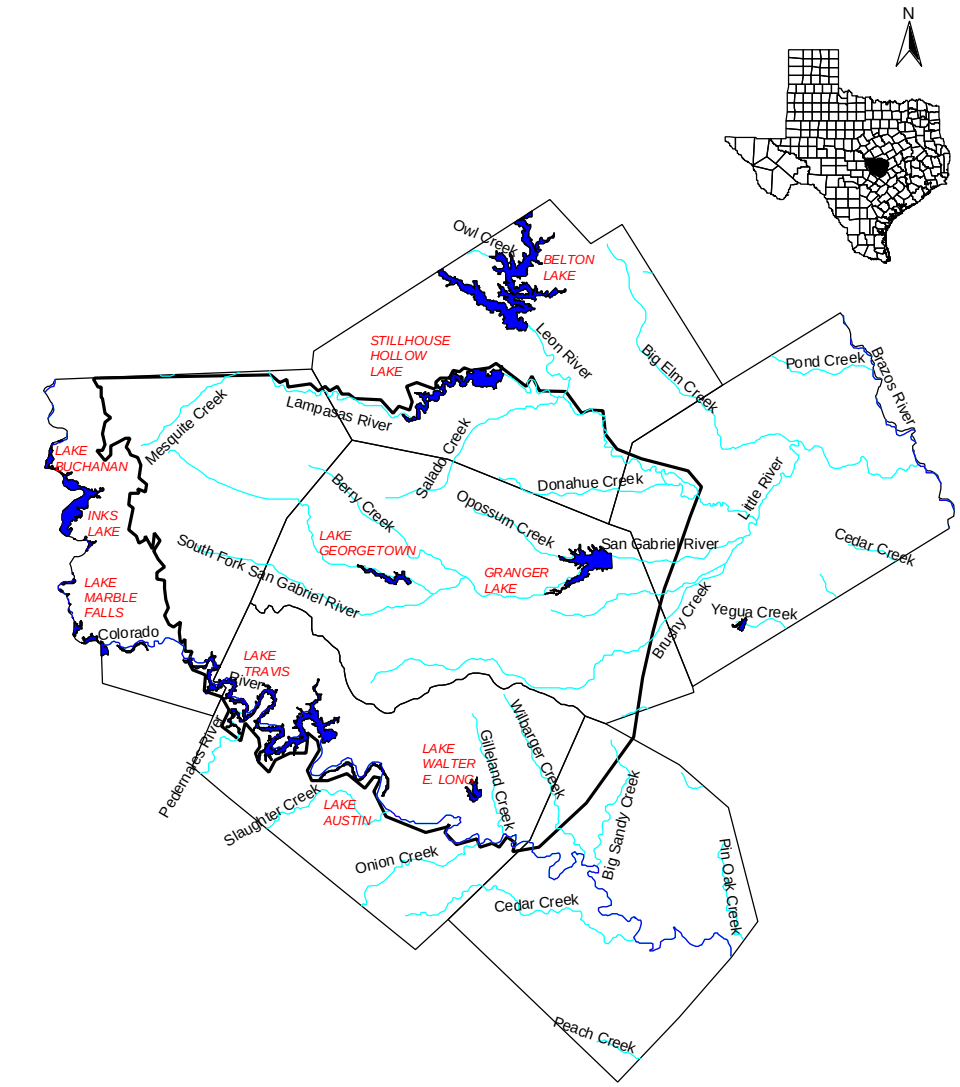
Source: TPWD GIS lab archives. The vegetation represents a general summary of previously produced larger scale maps. Delineation of the vegetation occurs only where the actual vegetation exibited adequate resolution for definition.

## Figure 5. Surface Water Resources in the Study Area

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Produced by the TPWD Water Resources Team, July 1998. No claims are made to the accuracy of the data or the suitability of the data for a particular use.

Sources:
Texas Natural Resources Information System,
Texas Water Developement Board,
TPWD GIS lab archives data 1998.

Projections:
Texas Statewide Projection

**Fishes**

The rivers and streams within the study area have a variety of fish species common to the Brazos and Colorado River drainages. Table 4 lists fish species sampled from Rocky Creek, Oatmeal Creek, Barton Creek, Little Barton Creek, and Willis Creek in 1988-1989 (Bayer et al. 1992; Mosier and Ray 1992).

**Table 4.** List of Freshwater Fishes Reported from the Study Area (Bayer et al 1992; Mosier and Ray 1992)

| Family | Species | Common Name |
|---|---|---|
| **Lepisosteidae** | *Lepisosteus oculatus* | Spotted gar |
| **Clupeidae** | *Dorosoma cepedianum* | Gizzard shad |
| **Cyprinidae** | *Campostoma anomalum* | Central stoneroller |
| | *Cyprinus carpio* | Common carp |
| | *Cyprinella lutrensis* | Red shiner |
| | *C. venusta* | Blacktail shiner |
| | *Notemigonus crysoleucas* | Golden shiner |
| | *Notropis. buchanani* | Ghost shiner |
| | *N. volucellus* | Mimic shiner |
| | *Opsopoeodus emilae* | Pugnose minnow |
| | *Pimephales vigilax* | Bullhead minnow |
| | *P. promelas* | Fathead minnow |
| **Catastomidae** | *Carpoides carpio* | River carpsucker |
| | *Moxostoma congestum* | Gray redhorse sucker |
| **Ictaluridae** | *Ameirus melas* | Black bullhead |
| | *Ameirus natalis* | Yellow bullhead |
| | *Ictalurus furcatus* | Blue catfish |
| | *Ictalurus punctatus* | Channel catfish |
| | *Pylodictus olivaris* | Flathead catfish |
| **Cyprinodontidae** | *Fundulus notatus* | Blackstripe topminnow |
| **Poeciliidae** | *Gambusia affinis* | Western mosquitofish |
| **Centrarchidae** | *Lepomis auritus*[a] | Redbreast sunfish |
| | *L. cyanellus* | Green sunfish |
| | *L. gulosus* | Warmouth |
| | *L. humilis* | Orangespotted sunfish |
| | *L. macrochirus* | Bluegill |
| | *L. megalotis* | Longear sunfish |
| | *L. microlophus* | Redear sunfish |
| | *Micropterus salmoides* | Largemouth bass |
| | *M. treculi* | Guadalupe bass |
| **Percidae** | *Etheostoma chlorosomum* | Bluntnose darter |
| | *E. lepidum* | Greenthroat darter |
| | *E. spectabile* | Orangethroat darter |
| | *Percina sciera* | Dusky darter |

One fish species listed in Table 4 is also on the special species list compiled by the Wildlife Diversity Program staff at TPWD; the Guadalupe bass (*Micropterus treculi*). The Guadalupe bass is endemic to the streams of the northern and eastern Edwards Plateau including portions of the Colorado, Brazos, Guadalupe, and San Antonio river basins (Hubbs et al. 1991).

The reservoirs in the study area support many fish species that are not native. This results from stocking and "bait bucket" transplants.

**Birds and Waterfowl**

Table 5 is extracted from the *Checklist and Seasonal Distribution: Birds of the Austin, Texas, region* (Travis Audubon Society 1994). The checklist area is a circle with 60-mile radius centered in Austin. Table 5 represents those bird species that are riparian or aquatic within the study area. Species in this table do not share the same probability of occurrence.

Many species of neotropical songbirds, wintering shorebirds, and a large number of waterfowl (Table 5) stopover in the study area to feed and rest along the river banks and creek bottoms. The trees and shrubs that grow along the rivers, streams, and lakes are of importance to migrating songbirds and raptors, such as the yellow warbler and the swallow-tailed kite.

The Bald eagle (*Haliaeetus leucocephalus)*, although rare in the study area, is a federally and state threatened species that is found primarily near rivers and large lakes in the study area. Bald eagles nest in tall trees or on cliffs near water.

The snow goose *(Chen caerulescens)*, mallard *(Anas platyrhynchos)*, lesser scaup *(Aythya affinis)*, bufflehead *(Bucephala albeola)*, and ruddy duck *(Oxyura jamaicensis)* are but some of a large population of waterfowl that stopover on reservoirs and rivers in the area at different times of the year to forage, nest, and roost.

The mountain plover *(Charadrius montanus)*, peregrine falcon *(Falco peregrinus)*, and the interior least tern *(Sterna antillarum athalassos)* are on the special species list of the TPWD Wildlife Diversity Program. The special species list includes those species that are considered threatened, endangered, rare or extirpated.

Table 5. Selected Birds and Waterfowl of the Study Area (Travis Audubon Society 1994)

| | **Spring** | **Summer** | **Fall** | **Winter** |
|---|---|---|---|---|
| **Gaviidae** | | | | |
| Common loon | R | | R | U |
| **Podicipedidae** | | | | |
| Least grebe* | V | V | R | V |
| Pied-billed grebe** | C | U | C | C |
| **Phalacrocoracidae** | | | | |
| Double-crested cormorant | C | | C | A |
| **Ardeidae** | | | | |
| Great blue heron** | C | U | C | C |
| Great egret** | R | U | U | U |
| Cattle egret** | A | A | R | R |
| Green heron** | C | C | R | R |
| White-faced ibis | R | U | U | |
| **Ciconiidae** | | | | |
| Wood stork | | V | R | |
| **Anatidae** | | | | |
| Black-bellied whistling-duck** | U | U | U | R |
| Greater white-fronted goose | | | R | R |
| Snow goose | | | R | V |
| Canada goose | | | R | V |
| Wood duck** | U | U | U | U |
| Green-winged teal | U | | C | C |
| Mallard** | U | U | C | C |
| Northern pintail | R | V | C | C |
| Blue-winged teal | C | R | C | R |
| Northern shoveler | R | R | A | A |
| Gadwall | U | V | C | C |
| American wigeon | U | | C | C |
| Canvasback | V | V | R | U |
| Redhead | R | V | U | U |
| Ring-necked duck | R | V | U | U |
| Lesser scaup | C | R | A | A |
| Bufflehead | C | | C | C |
| Ruddy duck | C | R | C | C |
| **Accipitridae** | | | | |
| Osprey | R | V | R | R |
| American swallow-tailed kite | V | V | V | V |
| Mississippi kite | V | V | V | V |
| Bald eagle** | V | V | V | R |
| Northern harrier | R | R | U | U |
| Red-shouldered hawk** | U | U | U | U |

A-abundant C-common U-uncommon R-rare V-very rare * has nested
**nests regularly

**Continued from previous page**

| | Spring | Summer | Fall | Winter |
|---|---|---|---|---|
| **Rallidae** | | | | |
| Virginia rail | R | V | V | V |
| Common moorhen** | V | R | V | V |
| American coot** | A | U | A | A |
| **Gruidae** | | | | |
| Sandhill crane | V | | U | U |
| Whooping crane | | V | | V |
| **Charadriidae** | | | | |
| Black-bellied plover | R | V | R | V |
| American golden plover | U | V | R | V |
| Snowy plover | | V | R | V |
| Killdeer** | A | A | A | A |
| Mountain Plover | V | | V | R |
| **Recurvirostridae** | | | | |
| Black-necked stilt** | R | R | R | |
| American avocet | R | U | V | |
| **Scolopacidae** | | | | |
| Greater yellowlegs | U | U | U | U |
| Lesser yellowlegs | C | U | U | R |
| Solitary sandpiper | U | U | V | V |
| Willet | V | R | | |
| Western sandpiper | U | C | R | V |
| Least sandpiper | C | C | C | C |
| Pectoral sandpiper | C | V | V | V |
| Dunlin | V | V | V | V |
| Stilt sandpiper | V | C | V | |
| Buff-breasted sandpiper | R | U | V | |
| Short-billed dowitcher | V | R | V | V |
| Common snipe | U | V | U | U |
| American Woodcock* | V | | U | U |
| Wilson's phalarope | C | R | V | V |
| **Laridae** | | | | |
| Franklin's gull | U | R | V | V |
| Ring-billed gull | A | V | R | A |
| Herring gull | V | | V | R |
| Forster's tern | R | V | R | U |
| **Alcedinidae** | | | | |
| Belted kingfisher** | C | C | C | C |
| Green kingfisher* | R | R | R | R |
| **Tyrannidae** | | | | |
| Acadian flycatcher** | R | R | V | |

A-abundant C-common U-uncommon R-rare V-very rare * has nested
**nests regularly

**Continued from previous page**

| | **Spring** | **Summer** | **Fall** | **Winter** |
|---|---|---|---|---|
| Eastern phoebe** | U | U | C | C |
| **Hirundinidae** | | | | |
| N. rough-winged swallow** | R | U | U | V |
| Bank swallow** | A | A | R | |
| Cliff swallow** | A | A | U | |
| Cave swallow** | U | U | U | |
| **Troglodytidae** | | | | |
| Sedge wren | R | | R | R |
| Marsh wren | R | V | | R |
| **Muscicapidae** | | | | |
| Swainson's thrush | R/U | V | V | V |
| **Motacillidae** | | | | |
| American pipit | U | | C | C |
| **Vireonidae** | | | | |
| Black-capped Vireo** | | U | U | |
| **Emberizidae** | | | | |
| Yellow warbler | C | V | R | V |
| Golden-cheeked warbler** | U | R | | |
| Northern parula** | U | V | V | V |
| Yellow-throated warbler* | V | V | V | V |
| Prothonotary warbler** | | V | U | |
| Swainson's warbler** | | R | V | |
| Northern waterthrush | V | V | | V |
| Louisiana waterthrush** | | V | R | R |
| Kentucky warbler** | R | R | R | |
| Common yellowthroat* | R | V | R | R |
| Hooded warbler** | R | R | | |
| Swamp sparrow | R | | R | R |
| Red-winged blackbird** | A | A | A | A |
| Yellow-headed blackbird | R | V | R | V |

A-abundant C-common U-uncommon R-rare V-very rare * has nested
**nests regularly

**Reptiles, Mammals, and Amphibians**

There are 1,100 vertebrate species in Texas, 60 of which are endemic (Texas Audubon 1997). In the study area there are at least 44 species of reptiles (Table 6), mammals (Table 7), and amphibians (Table 8) that are either aquatic, semi-aquatic, or in some way wetland-dependent.

The bats listed in Table 7 typically drink water from rivers and other riparian habitats, as well as use rivers and streams as travel corridors. The cave myotis (*Myotis velifer)* is a good example. It is the most abundant bat of the Edwards Plateau and hibernates in central Texas caves in winter. Cave myotis are opportunistic insectivores that feed on a wide

variety of insects depending upon what is most available on a given night. Small moths make up the largest portion of the diet although small beetles and weevils are also taken. The cave myotis is closely associated with water. When the bats leave their diurnal roosts late in the evening, they fly to nearby ponds and streams over which they forage and from which they drink (Davis and Schmidly 1994).

The listed frogs, toads, and salamanders (Table 8) are aquatic animals. Most toads and frogs require an aquatic habitat in order to reproduce. For example, the red-spotted toad thrives in dry habitats, but requires a constant source of moisture, such as springs, seepages, pools along streams, and stock tanks (Garrett and Barker 1987). The Jollyville Plateau salamander is known from springs and caves of Travis and Williamson counties north of the Colorado River.

In the study area, most of the snakes, lizards, and turtles listed in Table 6 are restricted to riparian habitats adjacent to the local rivers, springs, ponds, and wetlands. A good example is the Texas garter snake, which is usually found in riparian meadowland and juniper-wooded canyons along the eastern edge of the Edwards Plateau.

The following selected tables are based on the Texas Biological Conservation Database (TXBCD) inventory, and input from Texas Parks and Wildlife staff scientists.

**Table 6.** Selected Reptiles of the Study Area (Wildlife Diversity Program 1998)

| Scientific name | Common name |
|---|---|
| *Alligator mississippiensis* | American alligator |
| *Chelydra serpentina* | Snapping turtle |
| *Cnemidophorus gularis* | Texas spotted whiptail |
| *Graptemys versa* | Texas map turtle |
| *Kinosternon flavescens* | Yellow mud turtle |
| *Micrurus fulvius* | Eastern coral snake |
| *Nerodia erythrogaster* | Plainbelly water snake |
| *Nerodia rhombifer* | Diamondback water snake |
| *Pseudemys texana* | Texas river cooter |
| *Sternotherus odoratus* | Common musk turtle |
| *Thamnophis cyrtopsis* | Blackneck garter snake |
| *Thamnophis marcianus* | Checkered garter snake |
| *Thamnophis proximus* | Western ribbon snake |
| *Thamnophis sirtalis* | Common garter snake |
| *Thamnophis sirtalis annectens* | Texas garter snake |
| *Trionyx spiniferus* | Spiny softshell |

**Table 7.** Selected Mammals of the Study Area (Wildlife Diversity Program, 1998; Davis and Schmidly 1994)

| Scientific name | Common name |
|---|---|
| *Lasiurus borealis* | Eastern red bat |
| *Myocastor coypus* | Nutria |
| *Myotis velifer* | Cave myotis |
| *Pipistrellus subflavus* | Eastern pipistrelle |
| *Scalopus aquaticus* | Eastern mole |
| *Sylvilagus aquaticus* | Swamp rabbit |
| *Sylvilagus floridanus* | Eastern cottontail |
| *Tadarida braziliensis* | Mexican free-tailed bat |

**Table 8.** Amphibians of the Study Area (Wildlife Diversity Program, 1998)

| Scientific name | Common name |
|---|---|
| *Acris crepitans* | Northern cricket frog |
| *Ambystoma texanum* | Smallmouth salamander |
| *Bufo punctatus* | Red-spotted toad |
| *Bufo valliceps* | Gulf coast toad |
| *Bufo woodhousii* | Woodhouse's toad |
| *Eurycea sosorum* (federally listed endangered) | Barton spring salamander |
| *Eurycea sp.1* | Jollyville plateau salamander |
| *Eurycea sp.2* | Salado springs salamander |
| *Eurycea sp.5* | Georgetown salamander |
| *Gastrophryne carolinensis* | Eastern narrowmouth toad |
| *Gastrophryne olivacea* | Great plains narrowmouth toad |
| *Hyla chrysoscelis* | Cope's gray treefrog |
| *Hyla versicolor* | Northern gray treefrog |
| *Plethodon albagula* | Western slimy salamander |
| *Pseudacris clarkii* | Spotted chorus frog |
| *Pseudacris streckeri* | Strecker's chorus frog |
| *Rana berlandieri* | Rio Grande loepard frog |
| *Rana catesbeiana* | Bullfrog |
| *Rana clamitans* | Green frog |
| *Scaphiopus couchii* | Couch's spadefoot |

## Conclusion

Human changes to the landscape are extensive and accelerated. The human population of the study area is projected to more than double by 2050. Stresses on the different ecosystems come from the number of people, their location, and the nature and scale of their activities.

The selected natural resources covered in the report are facing an uncertain future, a future that depends on the quality and quantity of the water resources, both surface and ground, within the study area. The five species of *Eurycea* salamanders found in the study area are all endemic to local springs and caves. Therefore, their fate is tied to groundwater levels.

Mitigating the negative impacts of past and current practices, such as grazing, agriculture, industrialization, and urbanization, will improve the chances of natural resources recovery, be it surface water, groundwater, or fauna and flora. Fundamental changes in land and water management and resource valuation will be needed for mitigation plans to be effective.

The protection of riparian habitats fringing rivers, streams, and lakes should be priority in land-use planning processes. These habitats are not only very important to wildlife; they are also important in preventing erosion and in protecting water quality.

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# Appendix A

## Scientific Names of Plants Mentioned (from McMahan et al. 1984)

## APPENDIX A

Scientific Names of Plants Mentioned

| | |
|---|---|
| Agarito | *Berberis trifoliolata* |
| Bluestem, little | *Schizachyrium scoparium var. frequens* |
| Elm, cedar | *Ulmus crassifolia* |
| Euphorbia, mat | *Euphorbia serpens* |
| Grama, hairy | *Bouteloua hirsuta* |
| _____, sideoats | *B. curtipendula* |
| _____, Texas | *B. rigidiseta* |
| Greenbriar, saw | *Smilax bona-nox* |
| Hackberry | *Celtis spp.* |
| _____, netleaf | *Celtis reticulata* |
| Juniper, Ashe | *Juniperus ashei* |
| Kidneywood | *Eysenhardtia texana* |
| Mesquite, curly | *Hilaria belangeri* |
| Oak, blackjack | *Quercus marilandica* |
| ___, live | *Q. virginiana* |
| ___, post | *Q. stellata* |
| ___, shin | *Q. sinuata* var. *breviloba* |
| ___, Texas | *Q. texana* |
| Panicum, Halls | *Panicum hallii* |
| Persimmon, Mexican | *Diospyros texana* |
| Pricklypear, Texas | *Opuntia lindheimeri* |
| Rabbit tobacco | *Evax prolifera* |
| Sedge, cedar | *Carex planostachys* |
| Senna, two-leaved | *Cassia roemeriana* |
| Soapberry | *Sapindus saponaria* |
| Sumac | *Rhus spp.* |
| _____, flameleaf | *Rhus lanceolata* |

| | |
|---|---|
| Three-awn, purple | *Aristida purpurea* |
| Tridens, hairy | *Tridens* sp. |
| Wintergrass, Texas | *Stipa leucotricha* |