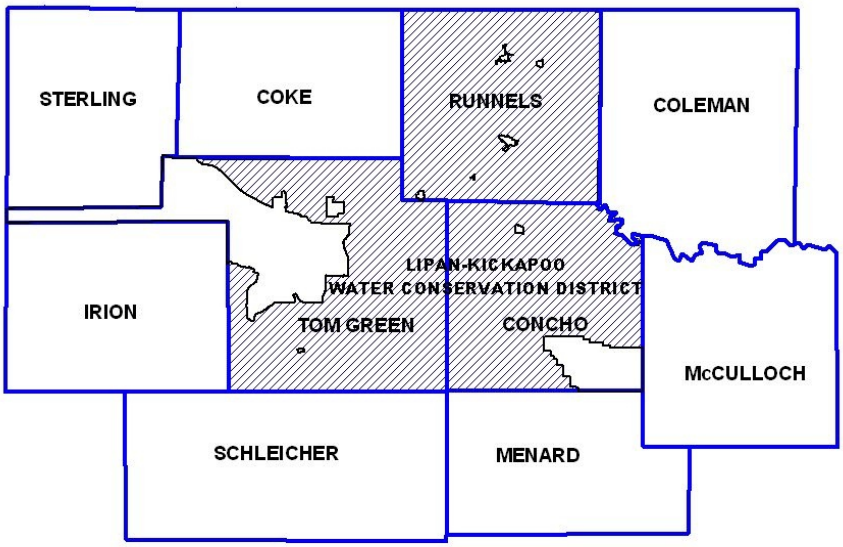
LIPAN-KICKAPOO
WATER CONSERVATION DISTRICT



MANAGEMENT PLAN

2008-2018

Adopted: August 6, 2008

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DISTRICT MISSION

The Lipan-Kickapoo Water Conservation District strives to develop, promote and implement water conservation and management strategies to conserve, preserve, and protect the groundwater supplies of the District, to protect and enhance recharge, prevent waste and pollution, and to effect the efficient, beneficial and wise use of water for the benefit of the citizens and economy of the District. The District seeks to protect the owners of water rights within the District from impairment of their groundwater quality and quantity within the District, pursuant to the powers and duties granted under Chapter 36, Subchapter D of the Texas Water Code.

TIME PERIOD FOR THIS PLAN

This plan becomes effective upon adoption by the Board of Directors and approval by the Texas Water Development Board executive administrator. This plan remains in effect for a ten-year period, or until such time as a revised or amended plan is approved.

STATEMENT OF GUIDING PRINCIPLES

The District recognizes that its groundwater resources are of utmost importance to the economy and environment, first to the residents of the District and then to the region. Also recognized is the importance of understanding the aquifers and aquifer characteristics for proper management of these resources. In addition, the integrity and ownership of groundwater play an important role in the management of this precious resource. One of the primary goals of the District is to preserve the integrity of the groundwater in the district from all potential contamination sources. This is accomplished as the District sets objectives to provide for the conservation, preservation, protection, recharge, prevention of waste and pollution, and efficient use of water including:

- Acquiring, understanding and beneficially employing scientific data on the District's aquifers and their hydrogeologic qualities and identifying the extent and location of water supplies within the District, for the purpose of developing sound management procedures;
- Protecting the private property rights of landowners in groundwater by ensuring that such landowners continue to have the opportunity to use the groundwater underlying their land;
- Promulgating rules for permitting and regulation of spacing of wells and transportation of groundwater resources in the District to protect the quantity and quality of the resource;
- Educating the public and managing for the conservation and beneficial use of the water;
- Educating the public and managing to prevent pollution of groundwater resources;
- Cooperating and coordinating with other groundwater conservation districts with which the District shares aquifer resources.

These objectives are best achieved through guidance from the locally elected board members who understand the local conditions and can manage the resource for the benefit of the citizens of the district and region.

Since a basic understanding of the aquifers and their hydrogeologic properties, as well as a quantification of resources is the foundation from which to build prudent planning measures, this management plan is intended as a tool to focus the thoughts and actions of those given the responsibility for the execution of district activities.

GENERAL DESCRIPTION OF THE DISTRICT

History

The primary concern of the residents of this area of the State regarding groundwater is the potential contamination of the groundwater from leaking oil and gas wells. For this reason, the residents introduced legislation in the 70th Regular Legislative Session (1987) for creation of the District. In November 1987, the residents confirmed the district and also voted to fund the district operations through local property taxes. It became an active district on November 1, 1988. On January 2, 1989, the district adopted a 10-year Management Plan and in February 1989 adopted Rules and By-Laws which became effective March 6, 1989. This 10-year Management Plan was replaced in 1998 by a new 10-year Management Plan that complied with the new mandates of Chapter 36 of the Texas Water Code. One of the new mandates is that management plans are required to be reviewed at least every 5 years. This new plan was reviewed and amended on July 9, 2003 to comply with this statute. Since 1989, the District rules were amended four times: March 6, 2000, August 4, 2004, November 1, 2006, and September 5, 2007.

The District is governed by a seven member locally elected Board of Directors - two members from Concho County, two members from Runnels County, two members from Tom Green County, and one member-at-large from the District as a whole. Elections are held every two years. The directors serve staggered four year terms - the directors from Concho and Runnels Counties are elected in one election and the directors from Tom Green County and the director at-large are elected in another. By having a local board of directors, the District is very responsive to voters' approval or disapproval of the local management of their groundwater and/or the services provided by the District.

Location and Extent

The Lipan-Kickapoo WCD has an areal extent of approximately 2,262,464 acres or 3,535 square miles and is located in the center of the State of Texas. The USGS geographic center of Texas monument is located within the District and is approximately 13 miles southeast of Vancourt, Texas where the District office is located.

The District's economy is based primarily on agriculture with some oil and gas production. The agricultural income is derived primarily from cotton, grain sorghum, wheat, corn, alfalfa as well as sheep, goats, and beef cattle production. Income is also obtained from cattle and sheep feedlots and dairies. Recreational hunting leases also contribute to the income of the area.

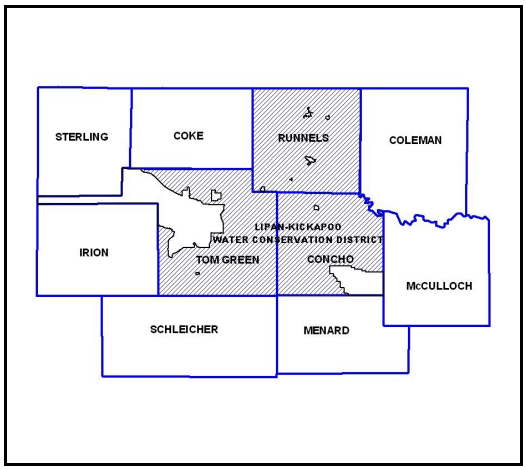

Figure 1. Location of the Lipan-Kickapoo Water Conservation District showing excluded areas.

The boundaries of the water district generally include: All of Tom Green, Runnels, and Concho counties not currently within the boundaries of the Hickory Underground Water Conservation District. The cities/towns of Winters, Ballinger, Rowena, Miles, Paint Rock, San Angelo, Christoval, Grape Creek, the Red Creek Municipal Utility District, and

the area northwest of San Angelo north of the Middle Concho River and south and west of US Highway 87 north to the Coke County line are excluded from the district (Fig. 1). Most of these towns and cities within these counties were excluded because they get their water supply from surface water that belongs to and is regulated by the state. Therefore, there are no major municipalities within the District boundaries.

Tom Green County

The total population of the county is approximately 103,938.[1] The largest city in Tom Green county is San Angelo (also the county seat) with a population of approximately 88,300 people. It is not a part of the District and is located northwest of the District. Other communities in Tom Green County not in the District are: Christoval, Grape Creek, Water Valley, and the Red Creek MUD with a combined population of approximately 10,460. There are 7 small communities within the District in Tom Green county: Vancourt, Wall, Veribest, Mereta, Carlsbad, Knickerbocker, and Harriet. The total estimated population within the District in Tom Green County is 5,178.

The largest single land use in the county is agriculture with a total of 844,695 acres of which 212,464 acres is crop or farm land and the balance of 632,231 acres is range land.[2] The crop land is located primarily in the center of the county over the Lipan aquifer while the range land is located on the north, west, and south portions of the county over the Edwards-Trinity aquifer. Irrigation covers approximately 48,308 acres of the county's crop land.[3] Pivot irrigation systems have been the primary method of applying irrigation water, but in the last few years a considerable number of drip irrigation systems have been installed replacing other methods of irrigation.

Concho County

The total population of the county is approximately 3,654.[4] The largest city in Concho county is Eden with a population of approximately 2,407. It is located within the Hickory UWCD boundaries. Paint Rock, the county seat, has a population of approximately 284 and is not a part of the District. There are several other small communities within the District in Concho county: Eola, Vick, Lowake, Live Oak, and Millersview. The total estimated population within the District in Concho county is 938.

The largest single land use in the county is agriculture with a total of 544,312 acres of which 142,138 acres is crop or farm land and the balance of 402,174 acres is range land.[5] The crop land is located primarily in the west central portion of the county over the Lipan aquifer while the range land is located on the north, east, and south portions of the county over the Edwards-Trinity and Hickory aquifers. Irrigation covers approximately 4,933 acres of the county's crop land. The principle method of irrigation is through pivot irrigation systems with some drip irrigation.

Runnels County

The total population of the county is approximately 10,724.[6] The largest city in Runnels county is Ballinger (also the county seat) with a population of approximately 3,918 people. This town is not a part of the District. Other communities with larger populations not in the District are: Winters with approximately 2,662 people, Miles with approximately 796 people, and Rowena with approximately 387. Other small communities in the District include: Olfen, Norton,

Hatchel, Crews, and Wingate. The total estimated population within the District in Runnels county is 2,961.

The largest single land use in the county is agriculture with a total of 584,878 acres of which 299,223 acres is crop or farm land and the balance of 285,655 acres is range land.[7] The crop land is located primarily in the west central and southwestern portion of the county over the Lipan aquifer while the range land is located on the north and east portions of the county. Irrigation covers approximately 3,351 acres of the county's crop land. The principle methods of irrigation are furrow irrigation, pivot irrigation, and drip irrigation.

The total estimated population of these three counties is 118,316.[8] However, since the District covers the area generally outside the cities and towns, the total estimated population in the District is 9,077.

Overall land use in the District is for agricultural purposes of which approximately 653,825 acres are crop or farm land and 1,320,060 acres are range land. The crop land is located primarily in the central portion of the District over the Lipan aquifer while the range land is located along the boundaries of the District over the Edwards-Trinity and Hickory aquifers. Irrigation covers approximately 56,592 acres of the District's crop land.[9] The principle method of irrigation has been furrow irrigation. However, within the last 10 years there has been a large scale change to more highly efficient pivot and drip irrigation. Drip irrigation is now being installed to replace both furrow irrigation and pivot irrigation.

Topography and Drainage

The District lies within the Colorado River Basin with much of the area known as the Concho Valley of Texas. Two major rivers, the Colorado-with its headwaters beginning on the South Plains and the Concho-with its headwaters located in the counties to the north, west, and south of Tom Green county, traverse the District and converge at the O.H. Ivie Reservoir on the Concho-Runnels-Coleman County lines. There are numerous creeks which are tributaries of these two rivers. Drainage is generally in an eastward direction. Springs flowing from the Edwards-Trinity aquifer form the headwaters of the South Concho river, Lipan Creek, and the Kickapoo Creek. Topographically, the District consists of the Lipan Flats in the center of the District southeast of the city of San Angelo to rolling plains in the remainder of the District in Concho, Runnels, and Tom Green Counties.

REGIONAL COOPERATION AND COORDINATION

West Texas Regional Groundwater Alliance

The District is a member of the West Texas Regional Groundwater Alliance (WTRGA). This regional alliance consists of seventeen (17) locally created and locally funded districts that encompass approximately eighteen (18.2) million acres or twenty eight thousand three hundred sixty eight (28,368) square miles of West Texas (Fig 2). To put this in perspective, this area is larger than many individual states including Rhode Island (1,045 sq mi), Delaware (1,954 sq mi), Puerto Rico (3,425 sq mi), Connecticut (4,845 sq mi), Hawaii (6,423 sq mi), New Jersey (7,417 sq mi), Massachusetts (7,840 sq mi), New Hampshire (8,968 sq mi), Vermont (9,250 sq mi), Maryland (9,774 sq mi), and West Virginia (24, 230 sq mi). This West Texas region is as diverse as the State of Texas. Due to the diversity of this region, each member district provides it's own unique programs to best serve its constituents.

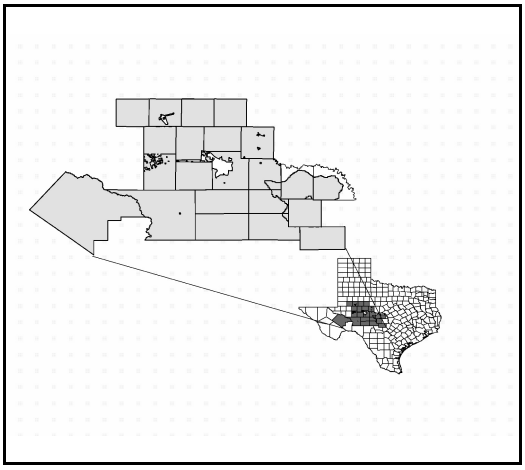

Figure 2. Territory in the West Texas Regional Alliance.

In May of 1988, four (4) groundwater districts; Coke County UWCD, Glasscock County UWCD, Irion County WCD, and Sterling County UWCD adopted the original Cooperative Agreement. As new districts were created, they too adopted the Cooperative Agreement. In the fall of 1996, the original Cooperative Agreement was redrafted and the West Texas Regional Groundwater Alliance was created. The current member districts and the year they joined the Alliance are:

Coke County UWCD	(1988)	Crockett County GCD	(1992)	Glasscock GCD	(1988)
Hickory UWCD # 1	(1997)	Hill Country UWCD	(2005)	Irion County WCD	(1988)
Kimble GCD	(2004)	Lipan-Kickapoo WCD	(1989)	Lone Wolf GCD	(2002)
Menard County UWD	(2000)	Middle Pecos GCD	(2005)	Permian Basin UWCD	(2006)
Plateau UWC & SD	(1991)	Santa Rita UWCD	(1990)	Sterling County UWCD	(1988)
Sutton County UWCD	(1991)	Wes-Tex GCD	(2005)		

This Alliance was created because the local districts have a common objective to facilitate the conservation, preservation, and beneficial use of water and related resources. Local districts monitor the water-related activities of the State's largest industries such as farming & ranching, oil & gas and municipalities. The Alliance provides coordination essential to the activities of these member districts to monitor these activities and to accomplish their objectives.

GROUNDWATER RESOURCES *

Lipan Aquifer

The Lipan aquifer is located in the Lipan Flats of eastern Tom Green, western Concho, and southern Runnels counties (Fig. 3). Water from the aquifer is principally used for irrigation, with limited amounts used for rural domestic and livestock needs. The typical irrigation practice in the area is to pump water held in storage in the aquifer during the growing season with the expectation of recharge of the aquifer during the winter months. Water levels in the past have generally remained unchanged, but due to the drought of the 1990's and early 2000's, they dropped drastically. In some areas, the aquifer was totally dry since there was minimal or no recharge at all. With the large rainfall events in late 2004, the aquifer recovered to within 90% of its highest levels recorded in 1990 and 1991. Since rainfall has been average or above the last 3-4 years, the aquifer has remained within 75% to 80% of the highest levels even though irrigation has taken place during the dry times of the years. Thus, groundwater availability for this aquifer is a function of average annual recharge, even though storage may not recover completely during dry years.

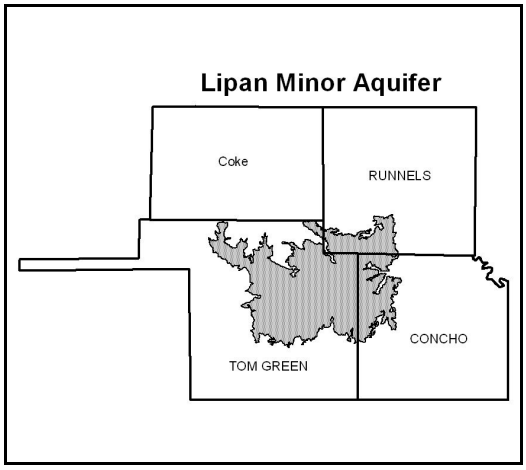

Figure 3. Location of Lipan Aquifer (Ashworth and Hopkins, 1995).

The aquifer is comprised of up to 125 feet of saturated alluvial deposits of the Leona formation of Quaternary age. Although the aquifer is located in three counties, water is found only sporadically throughout the aquifer. Also included in the Lipan aquifer are the updip portions of the underlying Choza Formation and Bullwagon Dolomite of Permian age that are hydrologically continuous with the Leona Formation. Ground water naturally discharges from the Lipan aquifer both by seepage to the Concho River and by evapotranspiration. This evapotranspiration occurs in areas where the water table is at or near the land surface. It is common for well yields to range from 50 gal/min to more then 500 gal/min.

The average annual effective recharge of the Leona formation, a formation included in the Lipan aquifer, is 35,436 acre-feet.[10] The water quality in the Leona Formation ranges from fresh to slightly saline and is very hard. Water in the underlying updip portions of the Choza and Bullwagon Formations tends to be slightly saline. The overall quality of the water within the Lipan aquifer generally does not meet drinking water standards. However, in most areas it is suitable for irrigation. [11]

* All estimates of groundwater availability, usage, supplies, recharge, storage, and future demands are from data supplied by the Texas Water Development Board, unless otherwise noted. Data sources include Region F-2007 State Water Plan. These estimates will be used until other data are available from ongoing studies of the region's aquifers.

Edwards-Trinity (Plateau) Aquifer

The Edwards-Trinity (Plateau) aquifer (Fig. 4) is a minor source of groundwater in the southern part of Concho county and the northern and southern parts of Tom Green county and is used primarily for livestock and domestic needs, with limited amounts used for irrigation. It is also a large source of recharge for the Lipan aquifer. The Edwards-Trinity aquifer consists of saturated sediments of lower Cretaceous age Trinity Group formations and overlying limestones and dolomite of the Comanche Peak, Edwards, and Georgetown formations. The Glen Rose Limestone is the primary unit of the Trinity in the in the southern part of the plateau and is replaced by the Antlers Sand north of the Glen Rose pinch out.

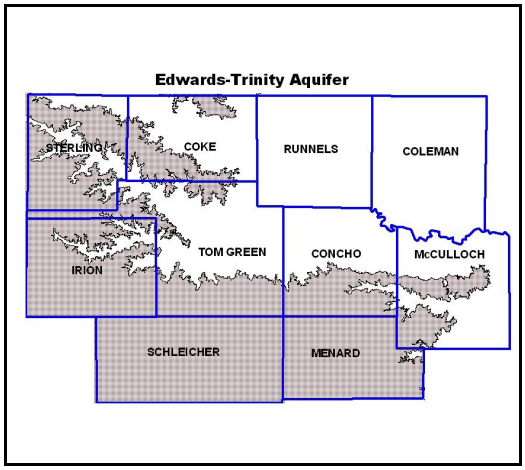

Figure 4. Location of Edwards-Trinity Aquifer. (Ashworth & Christian, 1989)

The average annual effective recharge of the Edwards-Trinity formation located in Concho and Tom Green counties is estimated to be 26,242 acre-feet.[12] Chemical quality of Edwards-Trinity (Plateau) water ranges from fresh to slightly saline. The water is typically hard and may vary widely in concentrations of dissolved solids made up mostly of calcium and bicarbonate. The salinity of the groundwater tends to increase toward the west. Certain areas have unacceptable levels of fluoride. [13]

Hickory Aquifer

Underlying the Edwards-Trinity (Plateau) aquifer in the southeastern part of Concho county is a down-dip portion of the Hickory aquifer (Fig. 5). The Hickory formation is comprised of Cambrian-age sands and gravels eroded from the granites of the Llano uplift in central Texas. There is no outcrop area of the Hickory formation in Concho County, but the formation down-dips fairly uniformly to the west, underlying the Edwards-Trinity formation in the southeastern part of the county. [14]

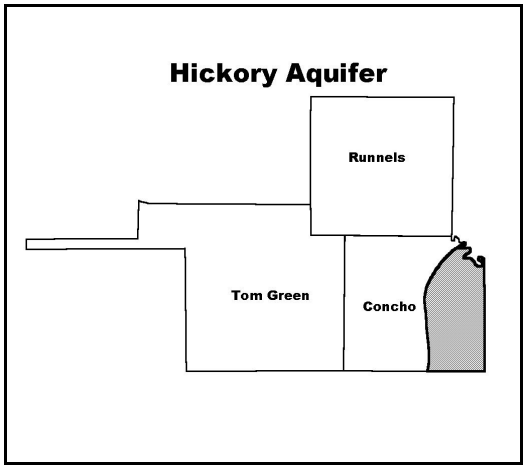

Figure 5. Location of Hickory Aquifer. (Bluntzer, 1992).

The Hickory aquifer has an average saturated thickness of 400-500 feet in the southeast corner of Concho county. There is no recharge to the aquifer within the District and only a limited amount of recoverable storage in the District. [15] Water in the Hickory in Concho county and within the boundaries of the Lipan-Kickapoo WCD is known to be very saline. The water quality varies and the extent of radioactivity within the Hickory aquifer within the District, which is known to exist in other parts of the aquifer, is not yet known. However, all of the formation within the District is downdip from the outcrop area, so it is possible that the Hickory water supply within the District will contain these radioactive decay products in some areas.

Data Sources

Currently, the District is using data from the Texas Water Development Board as a reference source for calculating and estimating groundwater resources. However, for planning purposes, the District, wherever possible, is using local data of existing conditions to provide better accuracy in determining groundwater resources. The primary reference sources are the TWDB's Lipan Groundwater Availability Model and the Edwards Trinity Groundwater Availability Model along with the Region F, Regional Water Plan adopted in January 2006 and the 2007 State Water Plan.

ANNUAL AMOUNT OF ADDITIONAL NATURAL OR ARTIFICIAL RECHARGE

West Texas landowners, range scientists and water supply professionals have long suspected that noxious brush, primarily mesquite and juniper, have had and will continue to have a tremendous influence on water resources of the region. From historical data collected by the U.S. Army Corp of Engineers from 1925 to the 1960's, the area experienced a dramatic shift in hydrologic characteristics beginning about 1960. These changes occurred due to several factors:
1) In the 1950's brush infestations were complete. Comparing aerial or ground based photos to current photos shows only slight differences. The most dramatic change in vegetative types occurs when comparing the same 1960 photos to 1920 photos. The "native" condition of much of the region could be characterized as a grassland prairie.
2) An historic drought occurred during the 1950's seriously depleting surface and groundwater resources. Many historic springs stopped flowing during this period and have never recovered.
3) It is theorized that the hydrologic systems in many of the watersheds that include gaining streams and the critical relationship between the groundwater and surface water flows contained large storage volumes that were slowly being depleted with the encroachment of the brush. Following the drought of the 1950's, the systems no longer had the capacity to recover because of the increased utilization of water by the brush.[16]

The evidence is overwhelming. More than 25 percent of once perennial streams in the Concho and Colorado basins stopped flowing after the drought of the 1950's when noxious brush such as mesquite, juniper, and salt cedar began to culminate its' dominance over what was once grassland prairie. As a result, every 10 acres of moderate to heavy brush infestations now steals one acre foot of water annually (325,851 gallons).[17]

District personnel have observed that during the period in the Fall when brush and trees become dormant to late Spring when brush and trees come out of dormancy that the water levels in monitor wells increase regardless of whether or not there has been rainfall. After the brush and trees come out of dormancy, the water levels continue to drop throughout the summer until Fall.

A study completed in 1998 concluded that brush control projects on total watersheds could restore watershed yields to near historic levels.[18] Computer modeling by Blackland Research and Texas A&M and calculated by the Upper Colorado River Authority shows that the entire Colorado and Concho River basins could gain an additional 249,584 acre feet of water annually in groundwater recharge and surface flow into existing reservoirs.[19]

There is no surplus surface water in the district available for artificial recharge of the aquifers. However, research performed at Texas A & M indicates that brush control would save rain water for desirable plants and increase the amount of percolation of excess water through the soil by 1 to 2 %. In an average rainfall year, approximately 19,350 acre-feet of water saved through brush control could eventually percolate through the soil as part of the natural recharge of the aquifers. This additional water would be available for use by the residents of the District.

Under the Texas Brush Control Plan developed pursuant to Chapter 203 of the Texas Agricultural Code, there are currently three Brush Control Projects underway in the District, including the North Concho River Pilot Brush Control Project, the Twin Buttes Reservoir/Lake Nasworthy Brush Control Project, and the Lake Ballinger Brush Control Project. Some success has been observed from some of these projects as some springs are beginning to flow again.

In addition to brush control on the watersheds, desalination of slightly saline water could help increase the amount of water available for use in the District.

SURFACE WATER RESOURCES

The Lipan-Kickapoo WCD has no jurisdiction over surface water nor does the district have any obligation or the jurisdiction to supply groundwater to surface water permit holders. In addition, only one surface water management entity is located within the boundaries of the District. However, there are several lakes adjacent to the District and only Lake Ballinger/Lake Moonen is located within the District. Lakes adjacent to the District are: in Runnels county-Lake Winters / New Lake Winters, and O.H. Ivie Reservoir; in Concho county-O.H. Ivie Reservoir; and in Tom Green county-O.C. Fisher Lake, Twin Buttes Reservoir, and Lake Nasworthy.

Table 1: Water Rights and Diversions of Major Reservoirs[20]

Reservoir	County	Water Right Numbers	Permitted Storage (acre-feet)	Permitted Diversion (acre feet/yr)
Lake Winters/New Lake Winters	Runnels	CA-1095	8,347	1,755
Lake Ballinger/Lake Moonen	Runnels	CA-1072	6,850	1,000
O.H. Ivie Reservoir	Concho	A- 3866/P-3676	554,340	113,000
O.C. Fisher Lake	Tom Green	CA-1190	119,000	80,400
Twin Buttes Reservoir	Tom Green	CA-1318	186,000	29,000
Lake Nasworthy	Tom Green	CA-1319	12,500	25,000
Total			887,037	250,155

Even though there is considerable permitted storage and permitted diversions of surface water, the drought of the 1990's has reduced the amount of water stored in most of these lakes to a small fraction of what they are permitted to store, e.g. O.H. Ivie is at 61.4% (08-04-08) of storage capacity, O.C. Fisher is at 6% (08-04-08) of storage capacity, while Twin Buttes Reservoir is at 31 % (08-04-08) of capacity. It will take several years of above average rainfall with considerable runoff to fill these reservoirs to capacity.

PROJECTED SURFACE WATER SUPPLIES

Table 2: Surface Water Rights by County and Category [21]

Region F - 2007 State Water Plan						
Permitted Surface Water Diversions (acre-feet per year)						
County	**Municipal**	**Industrial**	**Irrigation**	**Mining**	**Other**	**Total**
Concho	35	0	2,511	0	16	2,562
Runnels	2,919	0	6,924	70	0	9,913
Tom Green	107,934	8,002	41,019	0	0	156,955
Total	*110,888*	*8,002*	*50,454*	*70*	*16*	*169,430*

As shown in table 2, there are 2,562 acre-feet of water rights permitted by the TCEQ in Concho county, 9,913 acre-feet in Runnels county, and 156,955 acre-feet in Tom Green county for a total of 169,430 acre-feet permitted in the three counties. Of this total, 110,888 acre-feet are permitted for municipal use, 8,002 acre-feet are permitted for industrial use, 50,454 acre-feet are permitted for irrigation, 70 acre-feet are permitted for mining, and 16 acre-feet are permitted for other. Since there are no municipalities or manufacturing facilities located within the district, only the irrigation-50,454 acre-feet, mining-70 acre-feet, and other-16 acre-feet or a total of 50,540 acre-feet of surface water would be available for use in the District. Of this total, the Tom Green County Water Control and Improvement District #1, a federally owned surface water irrigation district, located within the boundaries of the LKWCD, has a permitted diversion of 25,000 acre feet per year from the Twin Buttes Reservoir located outside the LKWCD district. The majority of the remaining permitted diversions are for pumping out of the Concho and Colorado rivers. Recently, the irrigation district entered into an agreement with the city of San Angelo for all of the available waste water from the city. In return for the waste water, the irrigation district will be entitled to a maximum of 12,000 acre feet per year diversion from the Twin Buttes Reservoir instead of the permitted diversion amount of 25,000 acre feet per year.

Table 3. Projected Surface Water Supplies by County, Source, and Year [22]

2007 State Water Plan - Projected Surface Water Supplies

Runnels County

RWPG	Water User	County	River Basin	Source Name	2000	2010	2020	2030	2040	2050	2060
F	County-Other	Runnels	Colorado	Ballinger/Moonen Lake/Reservoir	88	0	0	0	0	0	0
F	County-Other	Runnels	Colorado	Winters Lake/Reservoir	231	0	0	0	0	0	0
F	Irrigation	Runnels	Colorado	Colorado River Combined Run-of-River Irrigation	5500	771	771	771	771	771	771
F	Livestock	Runnels	Colorado	Livestock Local Supply	1779	1148	1148	1148	1148	1148	1148
F	Millersview-Doole WSC	Runnels	Colorado	Colorado River MWD System	0	69	62	93	85	0	0
Total Projected Surface Water Supplies (acre-feet per year) =					**7598**	**1988**	**1981**	**2012**	**2004**	**1919**	**1919**

Concho County

RWPG	Water User	County	River Basin	Source Name	2000	2010	2020	2030	2040	2050	2060
F	County-Other	Concho	Colorado	Concho River Run-of-River City of Paint Rock	67	35	35	35	35	35	35
F	Irrigation	Concho	Colorado	Concho River Combined Run-of-River Irrigation	660	228	228	228	228	228	228
F	Livestock	Concho	Colorado	Livestock Local Supply	171	123	123	123	123	123	123
F	Millersview-Doole WSC	Concho	Colorado	Colorado River MWD System	0	92	85	123	112	0	0
Total Projected Surface Water Supplies (acre-feet per year) =					**898**	**478**	**471**	**509**	**498**	**386**	**386**

Tom Green County

RWPG	Water User	County	River Basin	Source Name	2000	2010	2020	2030	2040	2050	2060
F	County-Other	Tom Green	Colorado	Twin Buttes Lake/Reservoir San Angelo System	15	0	0	0	0	0	0
F	County-Other	Tom Green	Colorado	OC Fisher Lake/Reservoir San Angelo System	35	0	0	0	0	0	0
F	County-Other	Tom Green	Colorado	Nasworthy Lake/Reservoir San Angelo System	64	0	0	0	0	0	0
F	Irrigation	Tom Green	Colorado	Direct Reuse	11530	8500	8500	8500	8500	8500	8500
F	Irrigation	Tom Green	Colorado	Concho River Combined Run-of-River Irrigation	15839	2812	2812	2812	2812	2812	2812
F	Irrigation	Tom Green	Colorado	Twin Buttes Lake/Reservoir San Angelo System	7672	0	0	0	0	0	0
F	Irrigation	Tom Green	Colorado	Nasworthy Lake/Reservoir San Angelo System	316	0	0	0	0	0	0
F	Livestock	Tom Green	Colorado	Livestock Local Supply	1990	1644	1644	1644	1644	1644	1644
F	Millersview-Doole WSC	Tom Green	Colorado	Colorado River MWD System	0	174	176	290	300	0	0
Total Projected Surface Water Supplies (acre-feet per year) =					**37461**	**13130**	**13132**	**13246**	**13256**	**12956**	**12956**

Source: Volume 3, 2007 State Water Planning Database (http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp) TWDB: 5/1/2008

PROJECTED GROUNDWATER SUPPLIES

In order to maintain dependable groundwater supplies, the District follows the principle that the recharge rate of the aquifers is the projected water supply. Historically the aquifers are pumped each year until water is no longer available. Since the aquifers recharge rapidly after significant rainfall on the recharge area, the estimated recharge rate will be used in this plan as the projected water supply. Since there is no recharge to the Hickory aquifer in Concho county and the water in this downdip part of the aquifer within the District is very saline, no recoverable storage of Hickory groundwater is projected.

Tables 4 and 5 contain water-budget data for each layer that constitutes the GAM for the both the Lipan and the Edwards-Trinity (Plateau) aquifers in the District. Table 6 contains the combined water-budget data for both the Lipan and the Edwards-Trinity (Plateau) aquifers in the District.

Table 4: Annual groundwater flow budget for the Lipan-Kickapoo Water Conservation District (WCD), averaged for the years 1980 through 1998 from the groundwater availability model of the Lipan Aquifer. Flows are reported in acre-feet per year. [23]

	Lipan-Kickapoo WCD		
Flow Term	**In**	**Out**	**In-Out**
Change in Storage	17,349	-3,657	13,692
Reservoirs	1,481	-669	812
Springs and Seeps[1]	0	0	0
General head boundary (inflow from Edwards-Trinity (Plateau) Aquifer along western boundary.	5,706	-847	4,859
Wells	0	-29,384	-29,384
Rivers and streams	6,050	-15,197	-9,147
Direct precipitation recharge	50,801	0	50,801
Evapotranspiration	0	-27,857	-27,857
Lateral inflow	9,411	-13,190	-3,779

1. The drain cells representing the North Concho River are not within the Lipan-Kickapoo WCD so the drain discharge is zero for the Lipan Aquifer model in the district. However, spring discharge values from the Edwards-Trinity Aquifer in the district in Tom Green County can be found in Table 5.

Note: a negative sign refers to flow out of the aquifer in the District. A positive sign refers to flow into the aquifer in the District. All numbers are rounded to the nearest 1 acre-foot.

Table 5: Groundwater flow budget for the Lipan-Kickapoo Water Conservation District (WCD), averaged for the years 1980 through 1998 from the groundwater availability model of the Edwards-Trinity (Plateau) Aquifer. Flows are reported in acre-feet per year. [24]

	Lipan-Kickapoo WCD		
Flow Term	**In**	**Out**	**In-Out**
Edwards (Layer 1)			
Change in Storage	1,333	-436	897
Reservoirs	0	0	0
Springs and Seeps	0	-12,851	-12,851
General head boundary	0	0	0
Wells	0	-169	-169
Rivers and streams	0	-1,368	-1,368
Direct precipitation recharge	11,282	0	11,282
Evapotranspiration	0	0	0
Lateral inflow	7,241	-2,821	4,420
Upper vertical flow	0	0	0
Lower vertical flow	15	-2,217	-2,202

Trinity (Layer 2)			
Change in Storage	356	-186	170
Reservoirs	0	0	0
Springs and Seeps	0	-6,325	-6,325
General head boundary	0	-54	-54
Wells	0	-202	-202
Rivers and streams	66	-3,039	-2,973
Direct precipitation recharge	4,743	0	4,743
Evapotranspiration	0	0	0
Lateral inflow	4,080	-1,652	2,428
Upper vertical flow	2,226	15	2,241
Lower vertical flow	0	0	0

1. Note: a negative sign refers to flow out of the aquifer in the District. A positive sign refers to flow into the aquifer in the District. All numbers are rounded to the nearest 1 acre-foot.

Table 6: Combined Groundwater flow budget for the Lipan-Kickapoo Water Conservation District (WCD), averaged for the years 1980 through 1998 from the groundwater availability models of the Lipan Aquifer and the Edwards-Trinity (Plateau) Aquifer. Flows are reported in acre-feet per year. [25]

	Lipan-Kickapoo WCD		
Flow Term	**In**	**Out**	**In-Out**
Combined Lipan, Edwards (Layer 1), and Trinity (Layer 2) Aquifers			
Change in Storage	19,038	-4,279	14,759
Reservoirs	1,481	-669	812
Springs and Seeps	0	-19,176	-19,176
General head boundary	5,706	-901	4,805
Wells	0	-29,755	-29,755
Rivers and streams	6,116	-19,604	-13,488
Direct precipitation recharge	66,826	0	66,826
Evapotranspiration	0	-27,857	-27,857
Lateral inflow	20,732	-17,663	3,069
Upper vertical flow	2,226	15	2,241
Lower vertical flow	15	-2,217	-2,202

1. Note: a negative sign refers to flow out of the aquifer in the District. A positive sign refers to flow into the aquifer in the District. All numbers are rounded to the nearest 1 acre-foot.

As previously stated, the aquifers are pumped each year until water is no longer available. When the aquifers are filled to capacity, the wells will supply 55,570 to 74,094 acre-feet of recoverable

water. This is based on data from District pump and pivot evaluations and sales of electricity for irrigation by local electric service providers along with TWDB irrigation surveys that indicate irrigators apply from 1.5 to 2 acre-feet per acre annually. Multiplying the total estimated 37,047 acres within the District irrigated with groundwater by 1.5 acre-feet indicates that approximately 55,570 acre-feet of water is available for pumping within the District following above average recharge years. Multiplying the irrigated acres by 2 acre-feet indicates that approximately 74,094 acre-feet of water is available for pumping within the District following optimal recharge years. During an average year, irrigators generally have enough recoverable groundwater to apply 1 acre-foot per acre. This amount of pumping approximately equals the average annual recharge of the Lipan and other undifferentiated aquifers. Therefore, the estimated recoverable volume of water in storage from these aquifers is the annual recharge. There are no wells capable of pumping large volumes of water within the District. New wells being drilled in the Lipan aquifer are reducing the amount of water being pumped by existing wells. Well owners are being forced to down-size their pumps to cope with this situation. This indicates that 74,094 acre-feet is probably the maximum storage capacity of the aquifers within the District. It also reveals that the groundwater underlies a large area and that the residents of the District can effectively deplete the aquifers each year based on the amount of annual recharge, e.g. if the recharge is 25,000 acre-feet in a given year, then 25,000 acre-feet can be pumped; if the recharge is 72,000 acre-feet in a given year, then 72,000 acre-feet can be pumped. Groundwater within the District is not available for any other purpose other than supplemental irrigation and livestock and domestic use. This is a result of the scarcity of large pumping capacities, the annual depletion of the aquifers, and the poor quality of the water.

Table 7
Groundwater Availability in the Lipan-Kickapoo WCD [26]
(acre-feet per year)

Region F - 2007 State Water Plan						
County	**Aquifer**	**Basin**	**Annual Recharge During Drought**	**Annual Supply from Storage**	**County Annual Availability**	**District Annual Availability**
Concho	Edwards-Trinity	Colorado	11,869	409	12,278	8,595
	Hickory	Colorado	0	14,299	14,299	0
	Lipan	Colorado	5,984	529	6,513	6,513
Runnels	Lipan	Colorado	4,536	0	4,536	4,536
Tom Green	Dockum	Colorado	0	54	54	0
	Edwards-Trinity	Colorado	14,373	664	15,037	15,037
	Lipan	Colorado	24,916	12,570	37,486	37,486
Total Per Year			61,678	28,525	90,203	72,167

Total annual available groundwater supplies in the District as provided by the 2007 State Water Plan is estimated to be 90,203 acre-feet annually. However, data from the GAM run 08-08

indicates that only about 66,826 acre-feet per year is available from recharge each year. This annual available groundwater supply is as follows:

1) Groundwater availability from the Lipan aquifer in the District according to the GAM run 08-08 is the precipitation recharge estimated to be 50,801 acre-feet.[27]

2) The Edwards-Trinity (Plateau) aquifer provides, at best, water for livestock and limited domestic use. It is estimated that the annual recharge to the Edwards-Trinity aquifer is 26,242 acre-feet per year. According to the State Water Plan data, 27,315 acre-feet per year are available from the Edwards-Trinity (Plateau) aquifer. However, data from the GAM run 08-08 indicates that only about 16,025 acre-feet per year is available from precipitation recharge each year. Based on local data, only about 1,861 acre-feet per year is being pumped. Most of the groundwater is either being discharged from the aquifer as spring flow or is the primary source of recharge for the Lipan aquifer. Therefore, until yield estimates are improved, the District will rely on it's current local data to estimate the recoverable volume and annual recharge of the aquifer.

3) The data from the State Water Plan indicates no annual recharge to the Hickory aquifer in the District. It indicates that approximately 14,290 acre-feet per year is available for use. However, water analysis from wells drilled into the Hickory aquifer in the District indicate that the water is very saline and is therefore not usable. All wells permitted by the District that were drilled into the Hickory aquifer have been very saline or brine and have been plugged with cement to prevent any contamination to other possible fresh water aquifers.

GROUNDWATER USE

Based on available Texas Water Development Board data, the annual estimated usage in the District has varied from a low of 33,908 acre-feet to a high of 60,701 acre-feet during the 9 years ending in 2006.

Table 8
Concho, Runnels, Tom Green Counties
Historical Water Use [28]
(Surface and Groundwater Combined)

	Historical (acre ft)								
County	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Concho	4,089	5,881	2,574	2,093	3,690	2,690	3,064	3,556	7,727
Runnels	4,921	3,240	920	1,576	3,504	2,468	2,283	2,766	3,834
Tom Green	47,177	35,314	30,414	39,934	42,567	39,347	37,490	40,809	49,140
Total	56,187	44,435	33,908	43,603	49,761	44,505	42,837	47,131	60,701

During the nine years ending in 2006, the annual estimated groundwater usage in the District has varied from a low of 23,441 acre-feet to a high of 45, 421 acre-feet according to data supplied by the Texas Water Development Board.

Table 9 - Lipan-Kickapoo WCD
Concho, Runnels, Tom Green Counties
Historical Water Use [29]
(Groundwater)

	Historical (acre ft)								
County	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Concho	3,353	4,822	2,498	1,967	3,469	1,495	1,817	2,946	7,632
Runnels	1,968	1,296	480	820	1,822	1,497	1,476	1,650	2,663
Tom Green	40,100	30,017	20,463	26,756	28,520	25,892	24,356	27,809	33,086
Total	45,421	36,135	23,441	29,543	33,811	28,884	27,649	32,405	43,381

PROJECTED DEMANDS FOR WATER

Since there are no municipalities within the boundaries of the District, projected water demands are based on the Region F - 2007 State Water Plan combined surface and groundwater demands for irrigation and livestock over the next 50 years.

Table 10 - Projected Total Water Demands by Category
Irrigation and Livestock
Concho, Runnels, Tom Green Counties
(acre-feet per year)

	Historical	Projected					
Category	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Irrigation [30]	33,909	113,249	112,959	112,667	112,376	112,082	111,792
Livestock [31]	3,364	4,283	4,283	4,283	4,283	4,283	4,283
Total Per Year	37,273	117,532	117,242	116,950	116,659	116,365	116,075

Table 11 - Projected Water Demands by Category [32]
Combined Surface and Groundwater
Irrigation - By County
(acre-feet per year)

	Historical	Projected					
County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Concho	2,574	4,297	4,280	4,262	4,245	4,229	4,213
Runnels	920	4,331	4,317	4,298	4,279	4,260	4,241
Tom Green	30,415	104,621	104,362	104,107	103,852	103,593	103,338
Total Per Year	33,909	113,249	112,959	112,667	112,376	112,082	111,792

Table 12 - Projected Water Demands by Category [33]
Combined Surface and Groundwater
Livestock - By County
(acre-feet per year)

	Historical	Projected					
County	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**	**2060**
Concho	542	775	775	775	775	775	775
Runnels	936	1,530	1,530	1,530	1,530	1,530	1,530
Tom Green	1,886	1,978	1,978	1,978	1,978	1,978	1,978
Total Per Year	3,364	4,283	4,283	4,283	4,283	4,283	4,283

In order to manage the aquifers better, the experience of the District has been utilized in preparing another chart on projected water demands. The District's projected water demands are based on the projected water supplies and the estimated amount of irrigated land in the District. The following table 13 shows the demands on the aquifers when the aquifers are at or above normal storage capacity. Pumping in excess of recharge could result in some of the wells going dry which has occurred in the past. However, when significant rainfall events occur, the aquifers are again recharged. Since all available recharge can be pumped each year, it is safe to assume that in the future either new water conservation measures are going to have to be implemented or the demands are going to have to be reduced to equal the supply unless another source of water is located.

Table 13
Lipan-Kickapoo WCD - Projected Water Demands
Groundwater - By County
(acre-feet per year)

	Concho County		Runnels County		Tom Green County		Totals	
Year	Irrigation	Livestock	Irrigation	Livestock	Irrigation	Livestock	Irrigation	Livestock
2000	2,574	542	920	936	30,415	1,886	**33,909**	**3,364**
2010	4,698	547	5,480	941	78,258	1,876	**88,436**	**3,364**
2020	4,700	551	5,523	945	81,700	1,885	**91,923**	**3,381**
2030	4,640	548	5,544	940	82,500	1,880	**92,684**	**3,368**
2040	4,652	545	5,564	938	85,776	1,875	**95,992**	**3,358**
2050	4,622	542	5,593	935	86,260	1,870	**96,475**	**3,347**
2060	4,606	556	5,650	952	85,800	1,896	**96,056**	**3,404**

PROJECTED NEEDS FOR WATER AND MANAGEMENT STRATEGIES

Based on the projected groundwater supplies and projected groundwater demands, there will continue to be a shortage of groundwater available for irrigation in the future. Table 14 shows the projected irrigation water needs through the year 2060.

Table 14
Projected Irrigation Needs [34]
Lipan-Kickapoo WCD
(acre-feet per year)

Projected Water Needs						
Region F - 2007 State Water Plan						
County	**Projected Irrigation Needs**					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Runnels	1,358	1,344	1,325	1,306	1,287	1,268
Tom Green	47,090	46,831	46,576	46,321	46,062	45,807
Total	*48,448*	*48,175*	*47,901*	*47,627*	*47,349*	*47,075*

Since the groundwater resources are limited in the District, one of the ways to address these needs is through water conservation. Table 15 shows the projected irrigation water savings by installing more advanced irrigation technologies.

Table 15
Projected Water Management Strategies [35]
Lipan-Kickapoo WCD
(acre-feet per year)

Water Conservation Strategy					
Projected Water Savings with Advanced Irrigation Technologies					
Region F- 2007 State Water Plan					
County	**Irrigation Need**	**Projected Water Savings (acre-feet/year)**		**% Reduction of 2000 Need**	
	2010	**2020**	**2030-2060**	**2020**	**2030-2060**
Concho		748	1,496		
Runnels	1,358	0	0	0.0%	0.0%
Tom Green	47,090	5,690	11,548	12.1%	24.5%
Total	*48,448*	*6,438*	*13,044*	*12.1%*	*24.5%*

With the installation and use of more advanced irrigation technologies, the projected irrigation needs would be decreased as shown in table 16. However, even with the use of better technology there would still be a substantial need for more irrigation water. In order to prevent a water shortage in the District, the number of irrigated acres would have to be reduced.

Table 16
Revised Irrigation Needs
Lipan-Kickapoo WCD

Revised Irrigation Needs Incorporating Advanced Irrigation Technologies												
Region F - 2007 State Water Plan												
County	**Projected Irrigation Need (acre-feet/year)**						**Reduction in Irrigated Acres Needed to Prevent a Shortage (Acres)**					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**	**2000**	**2010**	**2020**	**2030**	**2040**	**2050**
Concho	0	0	0	0	0	0	0	0	0	0	0	0
Runnels	1,358	1,344	1,325	1,306	1,287	1,268	1,419	1,404	1,385	1,365	1,345	1,325
Tom Green	47,090	41,141	35,028	34,773	34,514	34,259	34,770	30,377	25,863	25,675	25,484	25,295
Total	*48,448*	*42,485*	*36,353*	*36,079*	*35,801*	*35,527*	*36,189*	*31,781*	*27,248*	*27,040*	*26,829*	*26,620*

Based on supply and demand calculations and projections, it is obvious that there will be times that demands exceed supply. In this area of the State and with the type of aquifers that serve the area, this is a normal occurrence that is recognized by most local residents. However, there is a growing trend in the District of large ranches being sold to developers who in turn are creating new subdivisions. Water use on some of these lands has gone from a few widely scattered low impact livestock wells to a much greater number of higher impact domestic, and in some cases irrigation wells. The District has observed that:

1) Some domestic wells in these subdivisions have been going dry due to the greater demand on the aquifers.

2) Municipalities in the counties not covered by the District are experiencing acute municipal water shortages and are looking to the District and other surrounding areas for additional water supplies.

3) In the fall of 2004 and the spring of 2005, the aquifers in the District were recharged by heavy rainfall that occurred in the fall of 2004. This recharge brought the water levels to within 90% of the highest levels that were recorded in 1990 and 1991. Since that time, rainfall and recharge have been slightly above average so the aquifers are remaining at about 80% of the highest levels even with heavy pumping during the summer months. Residents of the District understand that groundwater supplies are limited and have modified farming and ranching techniques to match the availability of water. There are approximately 200 highly efficient pivot irrigation systems installed within the District to conserve water. Thousands of acres of highly efficient drip irrigation have also been installed and continue to be installed. Efforts are being made by the residents of the District to use the available groundwater resources with maximum efficiency, while monitoring the quality of the groundwater to protect this resource for the years to come.

It is apparent that there is a need to manage this groundwater resource. In order to better manage this resource, better information on the characteristics, recoverable supplies, and recharge of the aquifers will have to be developed.

MANAGEMENT OF GROUNDWATER SUPPLIES

Preservation and protection of groundwater quality and quantity has been the guiding principle of the District since its creation while striving to maintain the economic viability of all groundwater user groups, public and private. In consideration of the economic and cultural activities occurring within the District, the District will continue to identify and engage in such activities and practices, that if implemented, would result in preservation and protection of the groundwater. The District will continue to make a regular assessment of groundwater supply and storage conditions and make them available to the public. Additional monitor wells both water quality and water level are being added to the monitor well program along with expansion of newer programs including the rainfall monitoring program.

The District has adopted rules to regulate groundwater withdrawals by means of spacing regulations and well density (number of wells per section). These rules were amended in March 2000, November 2006, and September 2007. The District will continue to amend these rules, within the limitations imposed by Chapter 36 of the Texas Water Code, as necessary to regulate groundwater withdrawals by means of additional spacing and/or production limits. District rules also address permitting and registration of wells, waste, well drilling and completion of wells, as well as capping and plugging of unused or abandoned wells. These rules are meant to provide equitable conservation and preservation of the groundwater resources.

The District may deny a drilling permit in accordance with the provisions of the District rules. The relevant factors to be considered in granting, denying, or limiting a permit include:

1) the purpose of the District rules, including but not limited to preserving and protecting the quality and quantity of the aquifer resources, and protecting existing uses;
2) the equitable conservation and preservation of the resource; and
3) the economic hardship resulting from denial or limitation of a permit.

In pursuit of the District's mission of preserving and protecting the resource, the District will enforce the terms and conditions of permits and the rules of the District by injunction, mandatory injunction, or other appropriate remedies in a court of competent jurisdiction as provided by Chapter 36.102, Texas Water Code.

The District also recognizes the importance of public education to encourage efficient use, promote conservation, prevent waste, and preserve the integrity of groundwater. District personnel will seek opportunities to educate the public on water conservation issues and other matters relevant to the protection of groundwater resources through public meetings, newspaper articles, newsletters, speaking engagements, and other means that may become available. The District also maintains a website that is updated weekly with relevant information.

ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

The District will implement the provisions of this plan and will utilize the provisions of this plan as a guide for determining the direction and/or priority for District activities. All operations of the District will be consistent with the provisions of this plan.

The District adopted rules in 1989 and amended the rules in 2000, 2006, 2007 and will continue to amend the rules as necessary. Rules adopted or amended by the District shall be pursuant to TWC Chapter 36 and the provisions of this plan. The promulgation and enforcement of the rules will be based on the best scientific and technical evidence available.

The District shall treat all citizens with equality. For good cause, the District, in its discretion, and after notice and hearing, if required, may grant an exception to the District rules. In doing so, the Board shall consider the potential for adverse effects on adjacent owners and aquifer conditions. The exercise of said discretion by the Board shall not be construed as limiting the power of the Board.

The District maintains a website www.lipan-kickapoo.org that is updated weekly. This site contains information on: District activities, forms, rules, hearing procedures, board meetings and hearings agendas, District programs, Chapter 36-Texas Water Code, Texas Water Well Drillers and Pump Installers Rules, Rules-Quick Reference Chart for the member districts of the West Texas Regional Groundwater Alliance (WTRGA) and other pertinent information.

Coordination With Surface Water Entities

Only the Tom Green County Water Control and Improvement District #1, a federally owned surface water irrigation district, is located within the boundaries of the LKWCD. However, several reservoirs are located either in the District, partially in the District, or adjacent to it. Therefore, in the spirit of cooperation, this management plan has been forwarded for comment to all surface water entities who hold water rights in these reservoirs.

Methodology for Tracking Progress

The methodology that the District will use to trace it's progress on an annual basis, in achieving all of it's management goals will be as follows:

The District manager will prepare and present an annual report to the Board of Directors on District performance in regards to achieving management goals and objectives for the previous fiscal year, during the first meeting of each new fiscal year. The report will include the number of instances each activity was engaged in during the year.

The annual report will be maintained on file at the District office.

GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

Goal

1.0 Provide for the Efficient Use of Groundwater Within the District.
Gather groundwater data both to improve the understanding of the aquifers and their hydrogeologic properties and to quantify this resource for prudent planning and efficient use. (36.1071(a)(1))

Management Objective

1.1 Each year measure, record, and accumulate an historic record of static water levels in 20 monitor wells.

Performance Standards

1.1a - District will maintain a water level monitoring network and annually measure the water levels in the monitor well network.

1.1b - Annual report to Board of Directors listing the number of wells measured in the water level monitoring network.

Goal

2.0 Control and Prevent the Waste of Groundwater. Minimize potential contamination of the groundwater by monitoring the drilling and completion of wells. (36.1071(a)(2))

Management Objective

2.1 Each year, register all new water wells drilled in the District.

Performance Standards

2.1a - District will maintain files including information on the drilling and completion of all new wells drilled within the District.

2.1b - Annual report to the Board of Directors on the number of new wells registered during the year.

Goal

3.0 Conjunctive Surface Water Management Issues. (36.1071(a)(4))

Management Objective

3.1 Each year, monitor rainfall events on the watersheds within the District that will impact surface water runoff and groundwater recharge.

Performance Standards

3.1a - District will maintain a voluntary rainfall monitoring network to monitor rainfall events. Rainfall event data will be filed with the District and used to monitor surface water runoff and groundwater recharge within the District.

3.1b - Annual report to Board of Directors listing the total number of rain gauges in the rainfall monitoring network.

Goal

4.0 Drought Conditions. (36.1071(a)(6))

Management Objective

5.1 Each year the District will monitor the Texas Palmer Drought Severity Index.

Performance Standards

5.1a - District staff will monitor the Texas Palmer Drought Severity Index and maintain a link to the index on the District website for public access. Additional drought information will be available to the public at the District office.

5.1b - Annual report to Board of Directors listing the number of times drought information was provided to the public.

Goal

5.0(a) Conservation. (36.1071(a)(7))

Management Objective

5.1(a) Each year provide and distribute water conservation literature to District residents to promote the efficient use of water.

Performance Standards

5.1(a)1 - Water conservation information will be available to the District residents at the District office.

5.1(a)2 - Annual report to the Board of Directors listing the number of times water conservation information was distributed to area residents.

MANAGEMENT GOALS DETERMINED NOT-APPLICABLE

Goal

5.0(b) Brush Control. (36.1071(a)(7))

Not appropriate or cost effective. Brush control projects are carried out and funded through the Upper Colorado River Authority and the NRCS. The projects are being used to replenish surface water supplies through the increased flow of springs in the creeks and rivers. This management goal is not applicable to the operations of the District.

Goal

5.0(c) Recharge Enhancement. (36.1071(a)(7))

Not appropriate or cost effective. Research project "Evaluation of Groundwater Availability, Recharge, and Monitoring System Design" [36] completed for the District by LBG-Guyton on January 12, 2005 indicates that water is not available for recharge to the aquifers in the District. This management goal is not applicable to the operations of the District.

Goal

5.0(d) Rainwater Harvesting. (36.1071(a)(7))

Not appropriate or cost effective. Due to the limited amount of rainfall in the District, it is not cost effective to do large scale rainwater harvesting. This management goal is not applicable to the operations of the District.

Goal

5.0(e) Precipitation Enhancement. (36.1071(a)(7))

Not appropriate or cost effective. Due to the limited amount of rainfall in the District and the fact that some areas of the counties including the cities are not part of the District, it would not be cost effective to participate in a weather modification program. This management goal is not applicable to the operations of the District.

Goal

6.0 Natural Resource Issues. (36.1071(a)(5))

Not appropriate or cost effective. The District has no documented occurrence of endangered or threatened species dependent upon groundwater. Other issues related to resources—air, water, soil, etc. supplied by nature that are useful to life are likewise not documented. The natural resources of the oil and gas industry are regulated by the Railroad Commission on Texas, and are exempt by Chapter 36.117(e). Therefore, this management goal is not applicable to the operations of the District.

Goal

7.0 Control and Prevention of Subsidence. (36.1071(a)(3))

Not appropriate or cost effective. The rigid geologic framework of the region precludes significant subsidence from occurring. This management goal is not applicable to the operations of the District.

Goal

8.0 Desired Future Conditions (DFC's) of the Aquifers. (36.1071(a)(8))

This information is not yet available. GAM runs for the Lipan Aquifer and the Edwards-Trinity Aquifer have been received from the TWDB, but due to the complexity of the aquifers within the District and inconsistencies in the groundwater availability model (GAM) for the Edwards-Trinity (Plateau) Aquifer, as noted in the Executive Summary of both GAM Run 07-32 and 07-37, no DFC's have been determined by the District board of directors. The District is continuing to evaluate the information from the GAM runs along with the information obtained from the research project, "Evaluation of Groundwater Availability, Recharge, and Monitoring System Design", completed for the District by LBG-Guyton in 2005. In addition, the District continues to work with GMA 7, other GCD's, the public and the TWDB to establish DFC's for the aquifers prior to the September 1, 2010 deadline. Therefore, since the DFC's of the aquifers within the District have not yet been established, no estimate of the managed available groundwater is available from the Texas Water Development Board.

DEFINITIONS AND CONCEPTS

“Board” - the Board of Directors of the Lipan-Kickapoo Water Conservation District.

“DFC” - Desired Future Condition of the aquifers.

“District” - the Lipan-Kickapoo Water Conservation District.

“Effective recharge” - the amount of water that enters the aquifer and is available for development

“Groundwater” - means water percolating below the surface of the earth.

“Integrity” - means the preservation of groundwater quality.

“Natural Recourse Issues” - includes groundwater integrity preservation

“Ownership” - pursuant to TWC Chapter 36, §36.002, means the recognition of the rights of the owners of the land pertaining to groundwater.

“Recharge” - the addition of water to an aquifer.

“Surface Water Entity” - TWC Chapter 15 Entities with authority to store, take divert, or supply surface water for use within the boundaries of a district.

“TCEQ” - Texas Commission on Environmental Quality.

“TWDB” - Texas Water Development Board.

"Waste" - as defined by Chapter 36 of the Texas Water Code means any one or more of the following:

(1) withdrawal of groundwater from a groundwater reservoir at a rate and in an amount that causes or threatens to cause intrusion into the reservoir of water unsuitable for agricultural, gardening, domestic, or stock raising purposes;

(2) the flowing or producing of wells from a groundwater reservoir if the water produced is not used for a beneficial purpose;

(3) escape of groundwater from a groundwater reservoir to any other reservoir or geologic strata that does not contain groundwater;

(4) pollution or harmful alteration of groundwater in a groundwater reservoir by saltwater or by other deleterious matter admitted from another stratum or from the surface of the ground;

(5) willfully or negligently causing, suffering, or allowing groundwater to escape into any

river, creek, natural watercourse, depression, lake, reservoir, drain, sewer, street, highway, road, or road ditch, or onto any land other than that of the owner of the well unless such discharge is authorized by permit, rule, or order issued by the commission under Chapter 26;

(6) groundwater pumped for irrigation that escapes as irrigation tailwater onto land other than that of the owner of the well unless permission has been granted by the occupant of the land receiving the discharge; or

(7) for water produced from an artesian well, "waste" has the meaning assigned by Section 11.205.

"Well" - means an artificial excavation that is dug or drilled for the purpose of producing groundwater.

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[10] Table 3.1-1, Lipan Aquifer, Region F, State Water Plan 2007.

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[12] Table 3.1-1, Edwards-Trinity Aquifer, Region F, State Water Plan 2007.

[13] Texas Water Development Board Report 345 - Aquifers of Texas - November 1995, p.21.

[14] Texas Water Development Board Report 345 - Aquifers of Texas - November 1995, p. 37.

[15] Table 3.1-1, Hickory Aquifer, Region F, State Water Plan 2007.

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[17] Concho River & Upper Colorado River Basins Brush Control Feasibility Study, Upper Colorado River Authority, December 2000, p. 9.

[18] North Concho River Watershed Brush Control Planning, Assessment and Feasibility Study, 1998, Upper Colorado River Authority.

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[20] Table 3.2-1, Major Reservoirs in Region F, State Water Plan 2007.

[21] Table 1.3-3, Surface Water Rights by County and Category, Region F, State Water Plan 2007.

[22] Volume 3, 2007 State Water Planning Database, TWDB: 5/1/2008, (http://www.twdb.state.tx.us/DATA/db07/defaultReadOnly.asp).

[23] Table 1, GAM run 08-08, Texas Water Development Board, January-2008.

[24] Table 2, GAM run 08-08, Texas Water Development Board, January-2008.

[25] Combined Table 1 and Table 2, GAM run 08-08, Texas Water Development Board, January-2008.

[26] Table 3.1-1, Groundwater Availability in Region F, State Water Plan 2007.

[27] Table 1, GAM run 08-08, Texas Water Development Board, January-2008.

[28] Historical Irrigation Water Use by County, Texas Water Development Board - Mark Michon, Program Specialist, Texas Water Development Board, March 2008.

[29] Historical Irrigation Water Use by County, Texas Water Development Board - Mark Michon, Program Specialist, Texas Water Development Board, March 2008.

[30] Table 2.3-8, Irrigation Water Demand Projections for Region F Counties, 2007 State Water Plan.

[31] Table 2.3-12, Livestock Water Demand Projections for Region F Counties, 2007 State Water Plan.

[32] Table 2.3-8, Irrigation Water Demand Projections for Region F Counties, 2007 State Water Plan.

[33] Table 2.3-12, Livestock Water Demand Projections for Region F Counties, 2007 State Water Plan.

[34] Table 4.6-1, Counties with Projected Irrigation Needs, Region F, 2007 State Water Plan.

[35] Table 4.6-5, Projected Water Savings with Advanced Irrigation Technologies, Region F, 2007 State Water Plan.

[36] Evaluation of Groundwater Availability, Recharge, and Monitoring System Design, LBG-Guyton Associates, Prepared for the Lipan-Kickapoo Water Conservation District, January 12, 2005.