## South Central Texas Regional Water Planning Area

**Regional Water Plan** 

Volume II — Technical Evaluations of Alternative Regional Water Plans

Prepared by:

#### South Central Texas Regional Water Planning Group

With administration by:

## San Antonio River Authority



With technical assistance by:

HDR Engineering, Inc. Moorhouse Associates, Inc. Open Forum

In association with:

Paul Price Associates, Inc. LBG-Guyton Associates R.J. Brandes Company The Wellspec Company

January 2001

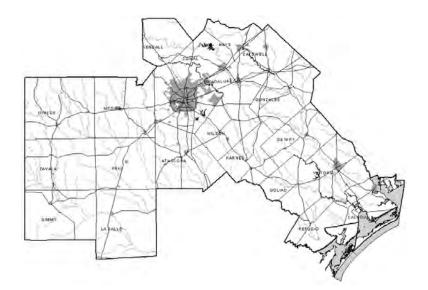
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×	E. Threatened and Endangered Species Related to						
>	Edwards Aquifer F. Application of Consensus Environmental Criteria						

## South Central Texas Region Regional Water Management Alternative Plans

Prepared for

## San Antonio River Authority for

South Central Texas Regional Water Planning Group



Prepared by

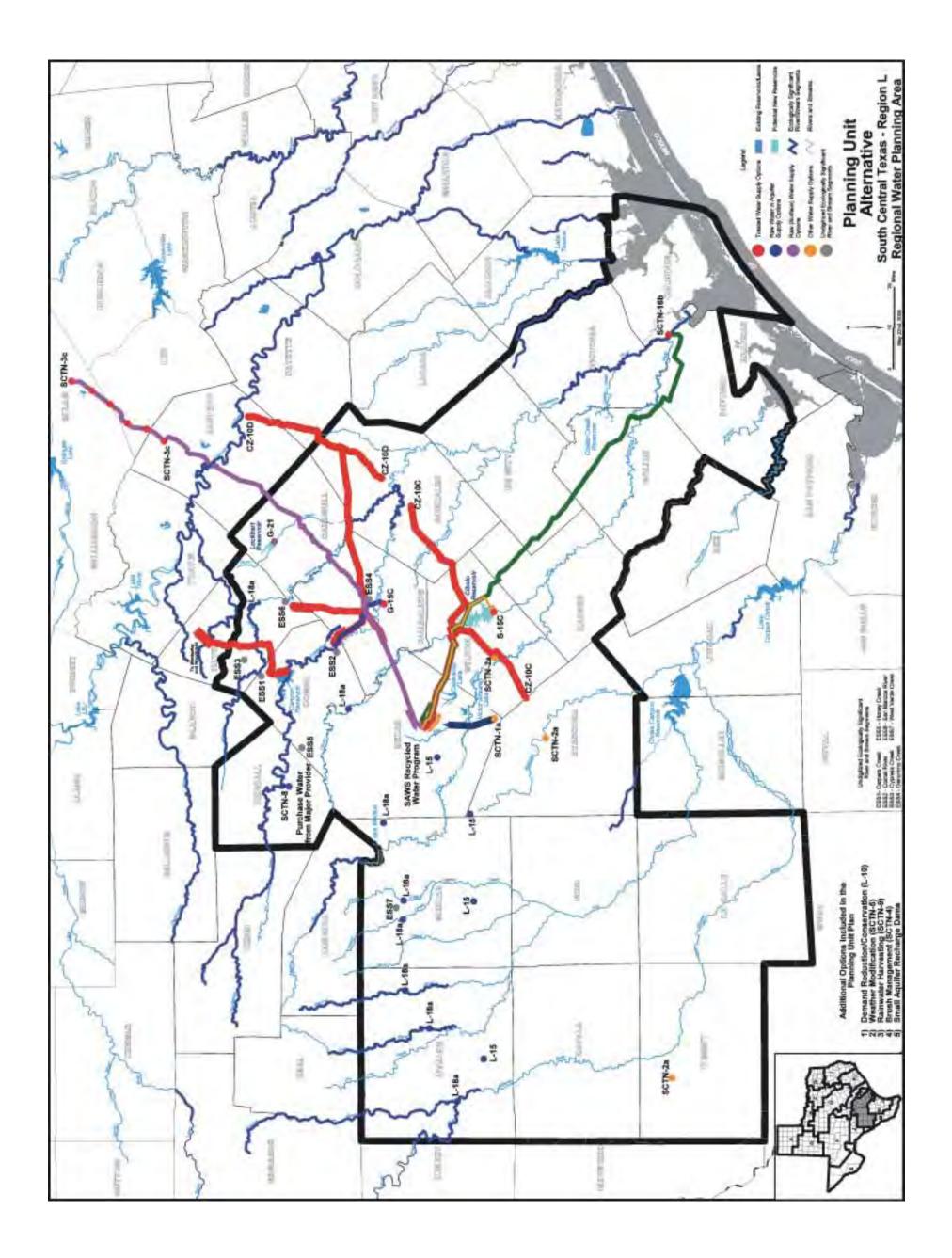


June 13, 2000

## South Central Texas Regional Water Planning Group

San Antonio River Authority

HDR Engineering, Inc. June 13, 2000



#### South Central Texas Region Alternative Water Plans

Alternative Name: Planning Unit Regional Water Management Alternative Plan

#### Alternative ID: PU Approach (PUA)

Alternative Description: The Planning Unit Approach (PUA) includes water management strategies (options) that have been identified by water supply entities as acceptable to meet projected water needs. Major water providers and water supply entities providing documented input into this alternative regional plan included the San Antonio Water System (SAWS), the Bexar Metropolitan Water District (BMWD), the Edwards Aquifer Authority (EAA), the Guadalupe-Blanco River Authority (GBRA), and Canyon Regional Water Authority (CRWA). Also, water plan information provided to the SCTRWPG by other water suppliers of the South Central Texas Water Planning Region was included, as appropriate. From the lists of options/strategies provided by the entities mentioned above, options/strategies were selected for inclusion in this alternative regional plan that would meet the projected needs in a timely manner, and without duplication of options/strategies suggested by others. The PUA options/strategies are organized by county. In cases of projected need where no local entity has identified water management strategies, the nearest available option/strategy of the South Central Texas Regional Water Planning Group (SCTRWPG) were selected for inclusion in the Planning Unit Plan. The following water supply options/strategies are included in the Planning Unit Plan (in no particular order):

- 1. Demand Reduction / Conservation (L-10)
- 2. Edwards Irrigation Transfers (L-15)
- 3. Regional Aquifer Storage & Recovery (SCTN-1a)
- 4. Edwards Recharge Type 2 Projects (L-18a)
- 5. Simsboro Aquifer (SCTN-3c)
- 6. Carrizo Aquifer Wilson and Gonzales Counties (CZ-10C)
- 7. Carrizo Aquifer Gonzales and Bastrop Counties (CZ-10D)
- 8. Carrizo Aquifer Bexar County (BMWD)
- 9. Lower Guadalupe River Diversions (SCTN-16b)
- 10. Cibolo Reservoir (S-15C)
- 11. Carrizo Aquifer Local Supply (SCTN-2a)
- 12. Trinity Aquifer Bexar County (BMWD)
- 13. Canyon Reservoir (G-15C)
- 14. SAWS Recycled Water Program
- 15. Wimberley and Woodcreek Canyon (G-24)
- 16. Lockhart Reservoir (G-21)
- 17. Trinity Aquifer Optimization (SCTN-8)
- 18. Rainwater Harvesting (SCTN-9)
- 19. Weather Modification (SCTN-5)
- 20. Brush Management (SCTN-4)

#### Planning Unit Alternative Regional Water Plan Summary of Key Information for South Central Texas Regional Water Planning Group

Quantity, Reliability, and Cost

- Plan includes management supplies to meet projected needs, ensure reliability, and maintain springflow, resulting in a quantity of additional water supplies sufficient to meet projected needs for municipal, industrial, steam-electric power, and mining uses through the year 2050.
- Cost is greater than the average for the five alternative plans under consideration.

**Environmental Factors** 

- Increased median annual streamflows in the San Antonio River.
- Most concerns with Endangered & Threatened Species, Vegetation & Wildlife Habitat, and Water Quality & Aquatic Habitat among the five alternative plans under consideration.

Impacts on Water Resources

- No unmitigated reductions in water available to existing water rights.
- Long-term reductions in water levels in the Carrizo Aquifer. Drawdown would be greater than the average for the five alternative plans under consideration.

Impacts on Agriculture and Natural Resources

- Major commitment to municipal and irrigation water Demand Reduction (Conservation) (L-10).
- Includes Brush Management (SCTN-4) and Weather Modification (SCTN-5).
- Inclusion of water supply options to meet projected irrigation needs in full is estimated to be economically infeasible at this time. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching).
- Includes maximum potential voluntary transfer of Edwards Aquifer irrigation permits to municipal permits through lease or purchase.

Other Relevant Factors per SCTRWPG

Comparison of Strategies to Meet Needs

• Selection of water supply options comprising the alternative plan based on preferences expressed by planning units or on closest available supply.

Interbasin Transfer Issues

- Projected non-irrigation needs in basin(s) of origin are met throughout the planning period.
- Plan includes only one potential interbasin transfer from the Saltwater Barrier at the confluence of the Guadalupe and San Antonio Rivers (SCTN-16b) to Bexar County.

Third-Party Impacts of Voluntary Redistribution of Water

- Potential positive or negative effects of Edwards Irrigation Transfers (L-15).
- Lower water levels in some portions of the Carrizo Aquifer.

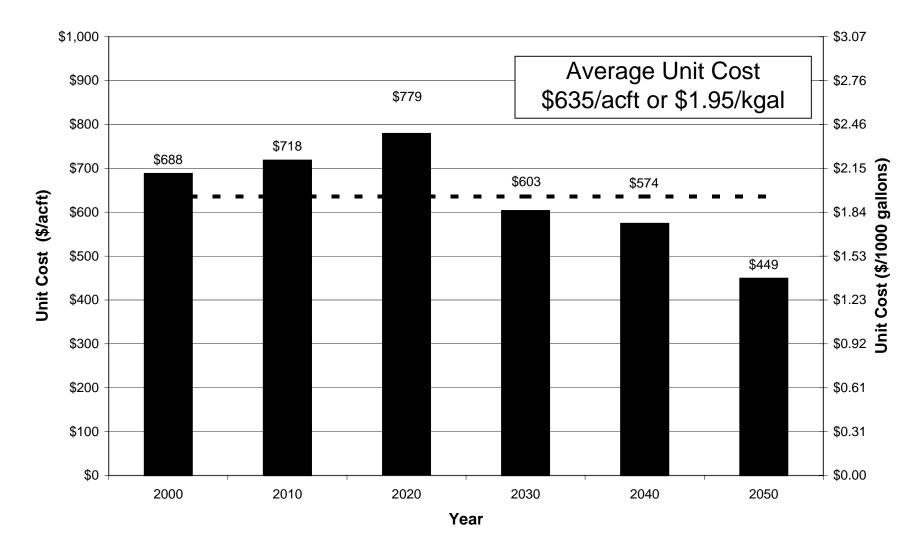
Regional Efficiency

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Terminal storage and regional water treatment facilities in Bexar County increase efficiency, improve reliability, and reduce unit cost.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.
- Consider reduced storage capacity for Cibolo Reservoir or include diversions from the San Antonio River to increase supply and moderate unit cost.

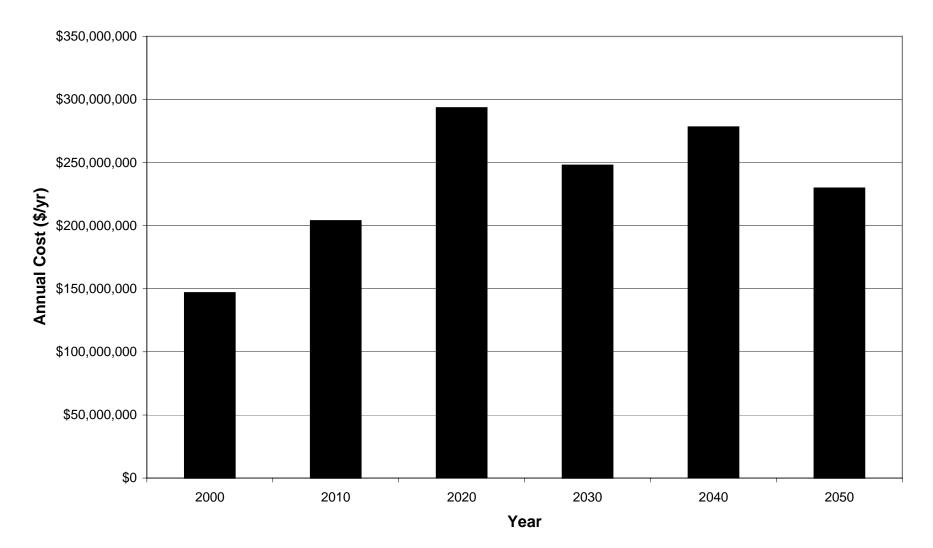
Effect on Navigation

• Not applicable.

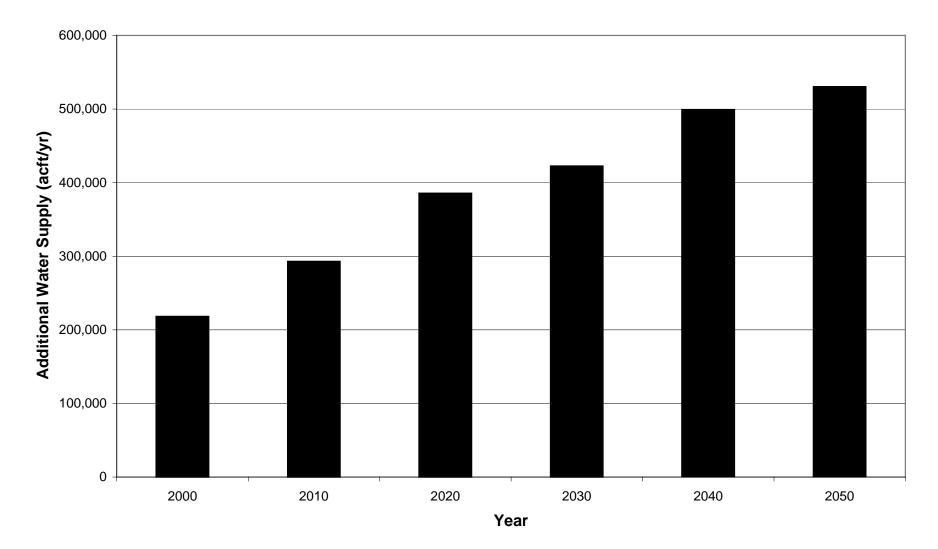
Planning Unit Alternative Regional Water Plan Unit Cost of Cumulative Additional Water Supply



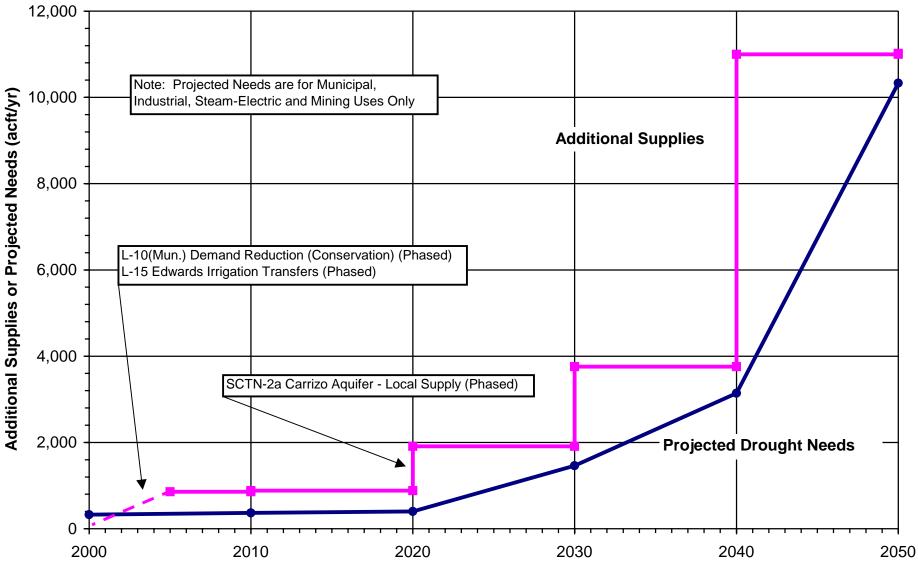
#### Planning Unit Alternative Regional Water Plan Annual Cost of Cumulative Additional Water Supply



#### Planning Unit Alternative Regional Water Plan Cumulative Additional Water Supply



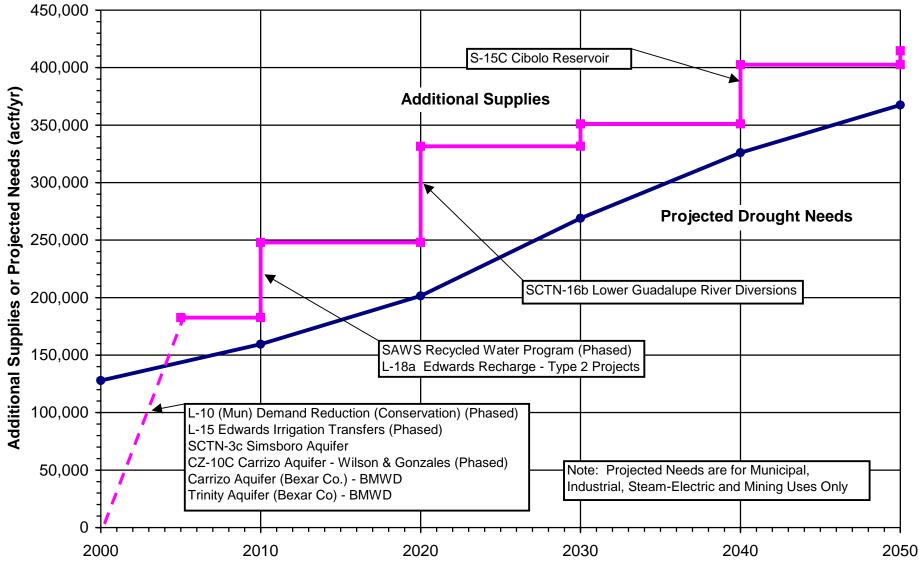
## Planning Unit Alternative Regional Water Plan Atascosa County



Year

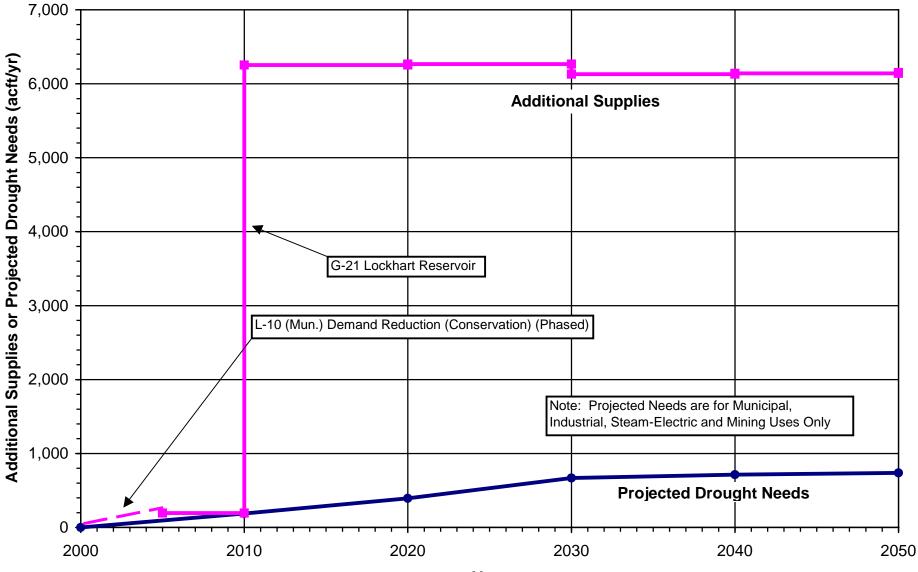
South Cer	ntral Texas Region					С	ounty =	Atascosa	3	
		Vater Supply	<b>Options</b>					all		
,		,	•				1 ( )			
	ty Summary of Projected Water Needs and Water Supply Options         User Group(s)         all           ted Water Needs (acft/yr)         2000         2010         2020         2030         2040         20           Municipal         325         366         401         468         530         0           Industrial         0         16/3         31/3         11         11         11         13/4         11         14/4         31/4         11         11         16/3         31/4         11         11         11/4         11         11/4         11         11/4         11         11/4         11         11/4         11/4         11/4         11/4<									
	1.,		2000	2010	2020	2030		2050	Notes	
	Municipal		325	366	401	468	530	587		
	Industrial		0	0	0	0	0	0		
	Steam-Electric		0	0	0	0	1,504	8,504		
	Mining		-	-	v	000				
	Irrigation		38,418	36,718	35,170	43,726	42,190	40,713		
			38,743	37,084	35,571		- ]	- /		
					401			10,330		
	Irrigation Needs		38,418	36,718	35,170	43,726	42,190	40,713		
Water Sup	nly Options (asttyr)	Condidate								
ID#			2000*	2010	2020	2030	2040	2050	Notes	
		New Supply							Notes	
L-15		81 000							2, 3,	
SCTN-2a		01,000		000	000				2, 0,	
SCTN-4										
SCTN-5										
SCTN-9	5									
1 10 (1== )			2 002	2 002	2 002	2,000	2 000	2,002		
L-10 (Irr.)			,	,	1			,		
	I otal New Supplies		4,548	4,576	4,603	5,451	7,692	14,711		
	Total System Mgmt. Supply / Deficit		-34,195	-32,508	-30,968	-39,738	-37,641	-36,332		
Mur							857			
	Irrigation System Mgmt. Supply / Deficit		-34,726	-33,026	-31,478	-40,034	-38,498	-37,021		
Notes:										
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	entation bu	t will not be	available ir	nmediatelv			
1										
2						may not be	reliable in (	drought		
3										
-										
4					prototou					
5		Mining use.								
6			sure sufficier	nt supply di	irina droual	ht.				
*								مغنقت ما		
7	Oblight expected to provide additional water suborv	in many years	but debenna	IDIE SUDDIV	aurina arou	iant is prese	entiv undua	ntinea.		
7 8										

## Planning Unit Alternative Regional Water Plan Bexar County



South Ce	entral Texas Region					Co	ounty =	Bexar			
County S	ummary of Projected Water Needs and W	Vater Supply	Options			User Gro	up(s) =	all			
oounty o		rator ouppiy	optione			0001 010	ap(0) =	un			
Projected	Water Needs (acft/yr)										
Fiojecieu	User Group(s)		2000	2010	2020	2030	2040	2050	Notos		
	,								Notes		
	Municipal		122,867	154,495	196,301	262,070	315,633				
	Industrial		0	0	0	1,430	4,759				
	Steam-Electric		0	0	0	-	0	-			
	Mining		4,963	4,936	5,201	5,406	5,645				
	Irrigation		22,575	20,374	19,585	19,015	18,385				
	Total Needs		150,405	179,805	221,087	287,921	344,422				
	Mun, Ind, S-E, & Min Needs		127,830	159,431	201,502	268,906	326,037	,			
	Irrigation Needs		22,575	20,374	19,585	19,015	18,385	17,368			
Matan Our	ante Ontinun (nafthar)										
	oply Options (acft/yr)	Candidate									
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes		
L-10 (Mun.)			33,528	42,509	41,210	36,533	38,834				
L-15	Edwards Irrigation Transfers	81,000	50,000	55,000	60,000	65,000	70,000	,	2,		
SCTN-3c	Simsboro Aquifer	55,000	55,000	55,000	55,000	55,000	55,000	/			
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	75,000	40,000	50,000	60,000	70,000	75,000		4,		
	Carrizo Aquifer (Bexar Co.) - BMWD	3,000	3,000	3,000	3,000	3,000	3,000				
	Trinity Aquifer (Bexar Co) - BMWD	1,000	1,000	1,000	1,000	1,000	1,000				
	SAWS Recycled Water Program			19,826	26,737	35,824	43,561		7,		
L-18a	Edwards Recharge - Type 2 Projects	21,577		21,577	21,577	21,577	21,577				
SCTN-16b	Lower Guadalupe River Diversions	63,177			63,177	63,177	63,177	,			
S-15C	Cibolo Reservoir	31,500					31,500	31,500			
SCTN-1a	Aquifer Storage & Recovery - Regional										
SCTN-4	Brush Management								1		
SCTN-5	Weather Modification								1		
SCTN-9	Rainwater Harvesting								1		
	Small Aquifer Recharge Dams								1		
L-10 (Irr.)	Demand Reduction (Conservation)		4,521	4,521	4,521	4,521	4,521		1		
	Total New Supplies		187,049	252,433	336,222	355,632	407,170	419,224			
	Total System Mgmt. Supply / Deficit		36,644 54.698	72,628	115,135 130,199	67,711 82.205	62,748				
IVIL	In, Ind, S-E, & Min System Mgmt. Supply / Deficit Irrigation System Mgmt. Supply / Deficit		-18,054	88,481 -15,853	-15,064	-14,494	76,612	, -			
	Irrigation System Mgmt. Supply / Dencit		-18,054	-15,853	-15,064	-14,494	-13,804	-12,847			
Notes:											
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	ority impleme	antation but	will not be	available in	mediately				
1	Demand Reduction (Conservation) strategies assu						integratery				
2	Candidate New Supply to be shared among Uvalde					may not be	reliable in (	drought			
~											
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of the estimated maximum potential annual transfer (95,430 acft) based on Proposed Permits prorated to 400,000 acft/yr.										
3	the estimated maximum notential annual transfer (										
		55,450 acity bas		1							
4	Effects on regional aquifer levels to be quantified.			om of 1/31/2	000						
4	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM	WD in Water St			000.						
3 4 5 6 7	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM Non-interruptible supplies identified by BMWD in W	WD in Water So Ater Supply Pro	ogram of 1/3	1/2000.		mated needs	3				
4 5 6 7	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM Non-interruptible supplies identified by BMWD in W Current SAWS Recycled Water Program is include	WD in Water Su /ater Supply Pro ed in the 24,941	ogram of 1/3 acft/yr (cons	1/2000. sumptive reu	use) in esti			and			
4 5 6 7 3	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM Non-interruptible supplies identified by BMWD in W Current SAWS Recycled Water Program is include Future use of recycled water for non-potable uses	WD in Water Su Vater Supply Pro ed in the 24,941 and based on go	ogram of 1/3 acft/yr (cons oal of meetir	1/2000. sumptive reung 20 percer	use) in esti nt of SAWS	S projected v	vater dema				
4 5 6 7 8 9	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM Non-interruptible supplies identified by BMWD in W Current SAWS Recycled Water Program is include Future use of recycled water for non-potable uses SAWS ASR program in southern Bexar County inc	WD in Water So /ater Supply Pro ad in the 24,941 and based on go reases reliability	ogram of 1/3 acft/yr (cons oal of meetir of Edwards	1/2000. sumptive reung 20 percers Aquifer sup	use) in esti nt of SAWS oply and re	S projected v duces seaso	vater dema onal aquife	r demands.			
4 5 6 7	Effects on regional aquifer levels to be quantified. Includes non-interruptible supplies identified by BM Non-interruptible supplies identified by BMWD in W Current SAWS Recycled Water Program is include Future use of recycled water for non-potable uses	WD in Water So /ater Supply Pro- ed in the 24,941 and based on go preases reliability in many years,	ogram of 1/3 acft/yr (cons oal of meetir of Edwards but dependa	1/2000. sumptive reung 20 percers Aquifer sup able supply of	use) in esting the of SAWS oply and re during drou	S projected v duces seaso ight is prese	vater dema onal aquife ntly unqua	r demands. ntified.			

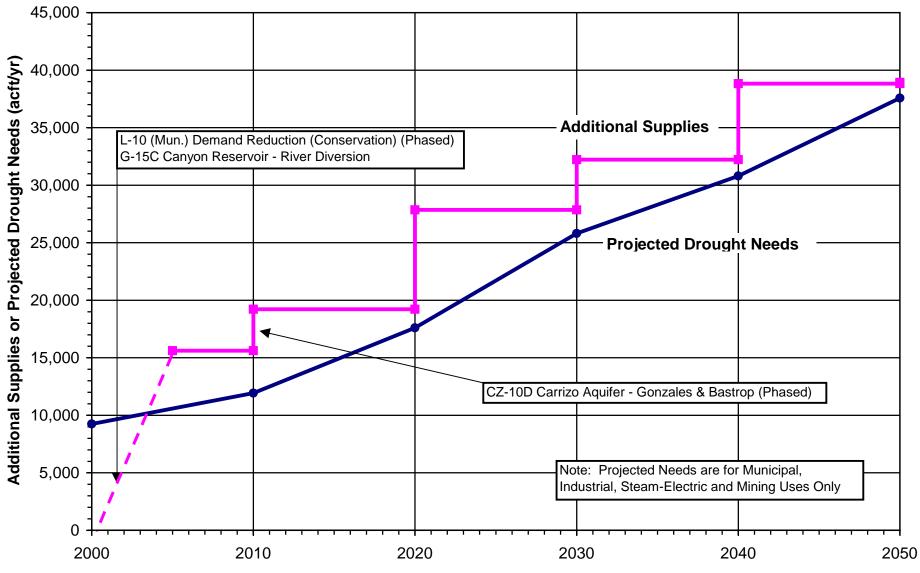
## Planning Unit Alternative Regional Water Plan Caldwell County



Year

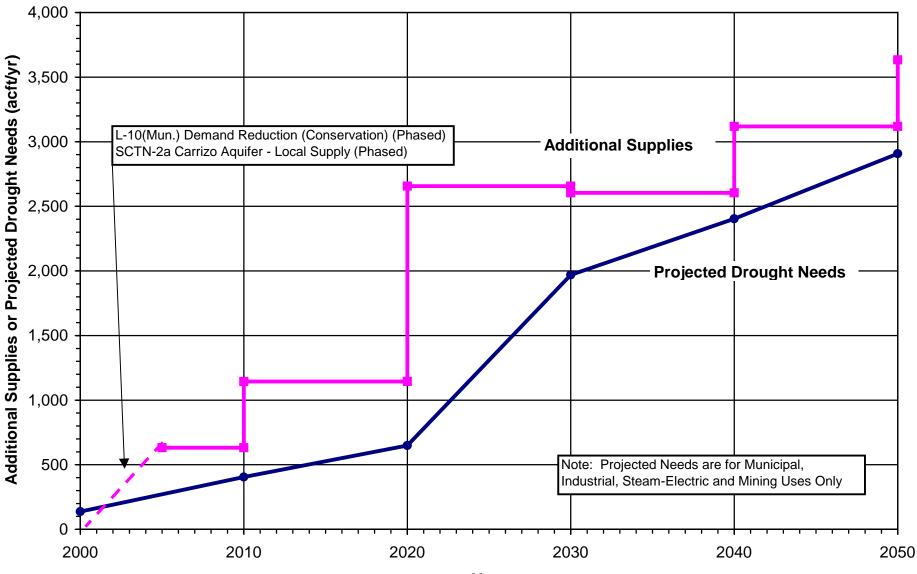
South Ce	ntral Texas Region					Co	ounty =	Caldwell	
County S	ummary of Projected Water Needs and W	ater Supply	Options			User Gro	up(s) =	all	
Projected	Water Needs (acft/yr)								
Fiojecieu	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	188	393	668	714		Notes
	Industrial		0	0	0	000	0	-	
	Steam-Electric		0	0	0	0	0	•	
	Mining		0	0	0	0	0	-	
	Irrigation		0	0	0	0	0	0	
	Total Needs		0	188	393	668	714	737	
	Mun, Ind, S-E, & Min Needs		0	188	393	668	714		
	Irrigation Needs		0	0	0	0	0	0	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		195	206	218	82	93	104	
G-21	Lockhart Reservoir			6,048	6,048	6,048	6,048	6,048	
<u> </u>									
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
<u> </u>	Total New Supplies		105	6,254	6,266	6 4 2 0	6 4 4 4	6 450	
	l otal New Supplies		195	0,204	0,200	6,130	6,141	6,152	
	Total System Mgmt. Supply / Deficit		195	6,066	5,873	5,462	5,427	5,415	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		195	6,066	5,873	5,462	5,427	5,415	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0,1_1		
				5					
Notes:									
1	Demand Reduction (Conservation) strategies assu		ected in proje	ected water	demands.				
2	Water supply for City of Lockhart and/or other users								
3	Option expected to provide additional water supply	in many years, t	out dependa	ble supply o	during drou	ght is prese	ntly unqua	ntified.	

Planning Unit Alternative Regional Water Plan Comal County



South Cer	ntral Texas Region					Co	ounty =	Comal	
	ummary of Projected Water Needs and W	ater Supply	Options			User Gro		all	
								,	
Projected \	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,289	5,049	10,487	18,282	25,205	33,062	
	Industrial		1,388	1,425	1,486	1,737	2,009	2,289	
	Steam-Electric		0	0	0	-	0	-	
	Mining		5,570	5,464	5,628	,	3,590	,	
	Irrigation		30	14	0	0	0	÷	
	Total Needs		9,277	11,952	17,601	25,815	30,804		
	Mun, Ind, S-E, & Min Needs		9,247	11,938	17,601	25,815	30,804	37,575	
	Irrigation Needs		30	14	0	0	0	0	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)	new ouppiy	616	718	848		824		1
G-15C	Canyon Reservoir - River Diversion	15,000	15,000	15,000	15,000	-	15,000	-	
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	90,000	13,000	13,000	3,500		16,500		3, 4, 5
	Small Aquifer Recharge Dams								6
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		15,616	15,718	19,348	27,718	32,324	38,942	
	Total System Mgmt. Supply / Deficit		6,339	3,766	1,747	1,903	1,520	1,367	
M.,	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		6,369	3,760	1,747	1,903	1,520	,	
IVIU	Irrigation System Mgmt. Supply / Deficit		-30	-14	1,747		1,520		
	inigation cystem ingint. cappiy / Benot		00	1-1	•	v	0	Ū	
Notes:									
*	Candidate New Supplies shown for year 2000 are i					e available in	nmediately		
1	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Portion of Canyon firm yield (with amendment) diverted below Seguin.								
3	Candidate New Supply to be shared among Comal, Guadalupe, and Hays Counties. Effects on regional aquifer levels to be quantified.								
4	Portion of 90,000 acft/yr available from northern Gonzales and southern Bastrop Counties under CZ-10D.								
5	Early implementation of facilities assumed in cost e								
6	Option expected to provide additional water supply	in many years, b	out dependa	able supply o	during drou	ight is prese	ntly unqua	ntified.	

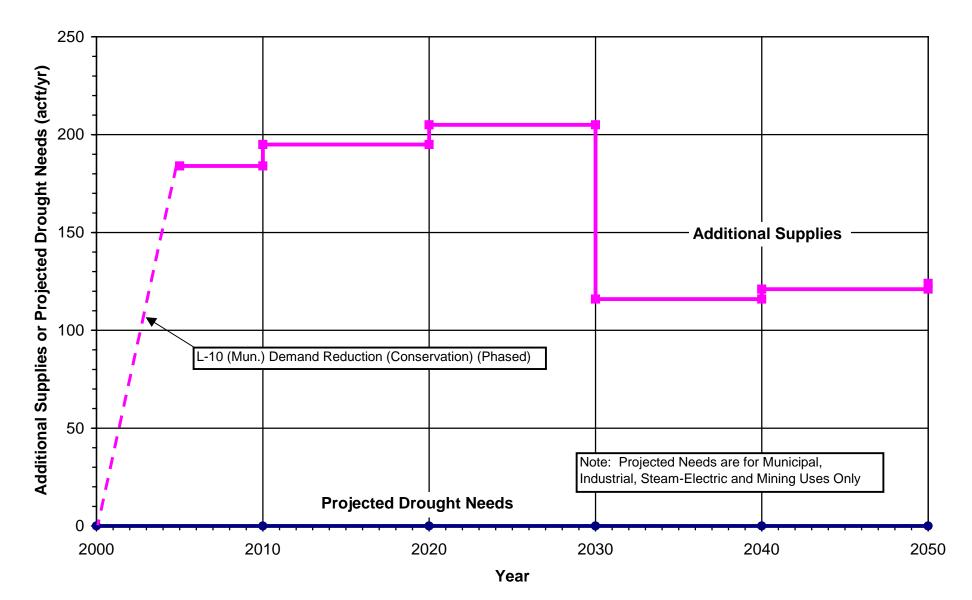
## Planning Unit Alternative Regional Water Plan Dimmit County



Year

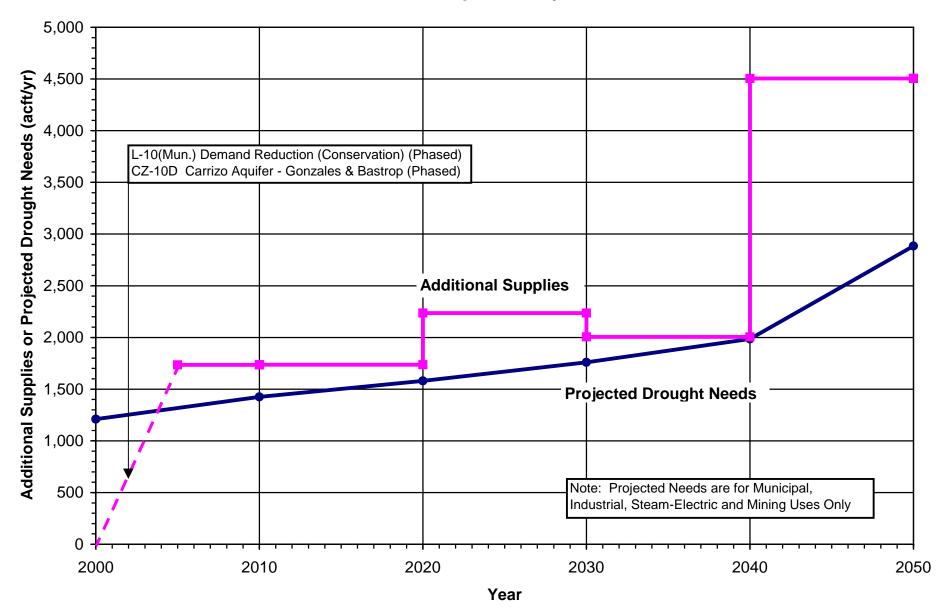
South Ce	ntral Texas Region					Co	ounty =	Dimmit	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
,		,					1 ( )		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		138	405	649	1,054	1,479	1,959	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	915	925	949	
	Irrigation		0	0	0	2,133	1,737	1,331	
	Total Needs		138	405	649	4,102	4,141	4,239	
	Mun, Ind, S-E, & Min Needs		138	405	649	1,969	2,404	2,908	
	Irrigation Needs		0	0	0	2,133	1,737	1,331	
								,	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		131	144	156	104	118	133	1
SCTN-2a	Carrizo Aquifer - Local Supply		500	1,000	1,000	2,500	3,000	3,500	2, 3
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
	Total System Mgmt. Supply / Deficit		493	739	507	-1,498	-1,023	-606	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	635	714		
	Irrigation System Mgmt. Supply / Deficit		0	0	0	-2,133	-1,737	-1,331	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	ntation but	will not be	available im	mediately		
1	Demand Reduction (Conservation) strategies assu						inculatory		
2	Additional well(s) for Carrizo Springs and Mining su				aomanas.				
3	Early implementation of facilities assumed in cost e		sure sufficien	nt supply du	rina drouab	ıt			
4	Option expected to provide additional water supply						ntly unqua	ntified	

## Planning Unit Alternative Regional Water Plan Frio County



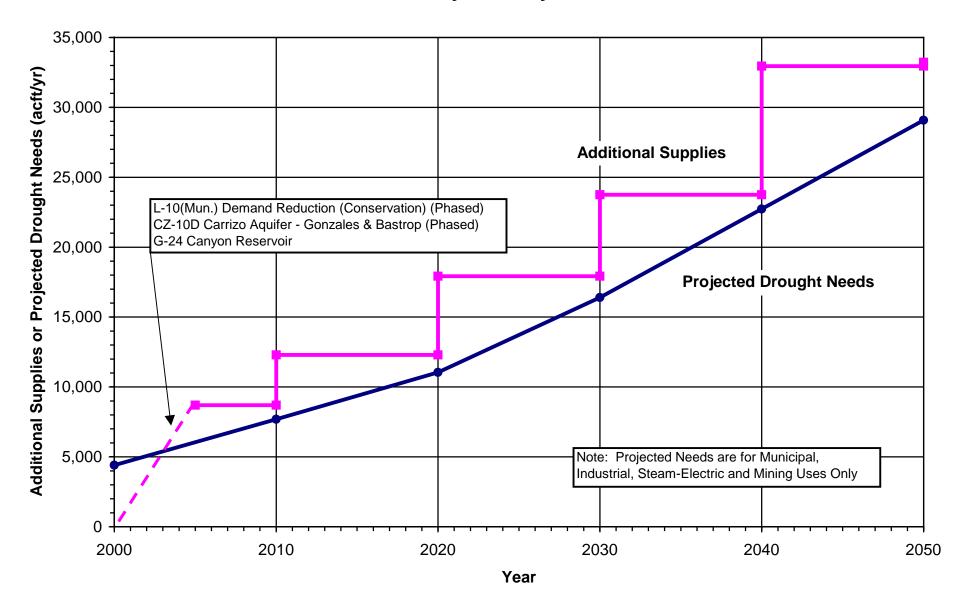
South Ce	ntral Texas Region					Co	ounty =	Frio	
		ater Supply	Options			User Gro	up(s) =	all	
Municipal         Dot         O <tho< th="">         O         <tho< th=""><th></th></tho<></tho<>									
						2030			Notes
					0	-	0		
	Industrial		0	0	0	0	0	0	
	Steam-Electric		-	0	0	0	0	0	
	Mining		v	0	0	0	v	0	
	Irrigation		71,126	67,646	64,365	76,505	73,519	70,662	
	Total Needs		71,126	67,646	64,365	76,505	73,519	70,662	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		71,126	67,646	64,365	76,505	73,519	70,662	
		New Supply	2000	2010	2020	2030	2040		Notes
L-10 (Mun.)			184	195	205	116	121	124	
SCTN-4	Brush Management								
	Rainwater Harvesting								
L-10 (Irr.)			5,947	5,947	5,947	5,947	5,947	5,947	:
	Total New Supplies		6,131	6,142	6,152	6,063	6,068	6,071	
	Total System Mant Sumply / Deficit		64 005	64 504	50 040	70 440	67 464	64 504	
R.4	I otal System Wight. Supply / Deficit		,						
MU			-						
	inigation System Mgmt. Supply / Delicit		-03,179	-01,039	-30,410	-10,330	-01,JIZ	-04,713	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proje	ected water	demands				
2						nht is nrese	ntly unquant	ified	
3									
<b>.</b>	application rate.	percent of acle	ages inigate	an 1997, W			POIDOIR OF I	nganon	

## Planning Unit Alternative Regional Water Plan Guadalupe County



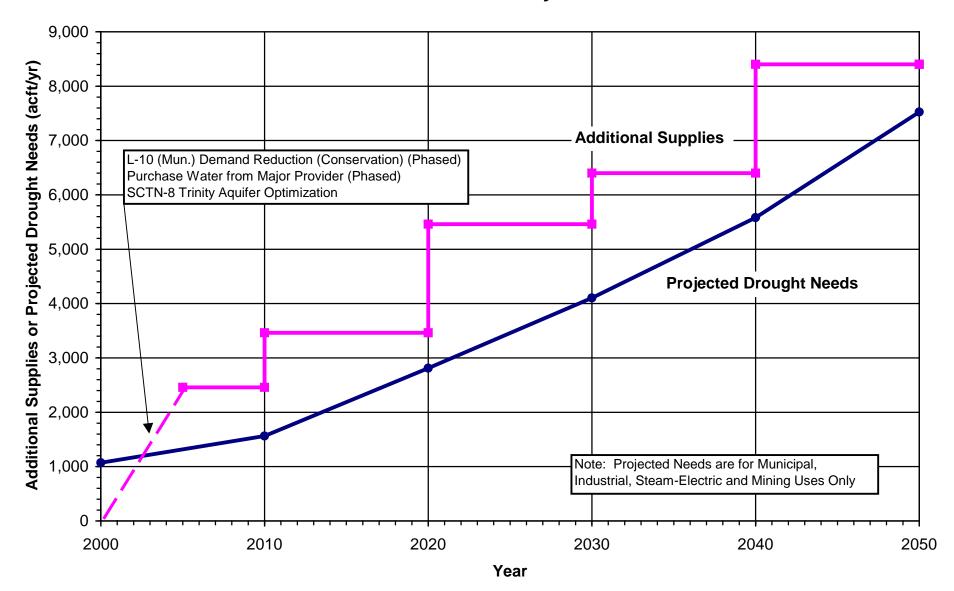
South Ce	entral Texas Region					Co	ounty =	Guadalu	be
	User Group(s)       User Group(s) = i         jected Water Needs (acft/yr)       User Group(s)       2000       2010       2020       2030       2040         Municipal       29       23       30       71       87         Industrial       985       1,204       1,350       1,487       1,692         Steam-Electric       0       0       0       0       0         Mining       196       198       200       2022       207         Irrigation       985       879       779       684       594         Mun, Ind, S-E, & Min Needs       1,210       1,425       1,580       1,760       1,986         er Supply Options (acft/yr)       Candidate       985       879       779       684       594         Description       New Supply       2000*       2010       2020       2030       2040         (Mun.)       Demand Reduction (Conservation)       235       236       236       5       5				all				
Projected	Water Needs (acft/ur)								
Fiojecieu			2000	2010	2020	2030	2040	2050	Notes
									Notes
							-	1,899	
					1,000		,	,	
			-	•	200	J	•	213	
						_	-	508	
					-				
		-							
ID#		New Supply				2030	2040	2050	Notes
							-	-	1
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	90,000	1,500	1,500	2,000	2,000	2,500	4,500	2, 3, 4
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		1,735	1,736	2,236	2,005	2,505	4,506	
	Total System Mgmt. Supply / Deficit		-460	-568	-123	-439	-75	1.113	
Mu	Ind, S-E, & Min System Mgmt. Supply / Deficit		525	311	656	245	519	, -	
inc	Irrigation System Mgmt. Supply / Deficit		-985	-879	-779	-684	-594	,-	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prid	rity impleme	entation, but	t will not be	available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Candidate New Supply to be shared among Comal					nal aquifer l	evels to be	quantified.	
3	Portion of 90,000 acft/yr available from northern Go							,	
4	Early implementation of facilities assumed in cost e								
5	Option expected to provide additional water supply						ntly unqua	ntified.	

## Planning Unit Alternative Regional Water Plan Hays County



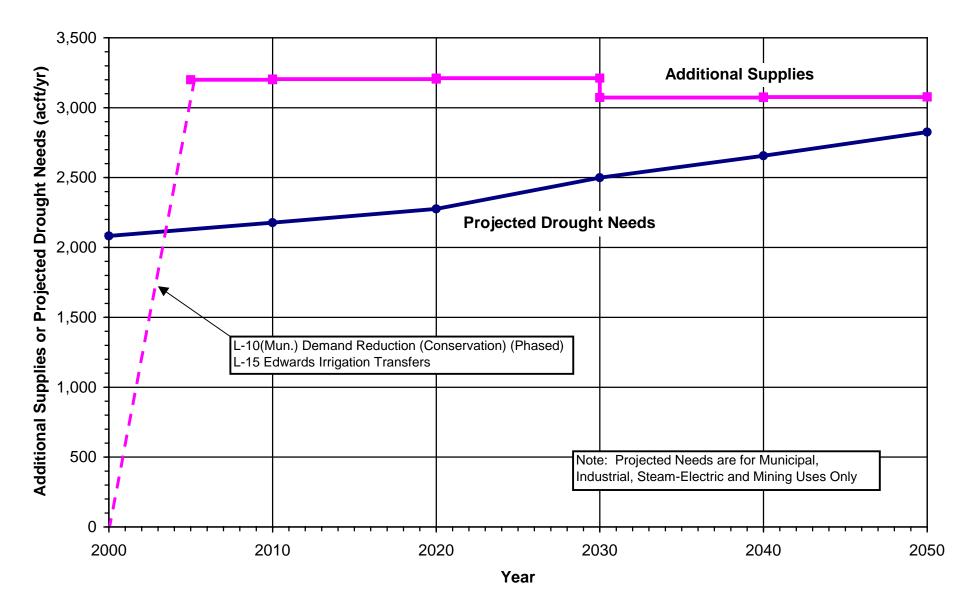
entral Texas Region					Co	ounty =	Hays	
	Vater Supply	/ Options					-	
User Group(s)		2000	2010	2020	2030	2040	2050	Notes
Municipal		4,325	7,609	10,980	16,349	22,696	29,059	
Industrial		0	0	0	0	0	0	
Steam-Electric		0	0	0	0	0	0	
Mining		84	82	68	55	37	28	
Irrigation		0	0	0	0	0	0	
Total Needs		4,409	7,691	11,048	16,404	22,733	29,087	
Mun, Ind, S-E, & Min Needs		4,409	7,691	11,048	16,404	22,733	29,087	
Irrigation Needs		0	0	0	0	0	0	
oply Options (acft/yr)	Candidate							
Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
Demand Reduction (Conservation)		647	747	873	699	906	1,174	1
Carrizo Aquifer - Gonzales & Bastrop	90,000	4,000	7,000	10,500	16,000	22,000	31,000	2, 3, 4
Canyon Reservoir	1,048	1,048	1,048	1,048			1,048	5
Small Aquifer Recharge Dams								6
Demand Reduction (Conservation)								
Total New Supplies		5,695	8,795	12,421	17,747	23,954	33,222	
		,	,		,	,	,	
		,		,		,	,	
Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Condidate New Supplies about for year 2000 are i	deptified for price	rity impland	natation but	huill not ho		madiatalu		
Early implementation of facilities assumed in cost e								
Candidate New Supply for Wimberley and Woodcre			ni suppiy uu	ining urougi	n.			
	ummary of Projected Water Needs and V Water Needs (acft/yr) User Group(s) Municipal Industrial Steam-Electric Mining Irrigation Total Needs Mun, Ind, S-E, & Min Needs Irrigation Needs Oply Options (acft/yr) Description Demand Reduction (Conservation) Carrizo Aquifer - Gonzales & Bastrop Canyon Reservoir Canyon Reservoir Small Aquifer Recharge Dams Demand Reduction (Conservation) Carrizo Aquifer Recharge Dams Demand Reduction (Conservation) Total New Supplies Total System Mgmt. Supply / Deficit Irrigation System Mgmt. Supply / Deficit Candidate New Supplies shown for year 2000 are i Demand Reduction (Conservation) strategies assu Candidate New Supply to be shared among Comal Portion of 90,000 acft/yr available from northern Go	ummary of Projected Water Needs and Water Supply         Water Needs (acft/yr)         User Group(s)         Municipal         Industrial         Steam-Electric         Mining         Irrigation         Total Needs         Mun, Ind, S-E, & Min Needs         Irrigation Needs         Ply Options (acft/yr)         Candidate         Description         New Supply         Demand Reduction (Conservation)         Carrizo Aquifer - Gonzales & Bastrop         90,000         Canyon Reservoir         1,048         Small Aquifer Recharge Dams         Demand Reduction (Conservation)         Small Aquifer Recharge Dams         Demand Reduction (Conservation)         Candidate New Supplies         Total New Supplies         Total System Mgmt. Supply / Deficit         Irrigation System Mgmt. Supply / Deficit         Candidate New Supplies shown for year 2000 are identified for price         Candidate New Supplies shown for year 2000 are identified for price         Candidate New Supply to be shared among Comal, Guadalupe, an         Portion of 90,000 acft/yr available from northern Gonzales and sou	ummary of Projected Water Needs and Water Supply Options         Water Needs (acft/yr)       2000         Municipal       4,325         Industrial       0         Steam-Electric       0         Mining       84         Irrigation       0         Mun, Ind, S-E, & Min Needs       4,409         Mun, Ind, S-E, & Min Needs       4,409         Mun, Ind, S-E, & Min Needs       0         ply Options (acft/yr)       Candidate         Description       New Supply         Demand Reduction (Conservation)       647         Carrizo Aquifer - Gonzales & Bastrop       90,000         Canyon Reservoir       1,048         Small Aquifer Recharge Dams       0         Demand Reduction (Conservation)       0         Small Aquifer Recharge Dams       0         Demand Reduction (Conservation)       1,048         Small Aquifer Recharge Dams       0         Demand Reduction (Conservation)       1         Carlio System Mgmt. Supply / Deficit       1,286         n, Ind, S-E, & Min System Mgmt. Supply / Deficit       1,286         nrigation System Mgmt. Supply / Deficit       1,286         Irrigation System Mgmt. Supply / Deficit       0         Candidate New Su	ummary of Projected Water Needs and Water Supply Options           Water Needs (acft/yr)         2000         2010           Municipal         4,325         7,609           Industrial         0         0           Steam-Electric         0         0           Municipal         844         82           Irrigation         0         0           Mun, Ind, S-E, & Min Needs         4,409         7,691           Irrigation         0         0         0           Oply Options (acft/yr)         Candidate         0         0           Demand Reduction (Conservation)         647         747           Carrizo Aquifer - Gonzales & Bastrop         90,000         4,000         7,000           Canyon Reservoir         1,048         1,048         1,048           Small Aquifer Recharge Dams	ummary of Projected Water Needs and Water Supply Options         Water Needs (acft/yr)       2000       2010       2020         User Group(s)       2000       2010       2020         Municipal       4,325       7,609       10,980         Industrial       0       0       0       0         Steam-Electric       0       0       0       0         Mining       84       82       68         Irrigation       0       0       0       0         Mun, Ind, S-E, & Min Needs       4,409       7,691       11,048         Mun, Ind, S-E, & Min Needs       4,409       7,691       11,048         Irrigation       0       0       0       0         Description       New Supply       2000*       2010       2020         Demand Reduction (Conservation)       647       747       873         Carrizo Aquifer - Gonzales & Bastrop       90,000       4,000       7,000       10,500         Canyon Reservoir       1,048       1,048       1,048       1,048         Municipal       Municipal       1,048       1,048       1,048         Mayon Reservoir       1,048       1,048       1,041       1,373	ummary of Projected Water Needs and Water Supply Options         User Gro           Water Needs (acft/yr)         2000         2010         2020         2030           Municipal         4,325         7,609         10,980         16,349           Industrial         0         0         0         0         0           Steam-Electric         0         0         0         0         0         0           Mining         84         82         68         55         55         57,691         11,048         16,404           Mun, Ind, S-E, & Min Needs         4,409         7,691         11,048         16,404           Mun, Ind, S-E, & Min Needs         4,409         7,691         11,048         16,404           Irrigation         0         0         0         0         0         0           Description         New Supply         2000*         2010         2020         2030           Carrizo Aquifer - Gonzales & Bastrop         90,000         4,000         7,000         10,500         16,000           Canyon Reservoir         1,048         1,048         1,048         1,048         1,048         1,048         1,048         1,048         1,048         1,048         1	ummary of Projected Water Needs and Water Supply Options         User Group(s)         User Group(s)         User Group(s)         2000         2010         2020         2030         2040           Municipal         4,325         7,609         10,980         16,349         22,696           Industrial         0<	ummary of Projected Water Needs and Water Supply Options         User Group(s)         all           Water Needs (acft/yr)         2000         2010         2020         2030         2040         2050           Municipal Industrial         4.325         7.609         10.980         16.349         22.696         29.059           Municipal Industrial         0

## Planning Unit Alternative Regional Water Plan Kendall County



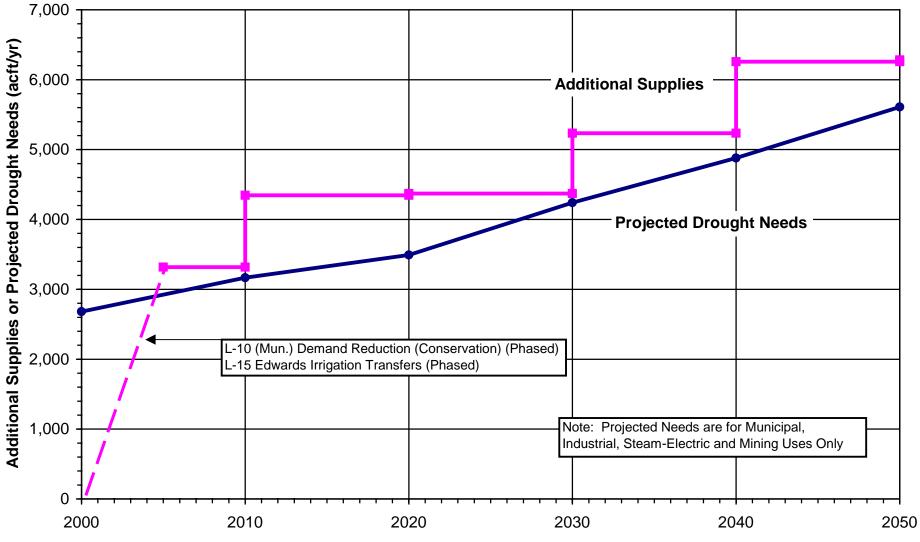
South Ce	entral Texas Region					Co	ounty =	Kendall	
	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
		, in the second s					-1(-)		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		1,070	1,560	2,808	4,099	5,578	7,518	
	Industrial		2	3	4	4	5	6	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		1,072	1,563	2,812		5,583	7,524	
	Mun, Ind, S-E, & Min Needs		1,072	1,563	2,812	4,103	5,583	7,524	
	Irrigation Needs		0	0	0	0	0	0	
			i i i i i i i i i i i i i i i i i i i						
	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)			67	71	71		11	11	1
	Purchase Water from Major Provider		2,000	2,000	3,000		6,000		2, 3
SCTN-8	Trinity Aquifer Optimization	390	390	390	390	390	390	390	
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		2,457	2,461	3,461	5,401	6,401	8,401	
	Total System Mgmt. Supply / Deficit		1,385	898	649	1,298	818	877	
Mu	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,385	898	649	1,298	818	877	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, but	will not be	available im	mediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Assumed purchase from Bexar County major provi					l in Bexar Co	ounty table		
3	Early implementation of facilities assumed in cost e						,		
4	Option expected to provide additional water supply						ntlv unquai	ntified.	

## Planning Unit Alternative Regional Water Plan Medina County



South Ce	entral Texas Region					C	ounty =	Medina	
	summary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
			·				,		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,015	2,110	2,206	2,427	2,582	2,750	
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		68	68	70	72	74	76	
	Irrigation		98,916	65,268	91,320	92,320	88,925	84,692	
	Total Needs		100,999	67,446	93,596	94,819	91,581	87,518	
	Mun, Ind, S-E, & Min Needs		2,083	2,178	2,276	2,499	2,656	2,826	
	Irrigation Needs		98,916	65,268	91,320	92,320	88,925	84,692	
Wator Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
	Demand Reduction (Conservation)	New Oupply	2000	2010	2020	73	76		10103
L-15 (Mull.)	Edwards Irrigation Transfers	81,000	3,000	3,000	3,000	3,000	3,000		2, 3
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)		11,867	11,867	11,867	11,867	11,867	11,867	5
	Total New Supplies		15,067	15,072	15,078	14,940	14,943	14,945	
	Total System Mgmt. Supply / Deficit		-85,932	-52,374	-78,518	-79,879	-76,638	-72.573	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,117	1,027	935	574	420	,	
Mic	Irrigation System Mgmt. Supply / Deficit		-87,049	-53,401	-79,453	-80,453	-77,058	-	
							·		
Notes:									
*	Candidate New Supplies shown for year 2000 are i					available in	nmediately		
1	Demand Reduction (Conservation) strategies assu								
2	Candidate New Supply to be shared among Uvalde							drought.	
3	Pursuant to draft EAA Critical Period Management rules, Candidate New Supply represents approximately 85 percent of								
	the estimated maximum potential annual transfer (95,430 acft) based on Proposed Permits prorated to 400,000 acft/yr.								
4	Option expected to provide additional water supply								
5	Estimates based upon use of LEPA systems on 80					vation at 40	percent of	irrigation	
	application rate, but applicable to only 50 percent o	f Edwards Aquif	er irrigation	permitted q	uantities.				

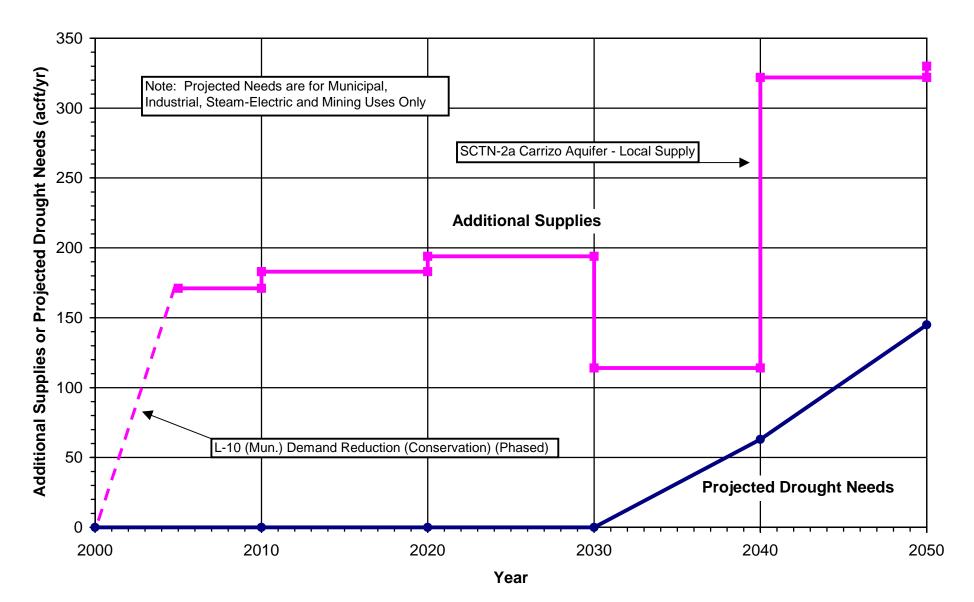
## Planning Unit Alternative Regional Water Plan Uvalde County



Year

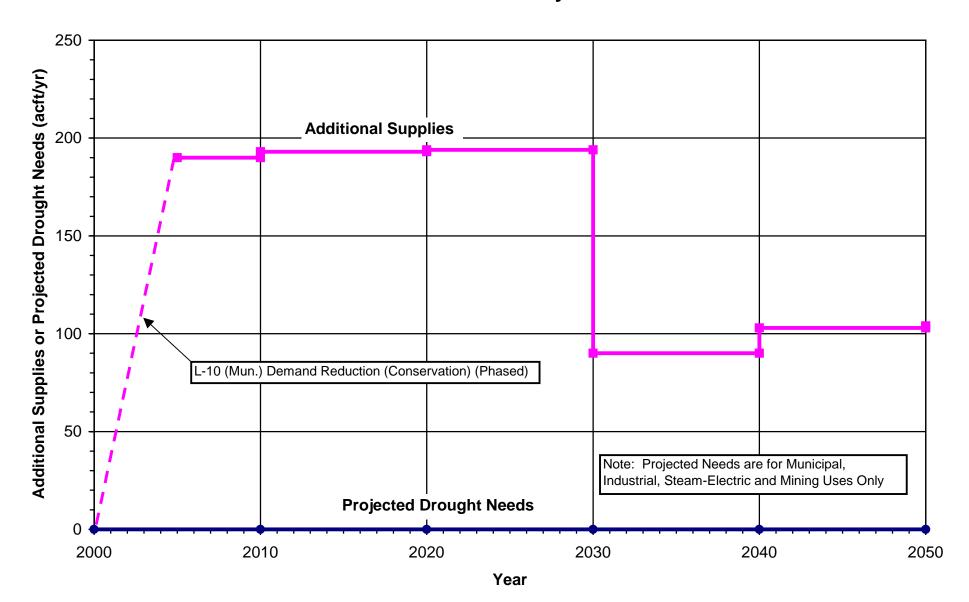
South Ce	ntral Texas Region					Co	ounty =	Uvalde	
	ummary of Projected Water Needs and W	ater Supply	Options			User Gro		all	
Due is stead y									
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,682	3,166	3,493		4,880		Notes
	Industrial		2,002	3,100	3,493	4,241	4,000		
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	0	0		
	Irrigation		75,263	72,798	70,154	-	68,880	-	
	Total Needs		77.945	75,964	73,647		73,760		
	Mun, Ind, S-E, & Min Need		2,682	3,166	3,493		4,880		
	Irrigation Needs		75,263	72,798	70,154		68,880		
	<b>J</b>		.,	,	-, -	7-	/	,	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		318	346	371	235	258	283	
L-15	Edwards Irrigation Transfers	81,000	3,000	4,000	4,000		5,000		2, 3,
	×								
									-
SCTN-4	Brush Management								
SCTN-5	Weather Modification								Į
SCTN-9	Rainwater Harvesting								:
	Small Aquifer Recharge Dams								:
L-10 (Irr.)	Demand Reduction (Conservation)		14,143	14,143	14,143	14,143	14,143	14,143	
	Total New Supplies	5	17,461	18,489	18,514	19,378	19,401	20,426	
		-							
	Total System Mgmt. Supply / Defic		-60,484	-57,475	-55,133		-54,359	<i>.</i>	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Defi		636	1,180	878		378		
	Irrigation System Mgmt. Supply / Defice	it	-61,120	-58,655	-56,011	-56,879	-54,737	-51,533	
Notes:									
*	Candidate New Supplies shown for year 2000 a	re identified for	nriority imp	lementation	n hutwillr	not he avail	ahle imme	diately	
1	Demand Reduction (Conservation) strategies as							clatery.	
2	Candidate New Supply to be shared among Uva						not be relia	able in drour	tht
3	Pursuant to draft EAA Critical Period Manageme								,
-	the estimated maximum potential annual transfe								
4	Early implementation of facilities assumed in co						,		
5	Option expected to provide additional water sup	ply in many yea	ars, but depe	endable su	pply during	g drought is	presently	unquantifie	d.
6	Estimates based upon use of LEPA systems on								
	application rate, but applicable to only 50 percer						•	Ŭ	-

## Planning Unit Alternative Regional Water Plan Wilson County



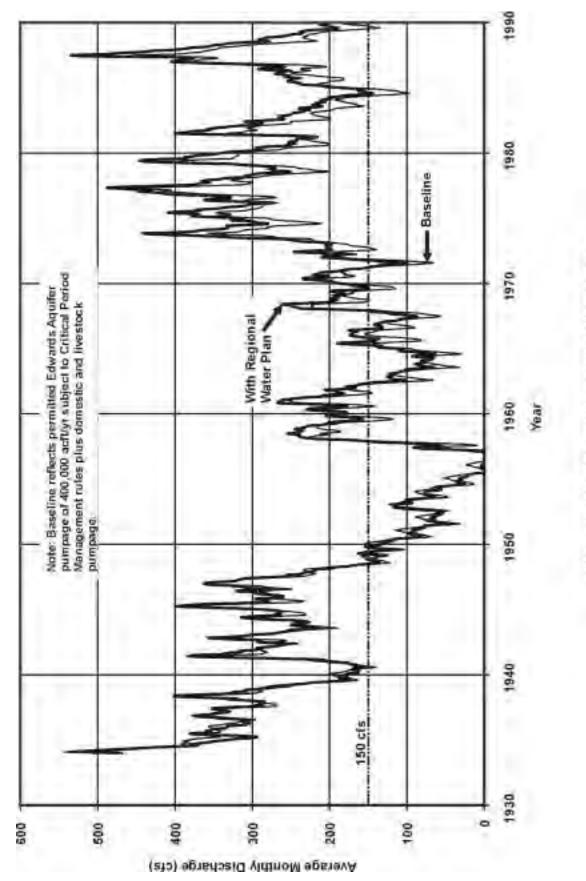
South Central Texas Region County Summary of Projected Water Needs and Water Supply Options						Co	ounty =	Wilson	
						User Group(s) = all			
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	63	145	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	-	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		0	0	0	-	63	145	
	Mun, Ind, S-E, & Min Needs		0	0	0	-	63	145	
	Irrigation Needs		0	0	0	0	0	0	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.		,	171	183	194	114	122	130	
SCTN-2a	Carrizo Aquifer - Local Supply						200	200	
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
,	Total New Supplies		171	183	194	114	322	330	
	Total System Mgmt. Supply / Deficit		171	183	194	114	259	185	
Mi	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		171	183	194		259	185	
IVIC	Irrigation System Mgmt. Supply / Deficit		0	0	0		239	0	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in pro	jected water	demands.				
2	Additional well(s) for Floresville.								
3	Option expected to provide additional water supply	in many years,	<u>but dependa</u>	able supply o	during drou	ight is presei	ntly unquan	tified.	

## Planning Unit Alternative Regional Water Plan Zavala County

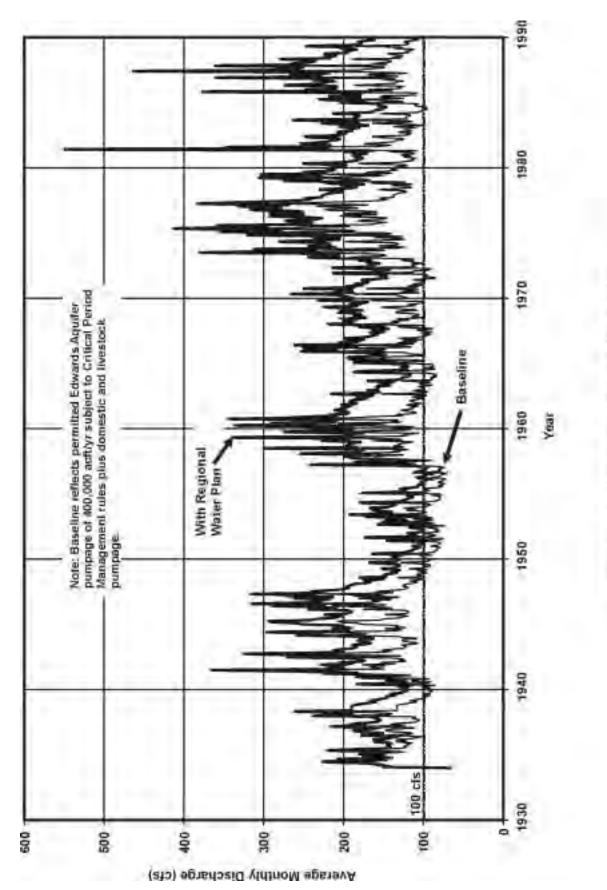


South Ce	entral Texas Region					Co	ounty =	Zavala	
	ummary of Projected Water Needs and V	Vater Supply	/ Options			User Gro	up(s) =	all	<u> </u>
-	· · ·		·						
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	-	
	Irrigation		80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		80,722	76,589	72,655	88,293	84,673	81,200	
Water Sup	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		190	193	194	90	103	104	
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	
	Total New Supplies		6,591	6,594	6,595	6,491	6,504	6,505	
	Total System Mgmt. Supply / Deficit		-74,131	-69,995	-66,060	-81,802	-78,169		
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		190	193	194	90	103		
	Irrigation System Mgmt. Supply / Deficit		-74,321	-70,188	-66,254	-81,892	-78,272	-74,799	
Notes:									
1	Demand Reduction (Conservation) strategies assu								
2	Option expected to provide additional water supply								
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997, v	with conser	vation at 20	percent of	irrigation	
	application rate.								

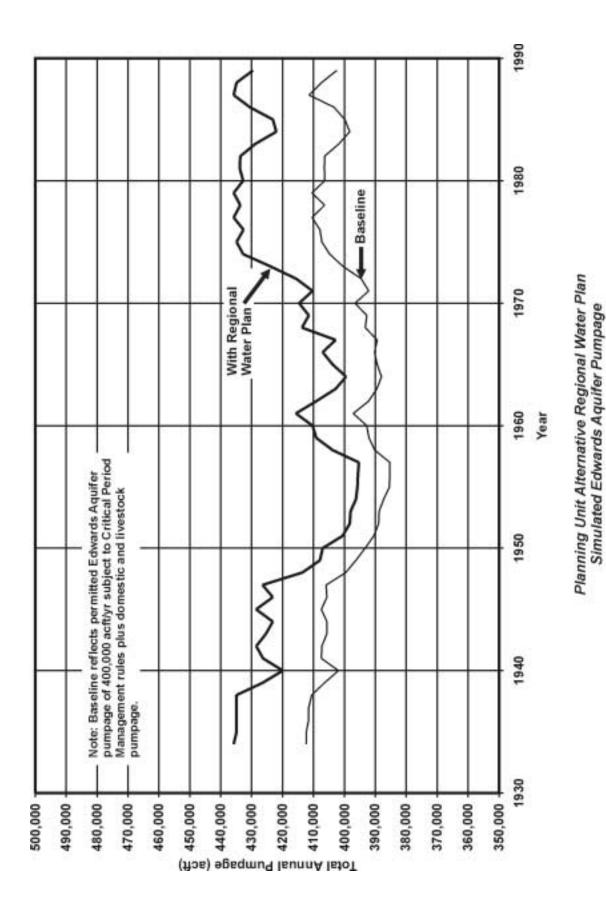
## Planning Unit Regional Water Management Alternative Plan

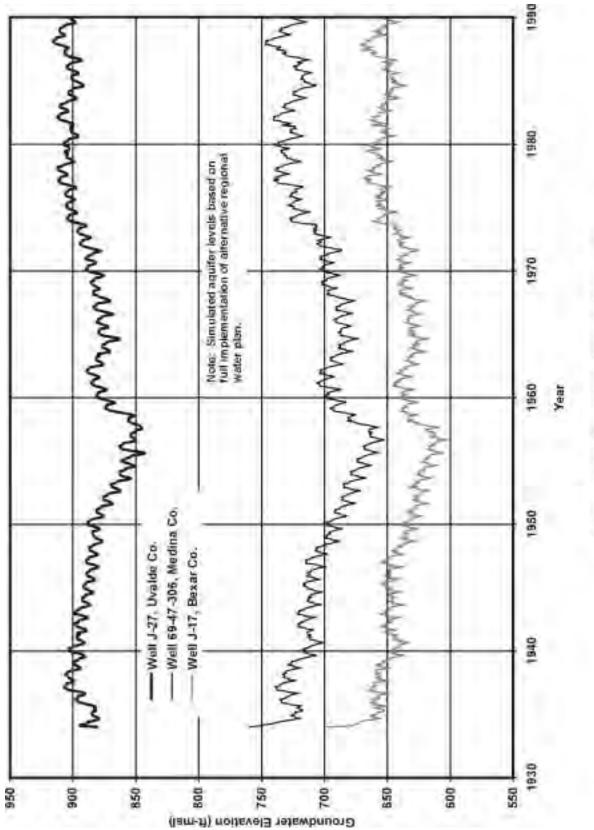


Planning Unit Atternative Regional Water Plan Simulated Comal Springs Discharge

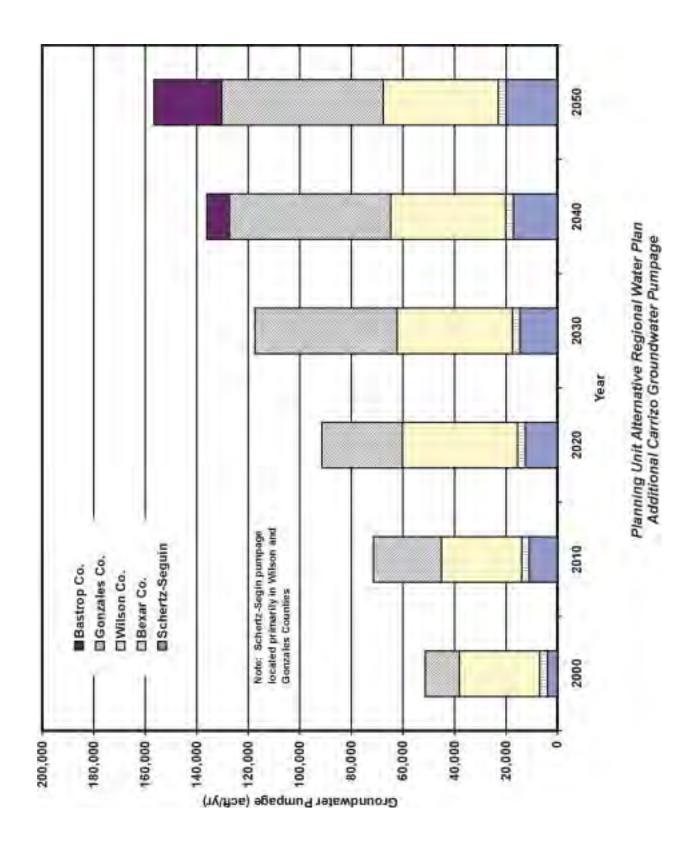


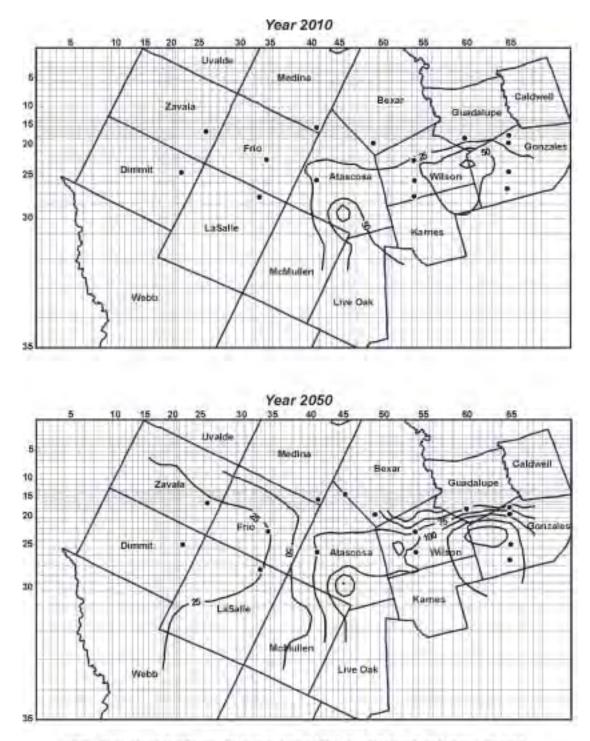






Planning Unit Alternative Regional Water Plan Simulated Edwards Aquifer Levels

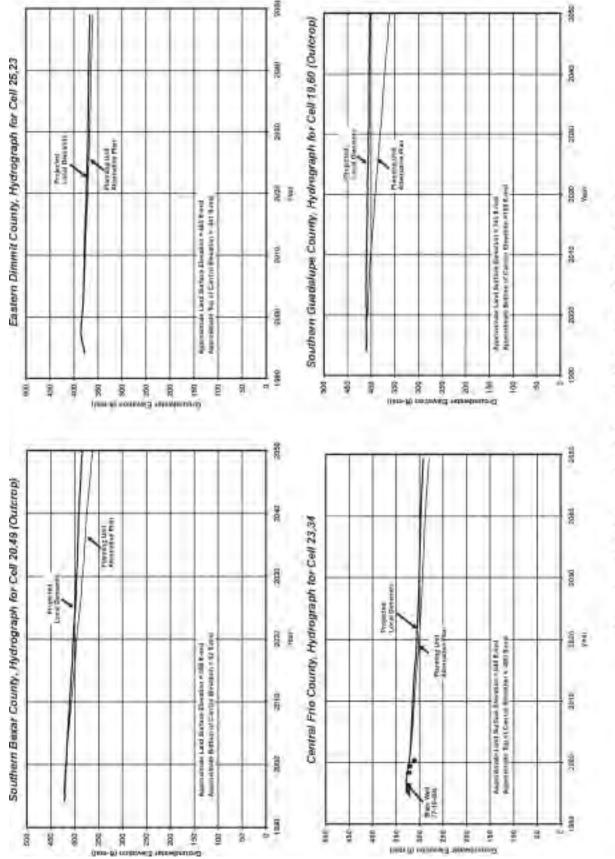




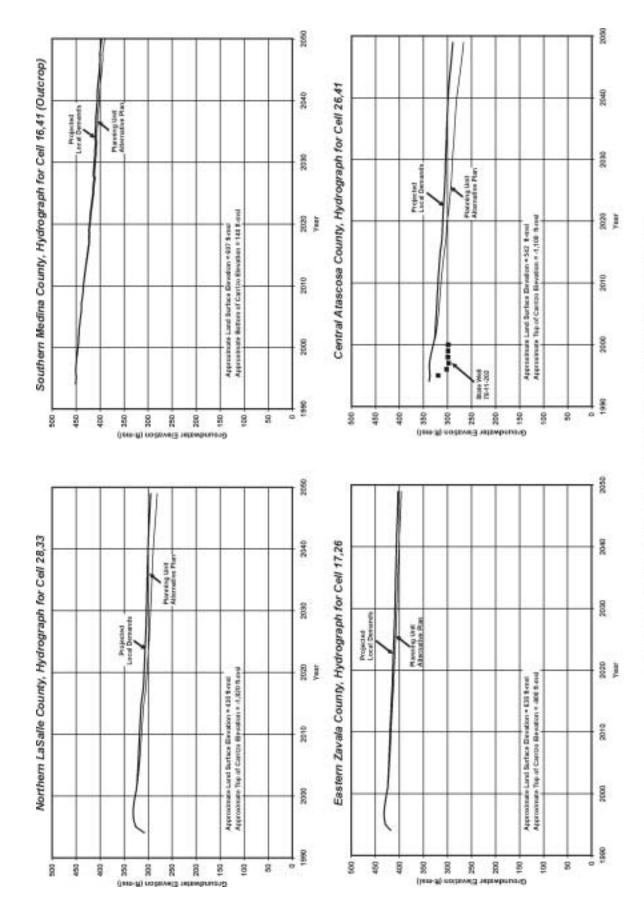
Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this alternative regional water plan.

Monitoring Well Location

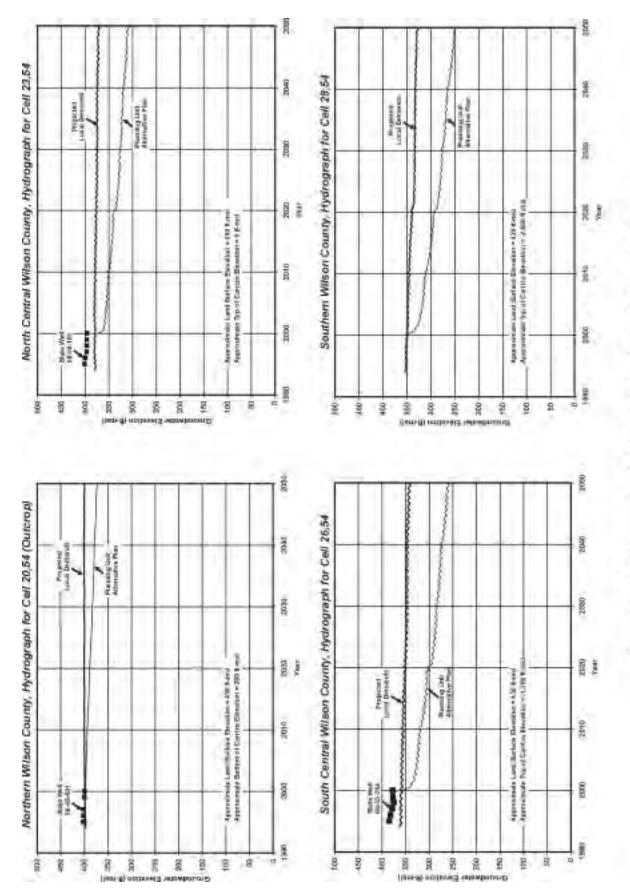
Planning Unit Alternative Regional Water Plan Simulated Carrizo Aquifer Drawdown



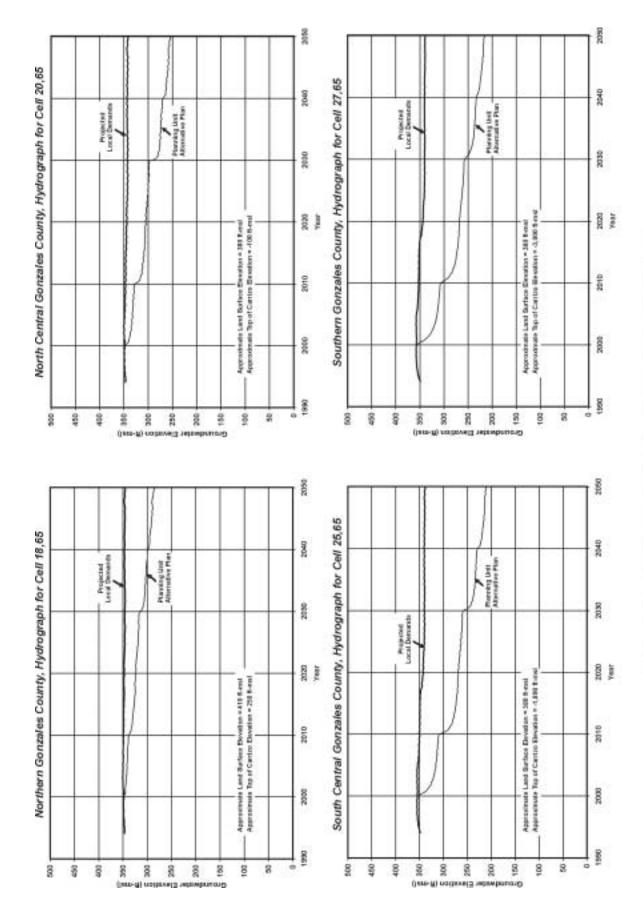






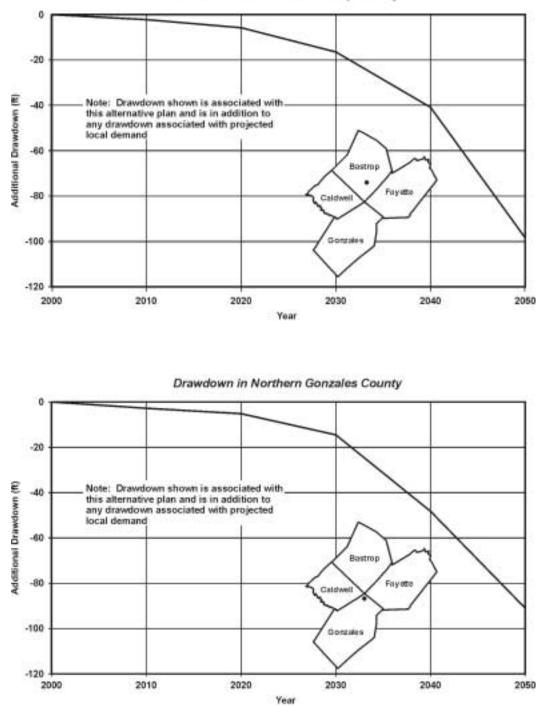




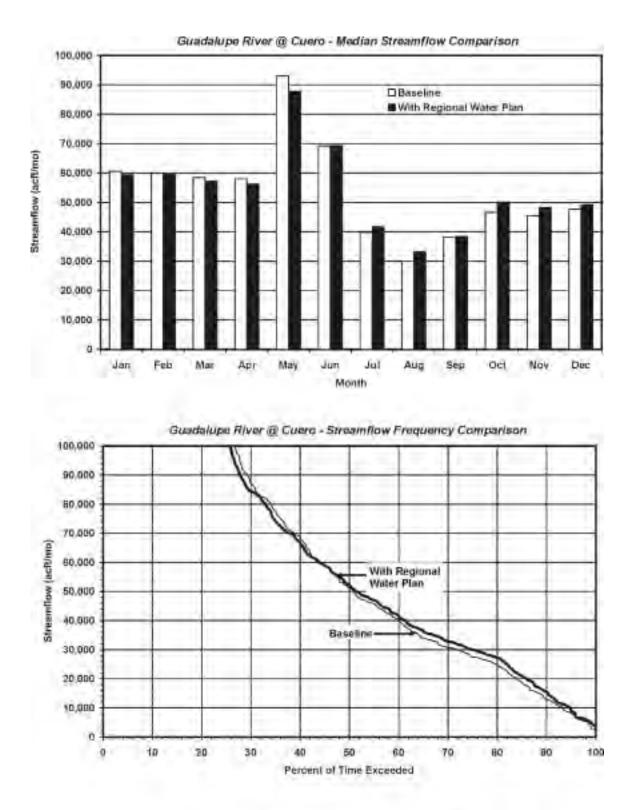




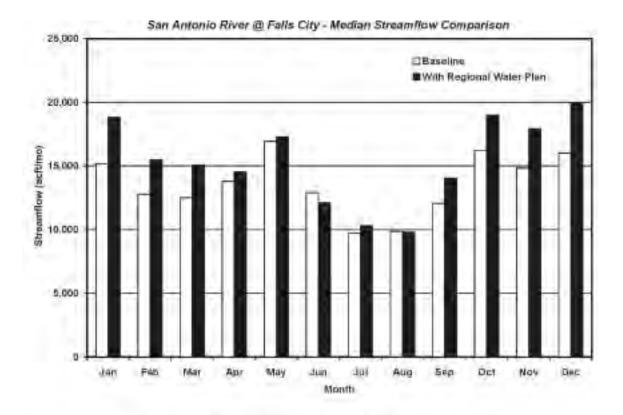
Drawdown in Southern Bastrop County

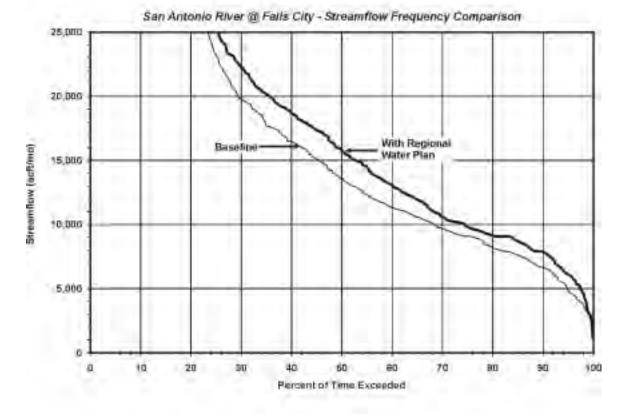


Planning Unit Alternative Regional Water Plan - Carrizo Aquifer

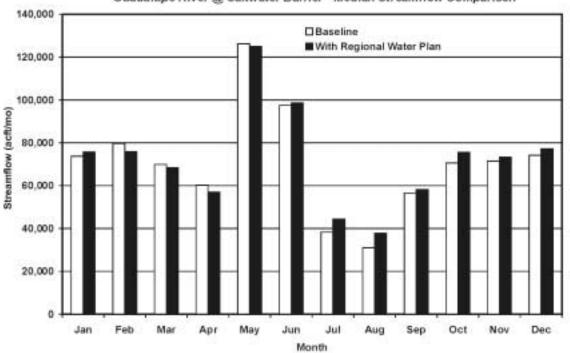


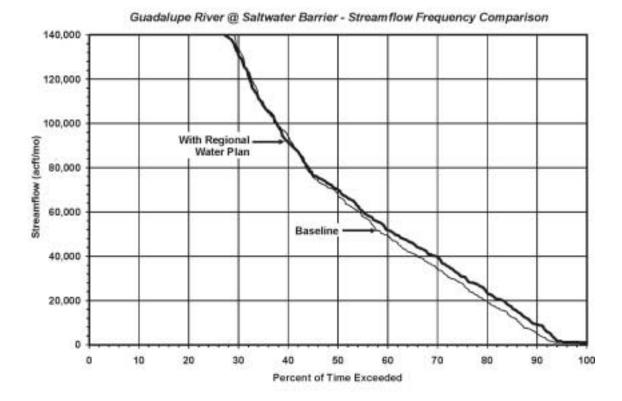
Planning Unit Alternative Regional Water Plan Streamflow Comparisons





Planning Unit Alternative Regional Water Plan Streamflow Comparisons





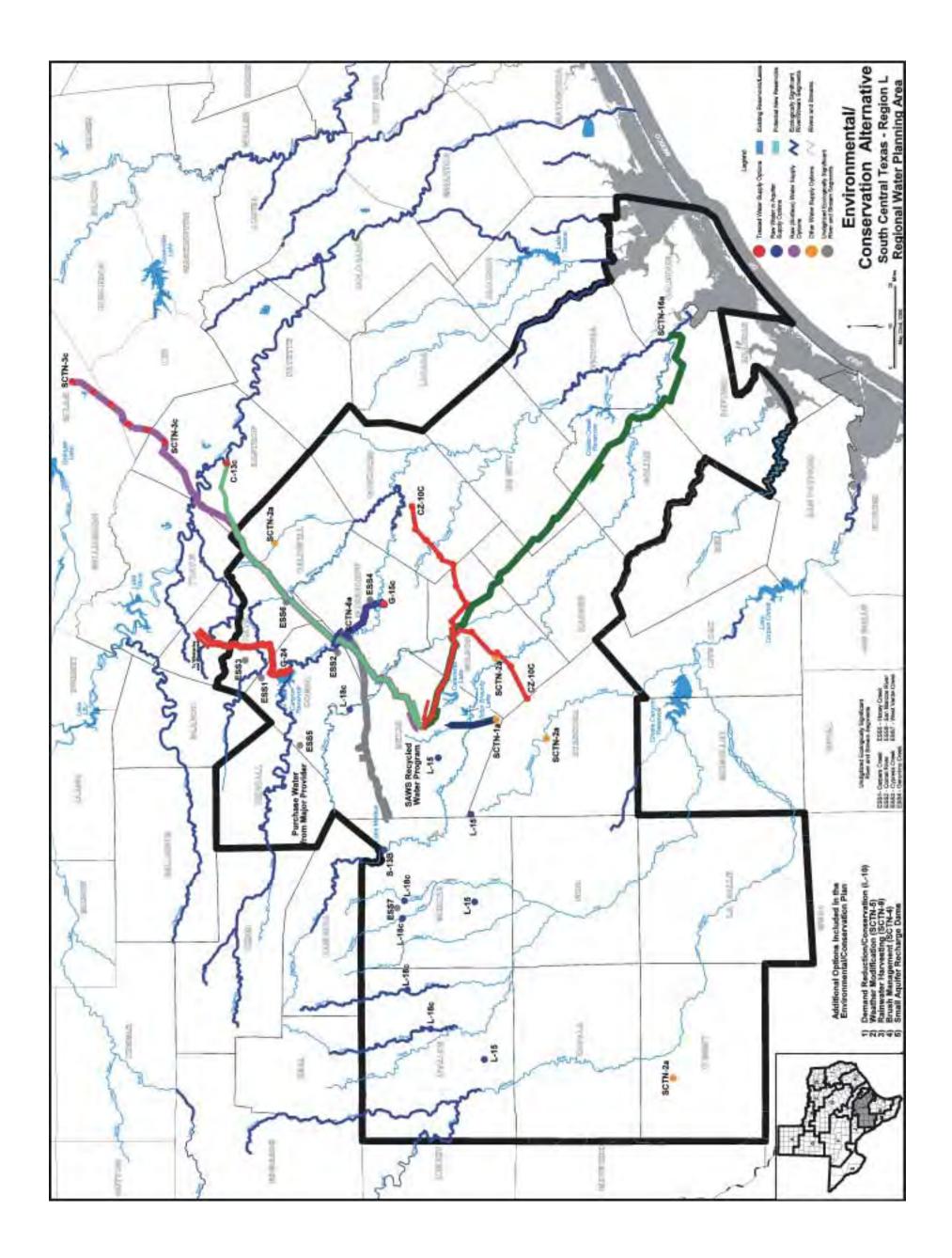
Planning Unit Alternative Regional Water Plan Streamflow Frequency Comparisons

#### Guadalupe River @ Saltwater Barrier - Median Streamflow Comparison

## South Central Texas Regional Water Planning Group

San Antonio River Authority

HDR Engineering, Inc. June 13, 2000



## South Central Texas Region Alternative Water Plans

Alternative Name: Environmental/Conservation

Alternative ID: E/C

**Alternative Description:** The Environmental/Conservation Alternative Regional Water Plan is predicated on the development of water supply options having the least expected environmental impacts and on the implementation of advanced conservation measures as assumed in the water demand projections adopted for the South Central Texas Region. Potential environmental impacts of various water supply options were assessed in a qualitative manner through consideration of endangered species, unique stream segments, bays & estuaries, instream flows, riparian forests, cultural resources, size/habitat, water quality, and sustainability. Efficiency, as reflected in unit cost, is considered as a secondary criterion for selection of water supply options for inclusion in this alternative regional water plan.

The following water supply options are included in the Environmental/Conservation Alternative Regional Water Plan (in no particular order):

- 1. Demand Reduction / Conservation (L-10)
- 2. Edwards Irrigation Transfers (L-15)
- 3. Medina Lake Recharge Enhancement (S-13B)
- 4. SAWS Recycled Water Program
- 5. Colorado R. @ Bastrop LCRA Stored Water (C-13C)
- 6. Carrizo Aquifer Wilson & Gonzales Counties (CZ-10C)
- 7. Lower Guadalupe River Diversions (SCTN-16a)
- 8. Edwards Recharge Type 2 Projects (L-18c)
- 9. Edwards Recharge Guadalupe R. Diversions (SCTN-6a)
- 10. Simsboro Aquifer (SCTN-3c)
- 11. Canyon Reservoir (G-15C)
- 12. Carrizo Aquifer Local Supply (SCTN-2a)
- 13. Wimberley & Woodcreek Canyon (G-24)
- 14. Regional Aquifer Storage & Recovery (SCTN-1a)
- 15. Weather Modification (SCTN-5)
- 16. Rainwater Harvesting (SCTN-9)
- 17. Brush Management (SCTN-4)

## *Environmental/Conservation Alternative Regional Water Plan* Summary of Key Information for South Central Texas Regional Water Planning Group

#### Quantity, Reliability, and Cost

- Plan includes management supplies to meet projected needs, ensure reliability, and maintain springflow, resulting in a quantity of additional water supplies sufficient to meet projected needs for municipal, industrial, steam-electric power, and mining uses through the year 2050.
- Cost is below the average for the five alternative plans under consideration.

#### **Environmental Factors**

- Greatest increase in median annual streamflow in the San Antonio River and least decrease in median annual freshwater inflow to the Guadalupe Estuary among the five alternative plans under consideration.
- Above average concerns with Endangered & Threatened Species and Cultural Resources among the five alternative plans under consideration.

#### Impacts on Water Resources

- No unmitigated reductions in water available to existing water rights.
- Long-term reductions in water levels in the Carrizo Aquifer. Drawdown would be less than the average for the five alternative plans under consideration.

#### **Impacts on Agriculture and Natural Resources**

- Major commitment to municipal and irrigation water Demand Reduction (Conservation) (L-10).
- Includes Brush Management (SCTN-4) and Weather Modification (SCTN-5).
- Inclusion of water supply options to meet projected irrigation needs in full is estimated to be economically infeasible at this time. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching).
- Includes maximum potential voluntary transfer of Edwards Aquifer irrigation permits to municipal permits through lease or purchase.
- Includes Medina Lake Recharge Enhancement (S-13B) which reduces or eliminates water supplies from the Medina Lake System for irrigation in Bexar, Medina, and Atascosa Counties.

#### **Other Relevant Factors per SCTRWPG**

#### **Comparison of Strategies to Meet Needs**

• Selection of water supply options comprising the alternative plan based on implementation of advanced conservation measures and minimization of environmental impacts.

#### Interbasin Transfer Issues

- Projected non-irrigation needs in basin(s) of origin are met throughout the planning period.
- Plan includes two interbasin transfers: 1) Edwards Recharge Guadalupe River Diversions (SCTN-6a) from the Guadalupe River near Lake Dunlap to the outcrop of the Edwards Aquifer in the San Antonio River Basin; and 2) LCRA Stored Water (C-13C) from the Colorado River at Bastrop to Bexar County.
- Plan includes one potential interbasin transfer from the Saltwater Barrier at the confluence of the Guadalupe and San Antonio Rivers (SCTN-16a) to Bexar County.

#### **Third-Party Impacts of Voluntary Redistribution of Water**

- Potential positive or negative effects of Edwards Irrigation Transfers (L-15).
- Lower water levels in some portions of the Carrizo Aquifer.

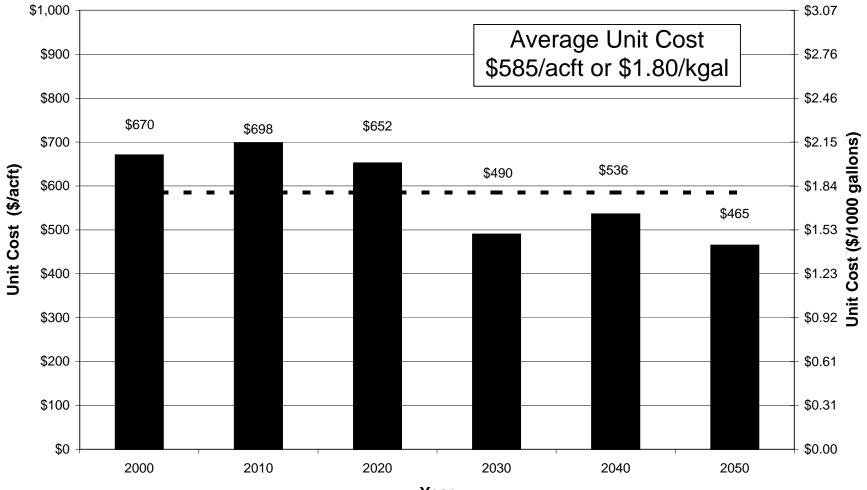
#### **Regional Efficiency**

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Terminal storage and regional water treatment facilities in Bexar County increase efficiency, improve reliability, and reduce unit cost.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.
- Edwards Recharge Guadalupe River Diversions (SCTN-6a) provides for recovery and recirculation of enhanced Comal springflow resulting from implementation of Edwards Recharge Type 2 Projects (L-18c).

#### Effect on Navigation

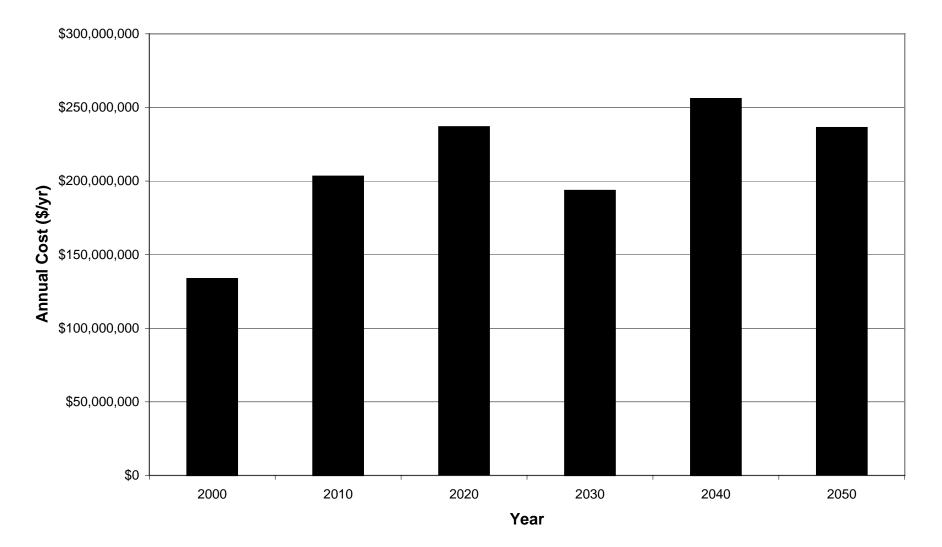
• Not applicable.

## Environmental/Conservation Alternative Regional Water Plan Unit Cost of Cumulative Additional Water Supply

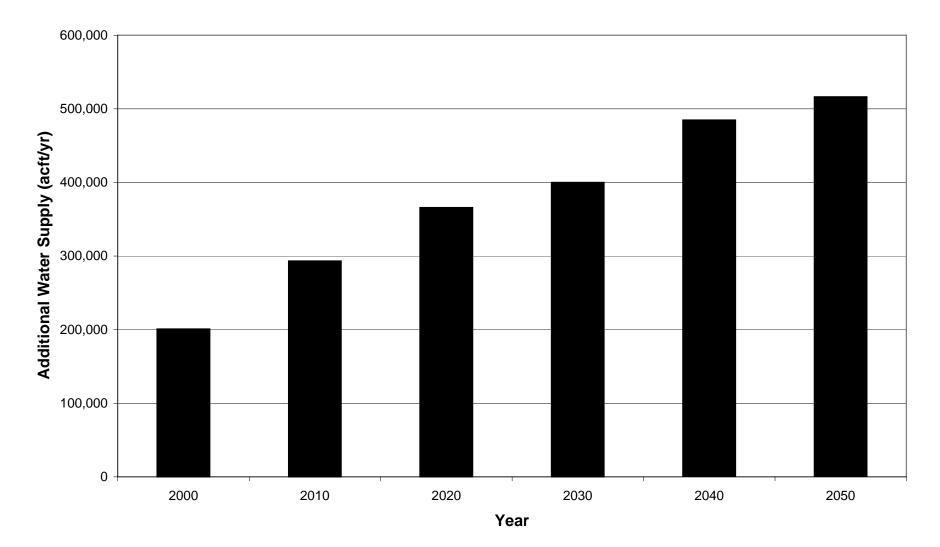


Year

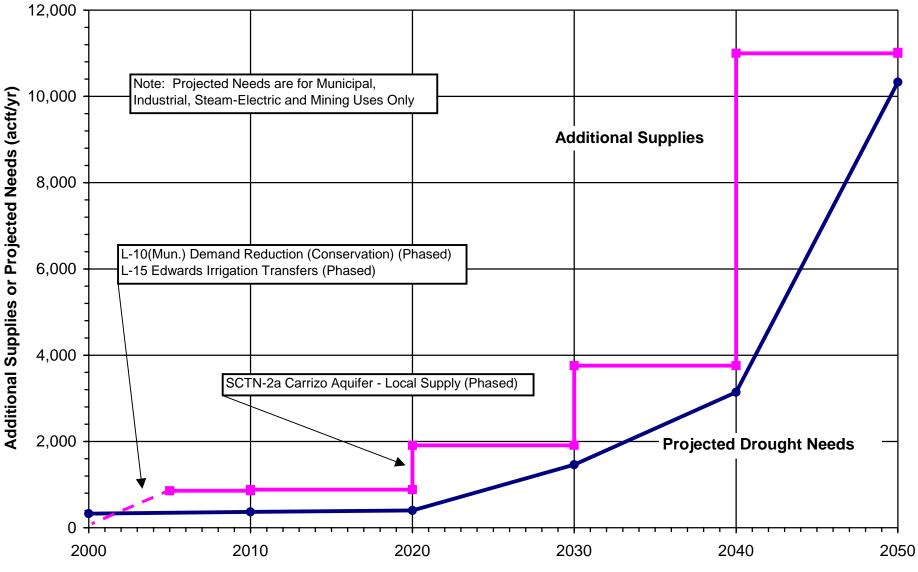
## Environmental/Conservation Alternative Regional Water Plan Annual Cost of Cumulative Additional Water Supply



## Environmental/Conservation Alternative Regional Water Plan Cumulative Additional Water Supply

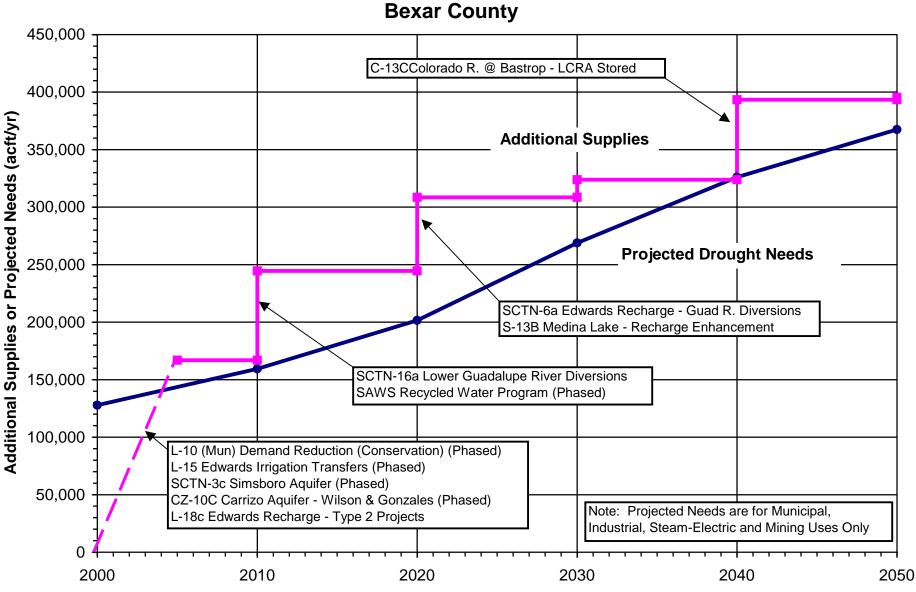


## Environmental/Conservation Alternative Regional Water Plan Atascosa County



Year

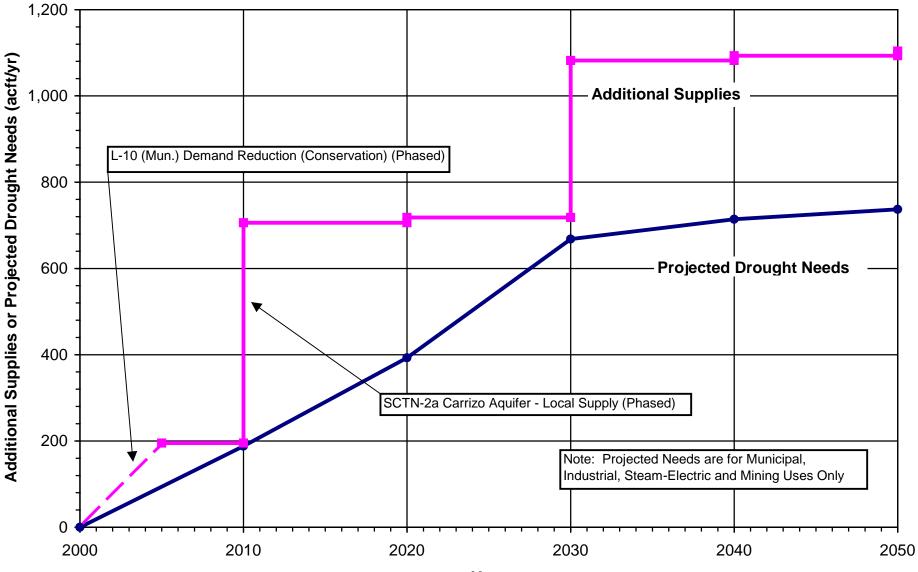
South Cer	ntral Texas Region					C	ounty =	Atascosa	1
		of Projected Water Needs and Water Supply Op				User Gro	$\frac{1}{2}$	all	
eeung ee		rator ouppij	optionio				up(0) =	un	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366		468	530		
	Industrial		0	0	0		0		
	Steam-Electric		0	0	0	0	1,504	8,504	
	Mining		0	0	0	995	1,109		
	Irrigation		38,418	36,718	35,170	43,726	42,190	40,713	
	Total Needs		38,743	37,084	35,571	45,189	45,333	51,043	
	Mun, Ind, S-E, & Min Needs		325	366	401	1,463	3,143	10,330	
	Irrigation Needs		38,418	36,718	35,170	43,726	42,190	40,713	
Water Sup	ply Options (acft/yr) Description	Candidate New Supply	2000*	2010	2020	2030	2040	2050	Notes
	Demand Reduction (Conservation)	New Supply	356	384	411	2030	2040		Notes
L-10 (Mult.)	Edwards Irrigation Transfers	81,000	500	500			700		2, 3, 4
SCTN-2a	Carrizo Aquifer - Local Supply	81,000	500	500	500	1,000	3,000		2, 3, 4
							-,		-,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
001110	Small Aquifer Recharge Dams								-
L-10 (Irr.)	Demand Reduction (Conservation)		3,692	3,692	3,692	3,692	3,692	3,692	
()	Total New Supplies		4,548	4,576	4,603	5,451	7,692	,	
	Total System Mgmt. Supply / Deficit		-34,195	-32,508		-39,738	-37,641		
Mui	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		531	518			857		
	Irrigation System Mgmt. Supply / Deficit		-34,726	-33,026	-31,478	-40,034	-38,498	-37,021	
Natao									
Notes:	Condidate New Supplies about for user 2000 and	dentified for the	with cine plane	ontotion by	tuill not be	ovoiloble in	o modiotal:		
1	Candidate New Supplies shown for year 2000 are i						rimediately	·	
1 2	Demand Reduction (Conservation) strategies assu Candidate New Supply to be shared among Uvalde						rolioblo in	drought	
								uougrit.	
3	Pursuant to draft EAA Critical Period Management								
4	the estimated maximum potential annual transfer ( Additional Edwards supply is for City of Lytle.	95,430 acm bas	eu on Propo	usea Permi	is prorated	10 400,000 8	acit/yr.		
		Mininguas							
5	Additional Carrizo supply is for Steam-Electric and				المعامم الم				
6	Early implementation of facilities assumed in cost e								
1	Option expected to provide additional water supply								
8	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ea in 1997,	with consei	vation at 20	percent of	irrigation	
	application rate.								



## Environmental/Conservation Alternative Regional Water Plan Bexar County

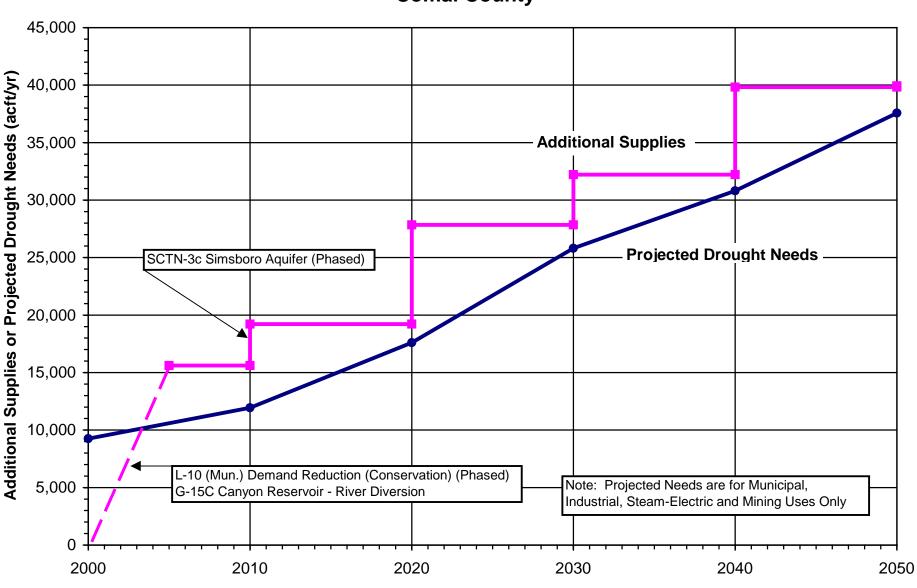
South Ce	ntral Texas Region					C	ounty =	Bexar	
	ummary of Projected Water Needs and V	Ator Supply	Ontions			User Gro		all	
County 3	unimary of Projected Water Needs and V	valer Suppry	Options			User Gru	up(s) =	an	
Due is stad	Mater Neede (active)								
Projected	Water Needs (acft/yr)			0040			00.40	0050	N
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		122,867	154,495	196,301	262,070			
	Industrial		0	0	0	1,430	4,759	- / -	
	Steam-Electric		0	0	0	0	-	-	
	Mining		4,963	4,936	5,201	5,406	5,645		
	Irrigation		22,575	20,374	19,585	19,015			
	Total Needs		150,405	179,805	221,087	287,921	- /		
	Mun, Ind, S-E, & Min Needs		127,830	159,431	201,502	268,906			
	Irrigation Needs		22,575	20,374	19,585	19,015	18,385	17,368	
	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		33,528	42,509	41,210	/	38,834		
L-15	Edwards Irrigation Transfers	81,000	50,000	55,000	60,000	65,000	,	,	2, 3
SCTN-3c	Simsboro Aquifer	55,000	51,000	48,000	41,000	27,000	16,500		4
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	75,000	19,000	19,000	29,000	49,000	64,000		Ę
L-18c	Edwards Recharge - Type 2 Projects	13,451	13,451	13,451	13,451	13,451	13,451	13,451	
SCTN-16a	Lower Guadalupe River Diversions	46,813		46,813	46,813	46,813			
	SAWS Recycled Water Program			19,826	26,737	35,824	43,561	52,215	6, 7
SCTN-6a	Edwards Recharge - Guad. R. Diversions	42,121			42,121	42,121	42,121		
S-13B	Medina Lake - Recharge Enhancement	8,136			8,136	8,136	8,136		
C-13C	Colorado R. @ Bastrop - LCRA Stored	50,000					50,000	50,000	8
SCTN-1a	Aquifer Storage & Recovery - Regional								ç
SCTN-4	Brush Management								1(
SCTN-5	Weather Modification								1(
SCTN-9	Rainwater Harvesting								1(
	Small Aquifer Recharge Dams								1(
L-10 (Irr.)	Demand Reduction (Conservation)		4,521	4,521	4,521	4,521	4,521	4,521	11
	Total New Supplies		171,500	249,120	312,989	328,399	397,937	399,991	
	Total Querter Manuel Querter / Dufficity		04 005	00.045	04.000	40.470	50 54 5	45 400	
M	Total System Mgmt. Supply / Deficit In, Ind, S-E, & Min System Mgmt. Supply / Deficit		21,095 39.149	69,315 85,168	91,902 106,966	40,478 54,972	53,515 67.379		
IVIU	Irrigation System Mgmt. Supply / Deficit		-18,054	-15,853	-15,064	-14,494	- /		
	inigation system wight. Supply / Dencit		-16,054	-15,655	-15,004	-14,494	-13,004	-12,047	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	entation bu	t will not be	l available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu						Inneulatory		
2	Candidate New Supply to be shared among Uvalde					may not be	reliable in	drought	
3	Pursuant to draft EAA Critical Period Management								
•	the estimated maximum potential annual transfer (								
4	Candidate New Supply to be shared among Bexar,							ntified	
5	Candidate New Supply to be shared among Bexar								
6	Current SAWS Recycled Water Program is include								
7	Future use of recycled water for non-potable uses							and	
8	Supply dependent upon future water needs in Regi						nator ucini		
9	SAWS ASR program in southern Bexar County inc				only and re	ducas seas	onal aquifo	r demande	
9 10	Option expected to provide additional water supply								
10	Estimates based upon use of LEPA systems on 80								
11	application rate, but applicable to only 50 percent of					valion al 40	percent of	Ingation	
	Tapplication rate, but applicable to only 50 percent of	i ⊑uwaius Aqui	iei iingalion	heuuiiiiea d	uannies.				

## Environmental/Conservation Alternative Regional Water Plan Caldwell County



Year

South Ce	entral Texas Region					Co	ounty =	Caldwell	
	Summary of Projected Water Needs and V	Nater Supply	y Options			User Gro	up(s) =	all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	188	393	668	714	737	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		0	188	393	668	714	737	
	Mun, Ind, S-E, & Min Needs		0	188	393	668	714	737	
	Irrigation Needs		0	0	0	0	0	0	
	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
	) Demand Reduction (Conservation)		195	206	218		93		
SCTN-2a	Carrizo Aquifer - Local Supply			500	500	1,000	1,000	1,000	
	Small Aquifer Recharge Dams								:
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		195	706	718	1,082	1,093	1,104	
	Total System Mamt Supply / Deficit		195	518	325	414	379	367	
M.,	Total System Mgmt. Supply / Deficit In, Ind, S-E, & Min System Mgmt. Supply / Deficit		195	518	325		379		
IVIU	Irrigation System Mgmt. Supply / Deficit		195	518	<u> </u>	414	<u> </u>		
	ingation system wight. Supply / Deficit		0	0	0	U	0	0	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refl	ected in proj	ected water	demands	1			
2	Additional well(s) for Lockhart.	incu largery rom			domanao.				

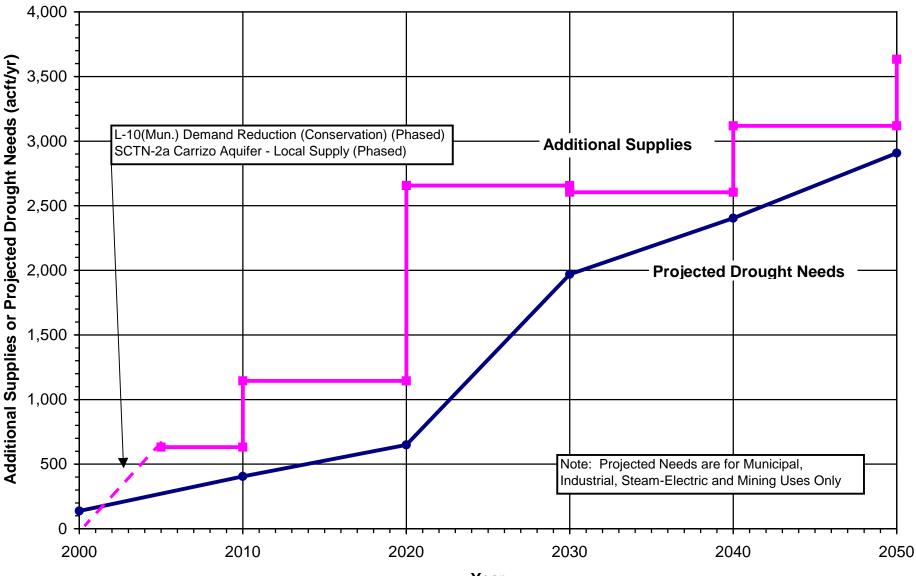


## Environmental/Conservation Alternative Regional Water Plan Comal County

Year

South Ce	ntral Texas Region					Co	ounty =	Comal	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,289	5,049	10,487	18,282	25,205	33,062	
	Industrial		1,388	1,425	1,486		2,009		
	Steam-Electric		0	0	0	0	0	0	
	Mining		5,570	5,464	5,628	5,796	3,590	2,224	
	Irrigation		30	14	0	0	0	0	
	Total Needs		9,277	11,952	17,601	25,815	30,804	37,575	
	Mun, Ind, S-E, & Min Needs		9,247	11,938	17,601	25,815	30,804	37,575	
	Irrigation Needs		30	14	0	0	0	0	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		616	718	848	718	824	942	1
G-15C	Canyon Reservoir - River Diversion	15,000	15,000	15,000	15,000	15,000	15,000	15,000	2
SCTN-3c	Simsboro Aquifer	55,000			3,500	12,000	16,500	24,000	3, 4
									-
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		15,616	15,718	19,348	27,718	32,324	39,942	
			0.000	0 700	/ = /=	4 000	4 500	0.007	
	Total System Mgmt. Supply / Deficit		6,339	3,766	1,747		1,520		
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		6,369	3,780	1,747	1,903	1,520		
	Irrigation System Mgmt. Supply / Deficit		-30	-14	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dontified for price	rity implom	ntation but	will not be		modiately	I	
1	Demand Reduction (Conservation) strategies assu						ineulately.		
2	Portion of Canyon firm yield (with amendment) dive			ected water	uemands.				
2	Candidate New Supply to be shared among Bexar,			Effocts on	rogional a		to bo quar	tified	
3	Early implementation of facilities assumed in cost e						to be quar	luneu.	
+ 5	Option expected to provide additional water supply						othy upque	atified	
5	Populon expected to provide additional water supply	in many years, t	ur deheugs	une supply (	Juning alot	ignt is prese	niy unqual	iineu.	

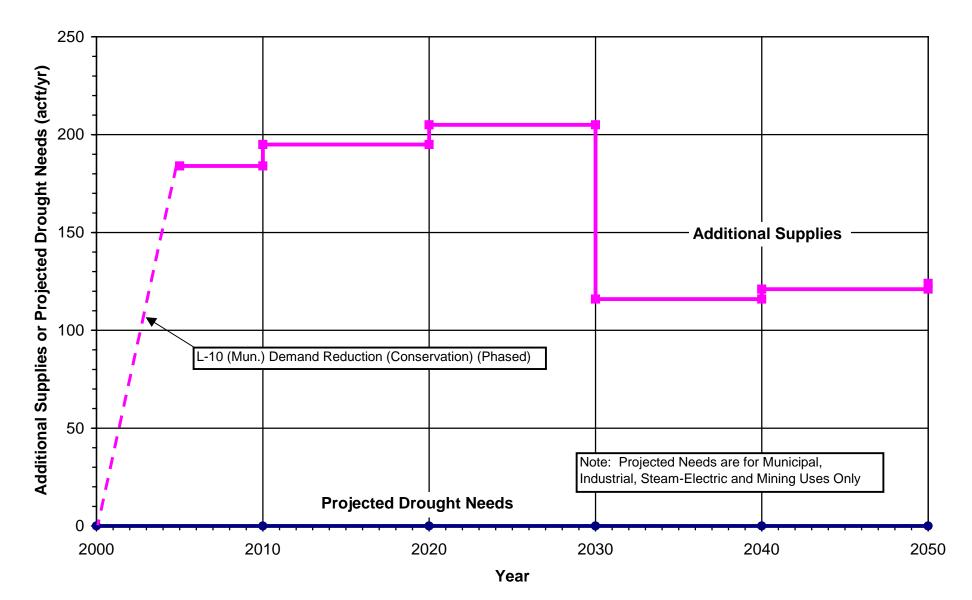
## Environmental/Conservation Alternative Regional Water Plan Dimmit County



Year

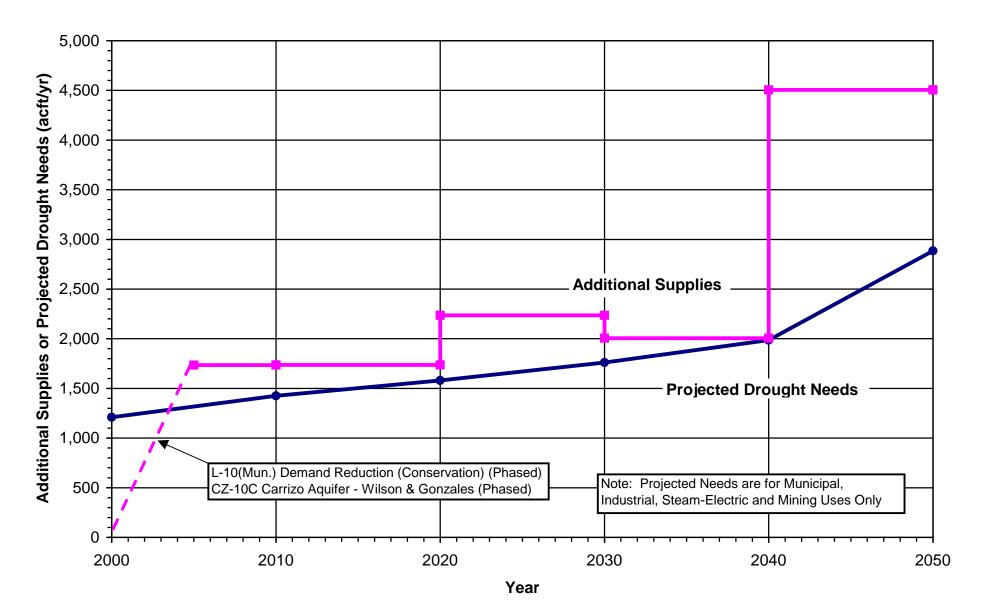
South Cer	ntral Texas Region					C	ounty =	Dimmit	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
			opnone				·••••(•)		
Projected '	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		138	405	649	1,054	1,479	1,959	
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	915	925	949	
	Irrigation		0	0	0	2,133	1,737	1,331	
	Total Needs		138	405	649	4,102	4,141		
	Mun, Ind, S-E, & Min Needs		138	405	649	1,969	2,404	2,908	
	Irrigation Needs		0	0	0	2,133	1,737	1,331	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		131	144	156	104	118	133	1
SCTN-2a	Carrizo Aquifer - Local Supply		500	1,000	1,000	2,500	3,000	3,500	2, 3
	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
			46.5	265		4 400	4 0 0 0	0.00	
	Total System Mgmt. Supply / Deficit		493	739	507	-1,498	-1,023		
Mur	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	635	714		
	Irrigation System Mgmt. Supply / Deficit		0	0	0	-2,133	-1,737	-1,331	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for price	rity impleme	entation but	will not be	l available ir	nmediatelv		
1							Inneulately		
	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Additional well(s) for Carrizo Springs and Mining su	innly							
2	Additional well(s) for Carrizo Springs and Mining su Early implementation of facilities assumed in cost e			nt supply du	ring droug	ht.			

## Environmental/Conservation Alternative Regional Water Plan Frio County



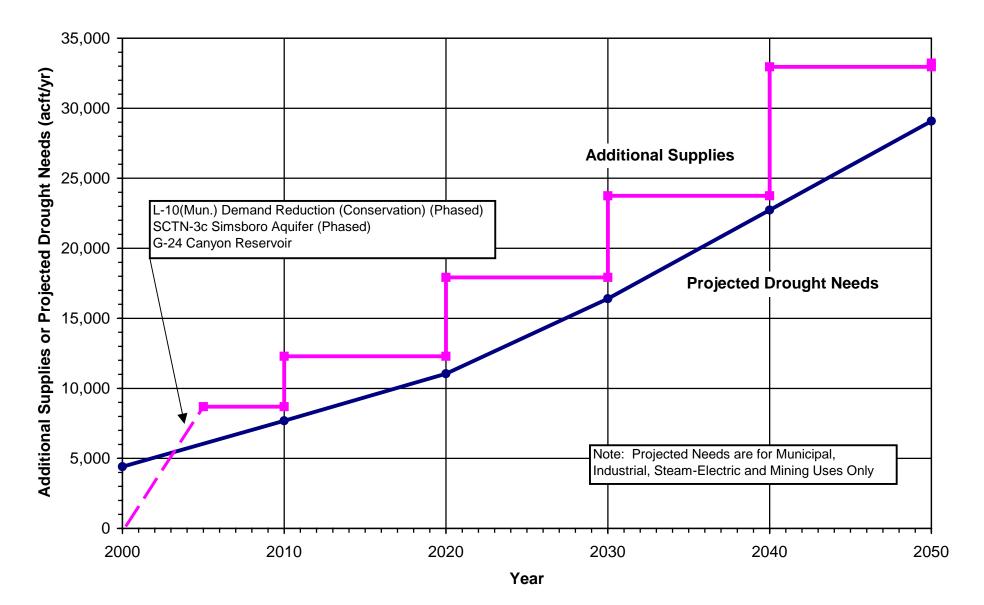
South Ce	entral Texas Region					C	ounty =	Frio	
County Summary of Projected Water Needs and Water Supply Options User Group(s) = all									
Projected	l Water Needs (acft/yr)								
riojecieu	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0		0		Notes
	Industrial		0	0	0	0	0	-	
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	0	0	-	
	Irrigation		71,126	67,646	64,365	76,505	73,519	•	
	Total Needs		71,126	67,646	64,365		73,519		
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0		
	Irrigation Needs		71,126	67,646	64,365	76,505	73,519	70,662	
Motor Su	nnly Ontions (soft/ur)	Candidate							
ID#	pply Options (acft/yr) Description		2000	2010	2020	2030	2040	2050	Notes
	Demand Reduction (Conservation)	New Supply	184	195	2020	2030	2040		Notes
SCTN-4 SCTN-5	Brush Management Weather Modification								
SCTN-9	Rainwater Harvesting								
001110	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	
- ( )	Total New Supplies		6,131	6,142	6,152		6,068		
	Total System Mgmt. Supply / Deficit		-64,995	-61,504	-58,213	-70,442	-67,451	-64,591	
М	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		184	195	205	116	121		
	Irrigation System Mgmt. Supply / Deficit		-65,179	-61,699	-58,418	-70,558	-67,572	-64,715	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proi	ected water	demands.				
2	Option expected to provide additional water supply					ight is prese	ntly unqua	ntified.	
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997, v	with conser	vation at 20			

## Environmental/Conservation Alternative Regional Water Plan Guadalupe County



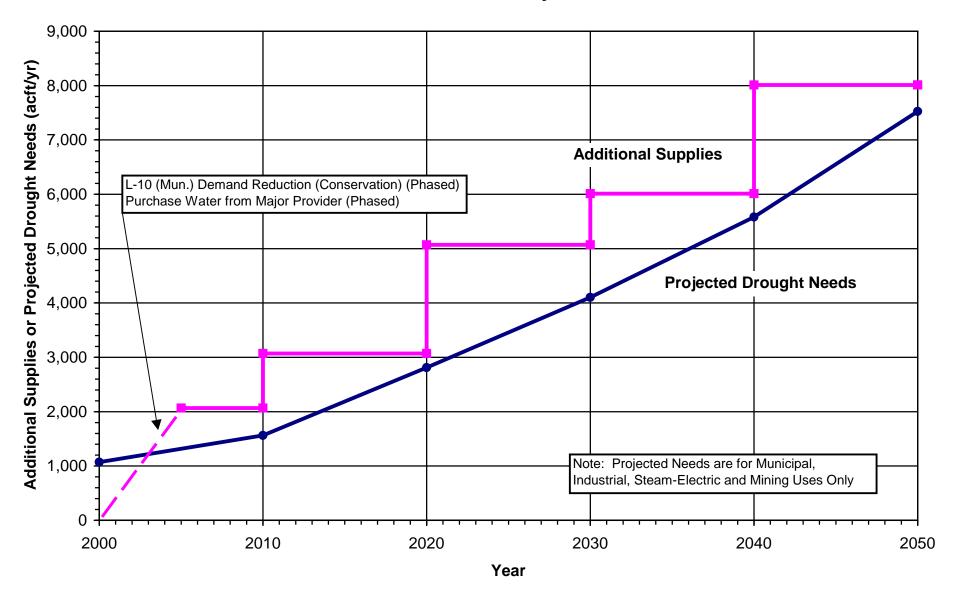
South C	entral Texas Region					Co	ounty =	Guadalu	pe
County	Summary of Projected Water Needs and V	Nater Supply	<b>Options</b>			User Gro	up(s) =	all	
Projecter	d Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		29	23	30	71	87	773	
	Industrial		985	1,204	1,350	1,487	1,692	-	
	Steam-Electric		0	0	0	0	0		
	Mining		196	198	200	202	207	213	
	Irrigation		985	879	779	684	594	508	
	Total Needs		2,195	2,304	2,359	2,444	2,580	3,393	
	Mun, Ind, S-E, & Min Needs		1,210	1,425	1,580	1,760	1,986	2,885	
	Irrigation Needs		985	879	779	684	594	508	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.	.) Demand Reduction (Conservation)		235	236	236	5	5	6	
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	75,000	1,500	1,500	2,000	2,000	2,500	4,500	2, 3
									· · · ·
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		1,735	1,736	2,236	2,005	2,505	4,506	
	Total System Mgmt. Supply / Deficit		-460	-568	-123	-439	-75		
M	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		525	311	656	245	519	,	
	Irrigation System Mgmt. Supply / Deficit		-985	-879	-779	-684	-594	-508	
Mate									
Notes:	Orandidata Naw Orandian July (	al a settifica al f	ulter land						
	Candidate New Supplies shown for year 2000 are i					available im	mediately.	· · · · · · · · · · · · · · · · · · ·	
1	Demand Reduction (Conservation) strategies assu						المعرفة المعر		
2	Candidate new supply to be shared by Bexar and C						iantified.		
3	Early implementation of facilities assumed in cost e				<u> </u>			- 4161	
4	Option expected to provide additional water supply	in many years, I	out dependa	ible supply o	during drou	ignt is preser	ntiy unquai	ntified.	

# Environmental/Conservation Alternative Regional Water Plan Hays County



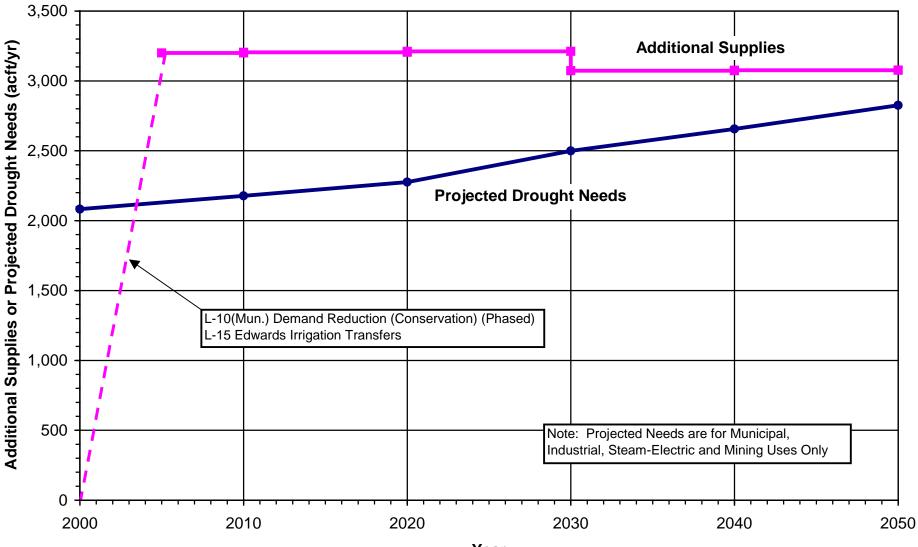
South Ce	ntral Texas Region					C	ounty =	Hays	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		4,325	7,609	10,980	16,349	22,696	29,059	
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		84	82	68	55	37	28	
	Irrigation		0	0	0	0	0		
	Total Needs		4,409	7,691	11,048	16,404	22,733	29,087	
	Mun, Ind, S-E, & Min Needs		4,409	7,691	11,048	,	22,733		
	Irrigation Needs		0	0	0	0	0		
			-	-	-				
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		647	747	873		906		1
SCTN-3c	Simsboro Aquifer	55,000	4,000	7,000	10,500		22,000		2, 3
G-24	Canyon Reservoir	1.048	1,000	1.048	1.048		1.048		4
0 2 1		1,010	1,010	1,010	1,010	1,010	1,010	1,010	
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
- ( )									
	Total New Supplies		5,695	8,795	12,421	17,747	23,954	33,222	
			•						
	Total System Mgmt. Supply / Deficit		1,286	1,104	1,373	1,343	1,221	4,135	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,286	1,104	1,373	1,343	1,221	4,135	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i						nmediately		
1	Demand Reduction (Conservation) strategies assu								
2	Candidate New Supply to be shared among Bexar,						to be qua	ntified.	
3	Early implementation of facilities assumed in cost e		ure sufficier	nt supply du	ring droug	ht.			
4	Candidate New Supply for Wimberley and Woodcre								
5	Option expected to provide additional water supply	in many years, b	out dependa	ble supply o	during drou	ught is prese	ntly unqua	ntified.	

# Environmental/Conservation Alternative Regional Water Plan Kendall County



South Ce	ntral Texas Region					Co	ounty =	Kendall	
	ummary of Projected Water Needs and V	Vater Supply	<b>Options</b>			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		1,070	1,560	2,808	4,099	5,578	7,518	
	Industrial		2	3	4	4	5	6	
	Steam-Electric		0	0	0	_	0	-	
	Mining		0	0	0		0	-	
	Irrigation		0	0	0	-	0	•	
	Total Needs		1,072	1,563	2,812	4,103	5,583	7,524	
	Mun, Ind, S-E, & Min Needs		1,072	1,563	2,812	4,103	5,583	7,524	
	Irrigation Needs		0	0	0	0	0	0	
Water Sun	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		67	71	71	11	11		1
	Purchase Water from Major Provider		2,000	2,000	3,000		6,000		2, 3
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		2,067	2,071	3,071	5,011	6,011	8,011	
	Total System Mgmt. Supply / Deficit		995	508	259	908	428	487	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		995	508	259	908	428	487	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity implem	entation, but	t will not be	available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Assumed purchase from Bexar County major provi						ounty table	<u> </u>	
3	Early implementation of facilities assumed in cost e								
4	Option expected to provide additional water supply							- 4340	

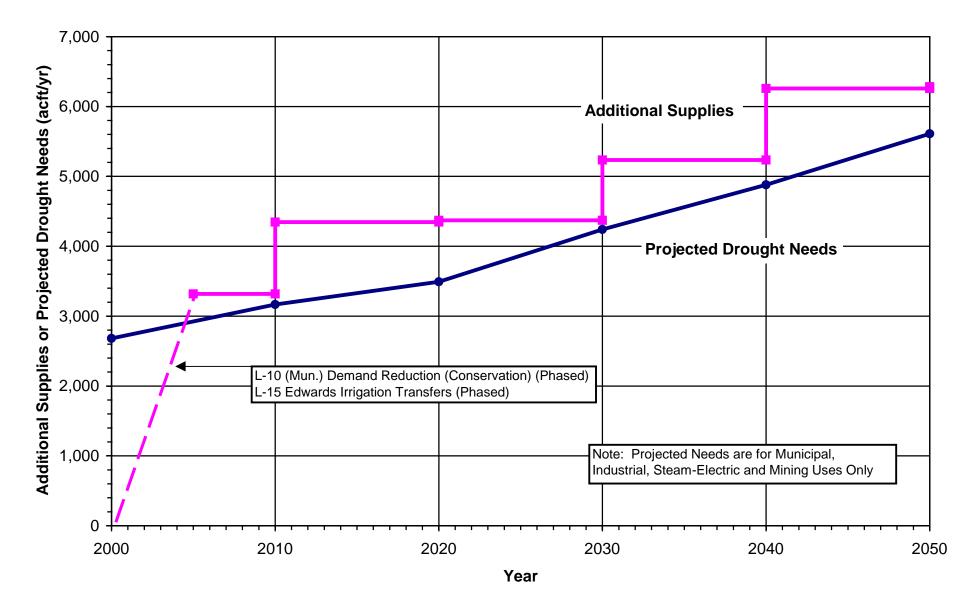
# Environmental/Conservation Alternative Regional Water Plan Medina County



Year

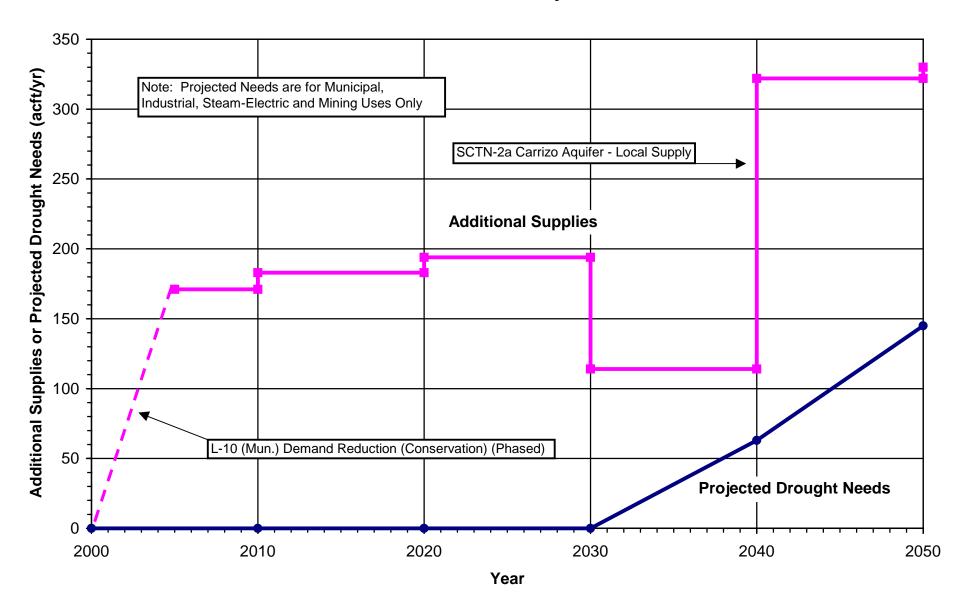
South Ce	entral Texas Region					Co	ounty =	Medina	
County S	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	up(s) =	all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,015	2,110	2,206	,	2,582	,	
	Industrial		0	0	0	-	0	-	
	Steam-Electric		0	0	0	-	0		
	Mining		68	68	70		74	-	
	Irrigation		98,916	95,268	91,320		88,925	,	
	Total Needs		100,999	97,446	93,596		91,581		
	Mun, Ind, S-E, & Min Needs		2,083	2,178	2,276		2,656		
	Irrigation Needs		98,916	95,268	91,320	92,320	88,925	84,692	
Water Sup	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	•		200	205	211		76		
L-15	Edwards Irrigation Transfers	50,000	3,000	3,000	3,000	3,000	3,000	3,000	2,
SCTN-4	Brush Management								
SCTN-4 SCTN-5	Weather Modification								
SCTN-5 SCTN-9	Rainwater Harvesting								
30111-3	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		11,867	11,867	11,867	11,867	11,867	11,867	
L=10 (III.)	Total New Supplies		15,067	15,072	15,078		14,943		
			10,001	10,012	10,010	1 1,0 10	11,010	1 1,0 10	
	Total System Mgmt. Supply / Deficit		-85,932	-82,374	-78,518	-79,879	-76,638	-72,573	
Mu	in, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,117	1,027	935		420		
	Irrigation System Mgmt. Supply / Deficit		-87,049	-83,401	-79,453	-80,453	-77,058	-72,825	
Notes:									
NOLES:	Candidate New Supplies shown for year 2000 are i	deptified for price	rity implome	ntation but	will not be		modiatoly		
1	Demand Reduction (Conservation) strategies assu						integlately	·	
2	Candidate New Supply to be shared among Uvalde						reliable in (	drought	
23	Pursuant to draft EAA Critical Period Management							alouyin.	
•	the estimated maximum potential annual transfer (								
4	Option expected to provide additional water supply							ntified.	
5	Estimates based upon use of LEPA systems on 80								
-	application rate, but applicable to only 50 percent o								

# Environmental/Conservation Alternative Regional Water Plan Uvalde County



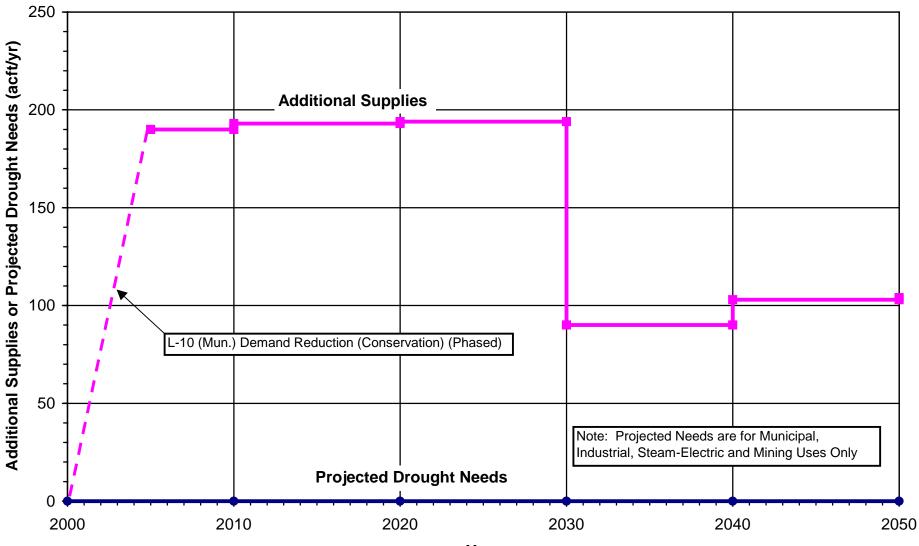
South Co	entral Texas Region					Co	ounty =	Uvalde	
	Summary of Projected Water Needs and V	Nater Supply	Options			User Gro	up(s) =	all	
-			•				/		
Projected	l Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,682	3,166	3,493	4,241	4,880	5,609	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		75,263	72,798	70,154	71,022	68,880	65,676	
	Total Needs		77,945	75,964	73,647	75,263	73,760	71,285	
	Mun, Ind, S-E, & Min Needs		2,682	3,166	3,493	4,241	4,880	5,609	
	Irrigation Needs		75,263	72,798	70,154	71,022	68,880	65,676	
Water Su	nnly Ontions (soft/yr)	Candidate							
	pply Options (acft/yr)		0000*	0010	0000	0000	00.40	0050	Netes
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
(	) Demand Reduction (Conservation)		318	346	371	235	258		
L-15	Edwards Irrigation Transfers	81,000	3,000	4,000	4,000	5,000	5,000	6,000	2, 3, 4
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)		14,143	14,143	14,143	14,143	14,143	14,143	6
	Total New Supplies		17,461	18,489	18,514	19,378	19,401	20,426	
	Total System Mgmt. Supply / Deficit		-60,484	-57,475	-55,133	-55,885	-54,359	-50,859	
Мі	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		636	1,180	878	994	378		
inc	Irrigation System Mgmt. Supply / Deficit		-61,120	-58,655	-56,011	-56,879	-54,737	-	
Notes:									
*	Candidate New Supplies shown for year 2000 are	dentified for price	rity impleme	entation, but	will not be	available im	mediately		
	Demand Reduction (Conservation) strategies assu								
1						may not be	reliable in a	drought.	
1		e. Medina. Atasc							
1 2 3	Candidate New Supply to be shared among Uvalde								
1 2 3	Candidate New Supply to be shared among Uvalde Pursuant to draft EAA Critical Period Management	rules, Candidate	e New Supp	ly represent	s approxim	nately 85 per	cent of		
1 2 3 4	Candidate New Supply to be shared among Uvalde Pursuant to draft EAA Critical Period Management the estimated maximum potential annual transfer (	rules, Candidate 95,430 acft) bas	e New Supp ed on Propo	ly represent sed Permits	s approxim s prorated	nately 85 per to 400,000 a	cent of		
4	Candidate New Supply to be shared among Uvalde Pursuant to draft EAA Critical Period Management the estimated maximum potential annual transfer ( Early implementation of facilities assumed in cost e	rules, Candidate 95,430 acft) bas estimation to ens	e New Supp ed on Propo sure sufficier	ly represent osed Permits nt supply du	s approxim prorated ring drougl	nately 85 per to 400,000 a nt.	cent of cft/yr.		
1 2 3 4 5 6	Candidate New Supply to be shared among Uvalde Pursuant to draft EAA Critical Period Management the estimated maximum potential annual transfer (	rules, Candidate 95,430 acft) bas estimation to ens in many years, I	e New Supp ed on Propo sure sufficien out depende	ly represent osed Permits nt supply du oble supply d	s approxim s prorated ring drough luring drou	nately 85 per to 400,000 a nt. ght is prese	cent of cft/yr. ntly unqua	ntified.	

# Environmental/Conservation Alternative Regional Water Plan Wilson County



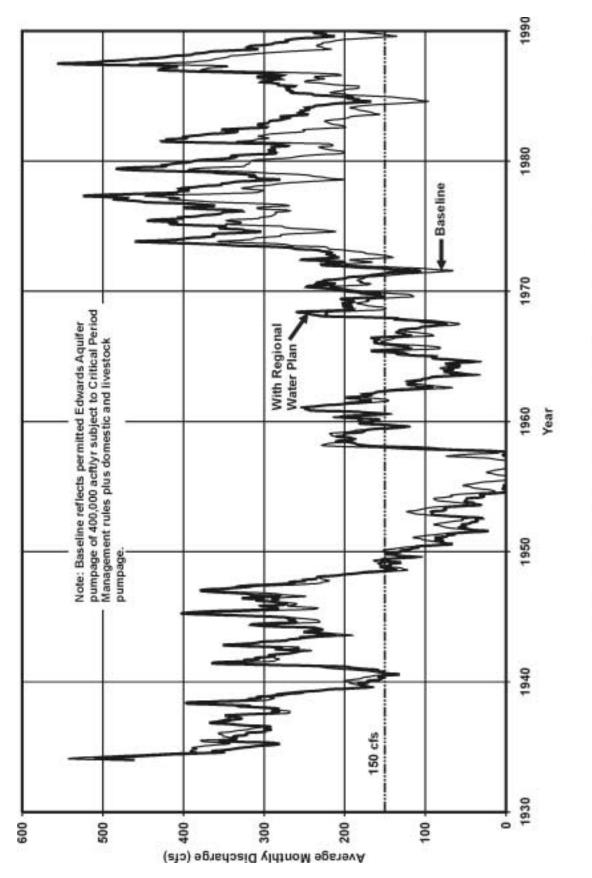
South Ce	ntral Texas Region					Co	ounty =	Wilson	
County S	ummary of Projected Water Needs and W	later Supply	Options			User Gro	up(s) =	all	
Dreiseted	Motor Nacio (active)								
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2000	0	0		63	145	Notes
	Industrial		0	0	0		03	0	
	Steam-Electric		0	0	0		0	0	
	Mining		0	0	0	-	0	0	
	Irrigation		0	0	0		0	0	
	Total Needs		0	0	0		63	145	
	Mun, Ind, S-E, & Min Needs		0	0	0	-	63	145	
	Irrigation Needs		0	0	0	_	03	145	
	Inigation Needs		U	U	0	0	0	U	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
10 (Mun.)	Demand Reduction (Conservation)		171	183	194	114	122	130	
SCTN-2a	Carrizo Aquifer - Local Supply						200	200	
									-
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
- \ /	Total New Supplies		171	183	194	114	322	330	
	Total System Mgmt. Supply / Deficit		171	183	194	114	259	185	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		171	183	194	114	259	185	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:	Demand Reduction (Conservation) strategies assur	mod lorgoly roft	otod in proje		domonda				
ו ס	Additional well(s) for Floresville.	nieu largely refle	ected in proje	ected water	uemanos.				
/	ADDWDDALWEII(S) TOF FIORESVIIIE								

# Environmental/Conservation Alternative Regional Water Plan Zavala County

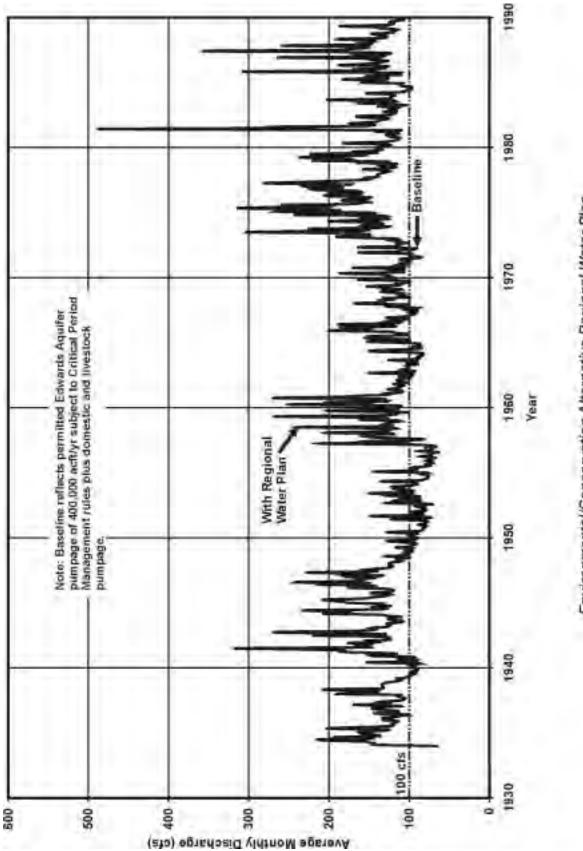


Year

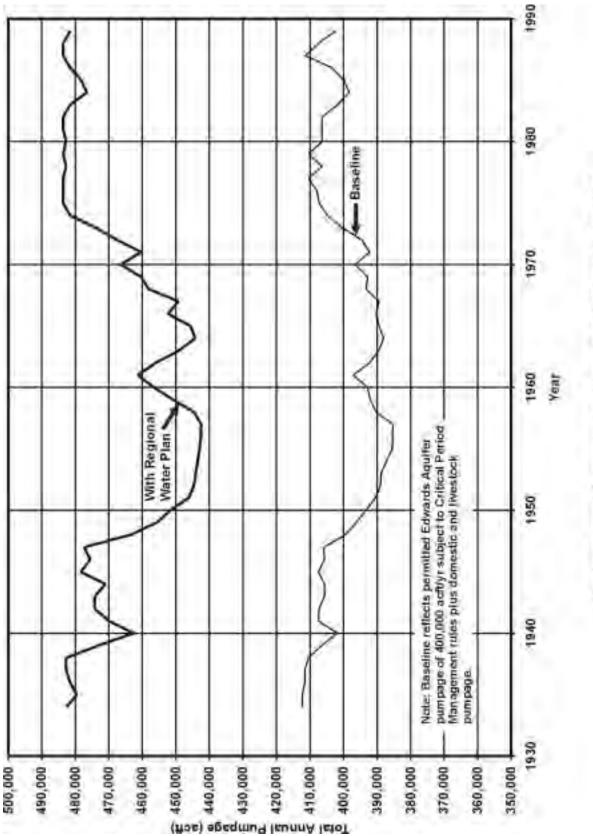
South Ce	entral Texas Region					С	ounty =	Zavala	
	Summary of Projected Water Needs and V	Nater Suppl	y Options	5		User Gro	oup(s) =	all	
Projected	l Water Needs (acft/yr)								
TTOJECIEU	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0		0				
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	Mun, Ind, S-E, & Min Needs		0	0	0		0		
	Irrigation Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	pply Options (acft/yr)	Candidate							
<b>ID#</b> L-10 (Mun.)	Description Demand Reduction (Conservation)	New Supply	<b>2000</b> 190	<b>2010</b> 193	<b>2020</b> 194	<b>2030</b> 90	<b>2040</b> 103	<b>2050</b>	Notes
SCTN-4 SCTN-5	Brush Management Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	
	Total New Supplies		6,591	6,594	6,595	6,491	6,504	6,505	
	Total System Mgmt. Supply / Deficit		-74,131	-69,995	-66,060	-81,802	-78,169	-74,695	
Mu	Ind, S-E, & Min System Mgmt. Supply / Deficit		190	193	194		,		
	Irrigation System Mgmt. Supply / Deficit		-74,321	-70,188	-66,254		-78,272		
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely ref	ected in pro	iactad wata	r domanda				
2	Option expected to provide additional water supply						ntly upqua	atified	
2	Estimates based upon use of LEPA systems on 50								
5	application rate.	percent of acre	ayes iniyal					Ingation	



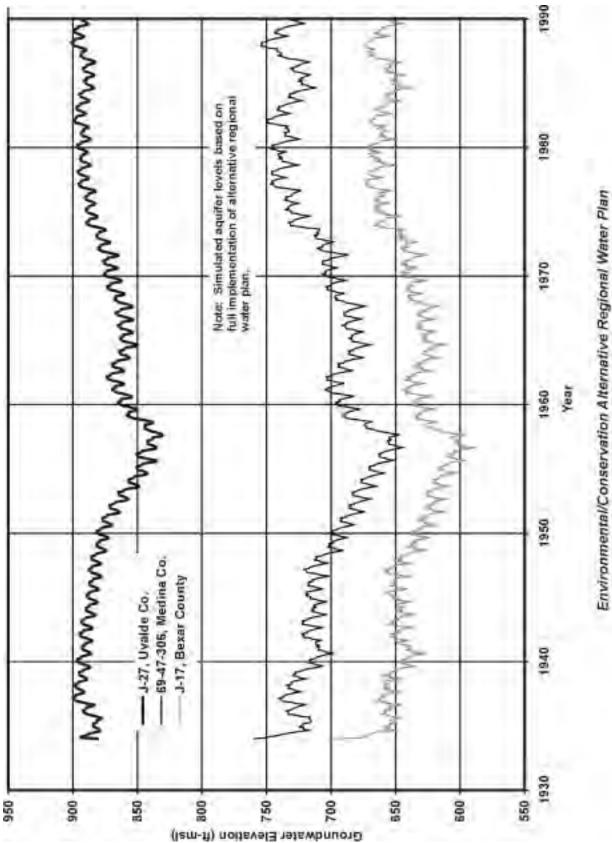
Environmental/Conservation Alternative Regional Water Plan Simulated Comal Springs Discharge



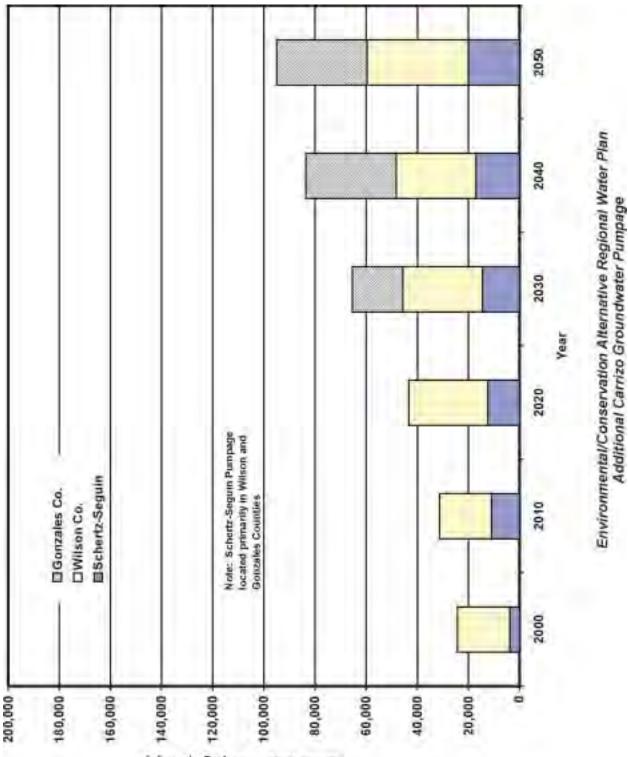
Environmental/Conservation Alternative Regional Water Plan Simulated San Marcos Springs Discharge



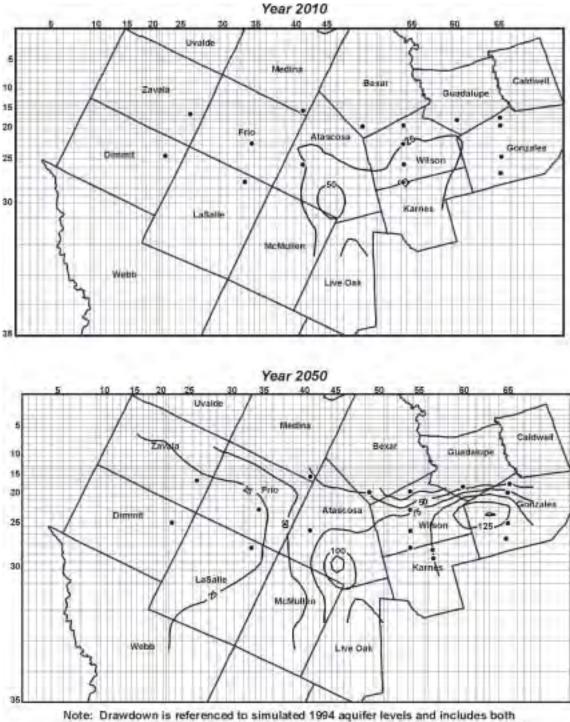
Environmental/Conservation Alternative Regional Water Plan Simulated Edwards Aquifer Pumpage



vironmentaiv.conservation Auternauve regione Simulated Edwards Aquifier Levels



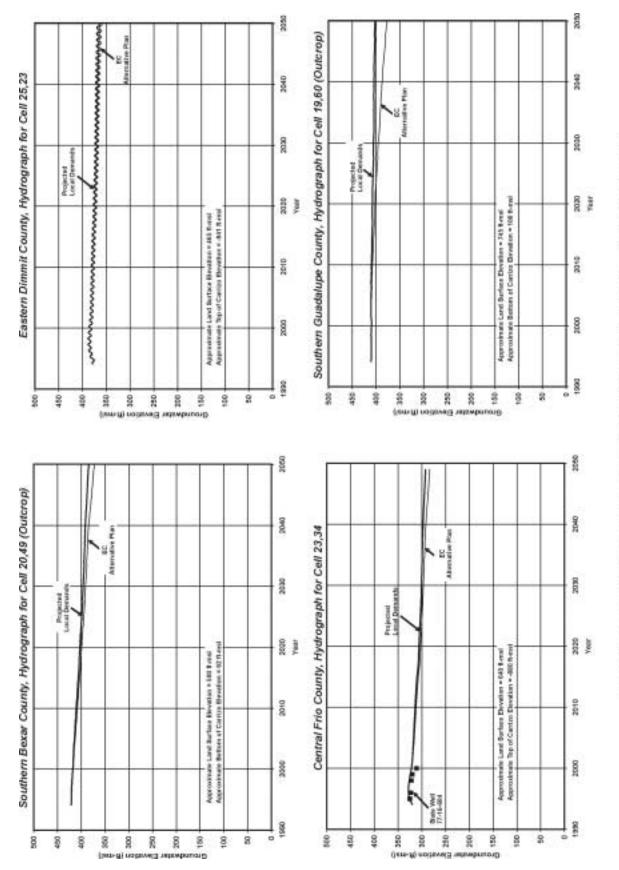
Groundwater Pumpage (acft/yr)



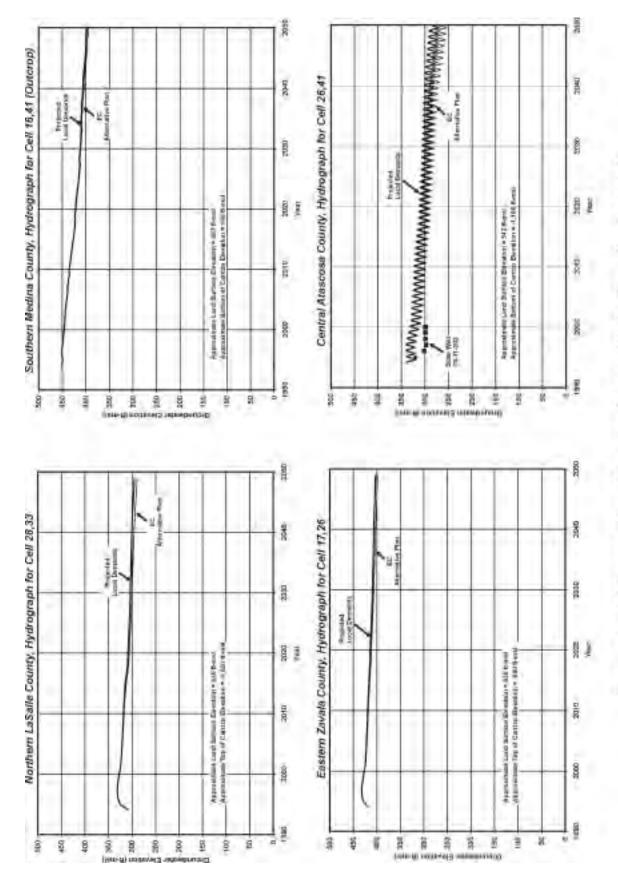
Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this alternative regional water plan.

Monitoring Well Location

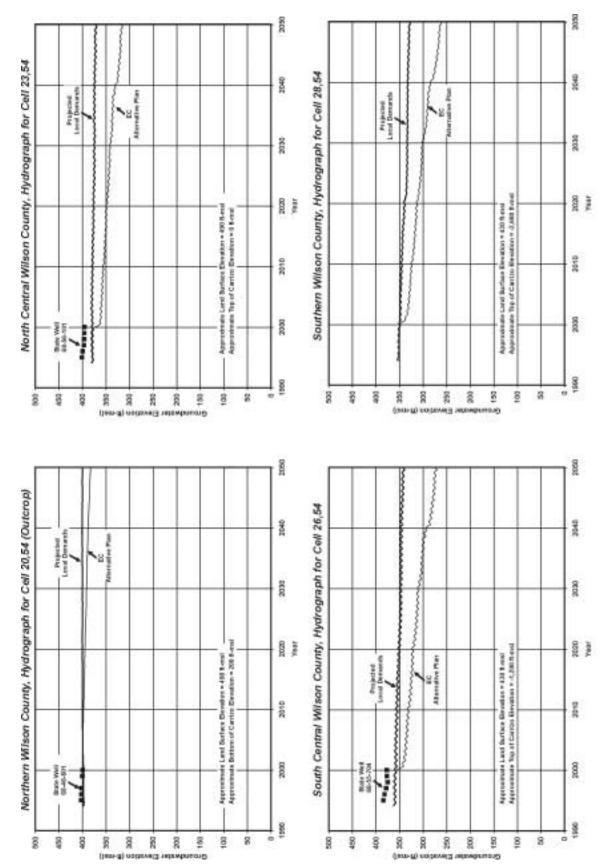
Environmental/Conservation Alternative Regional Water Plan Simulated Carrizo Aquifer Drawdown



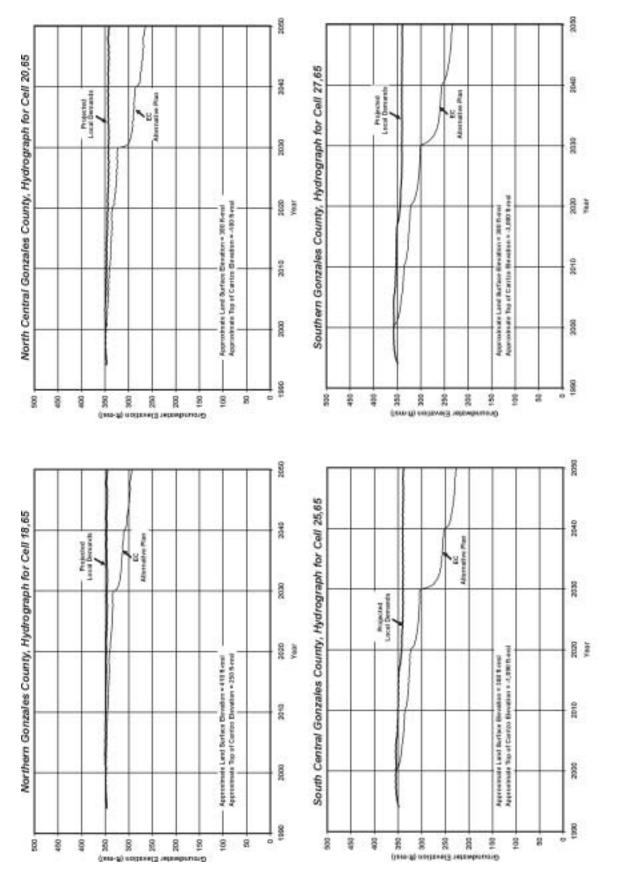




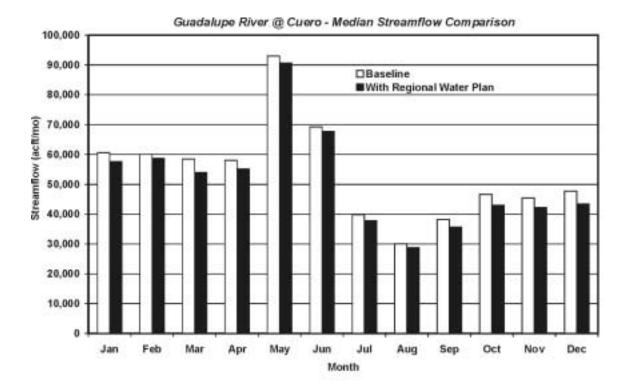


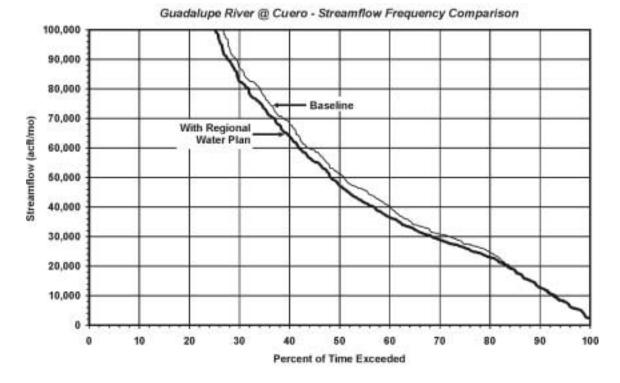




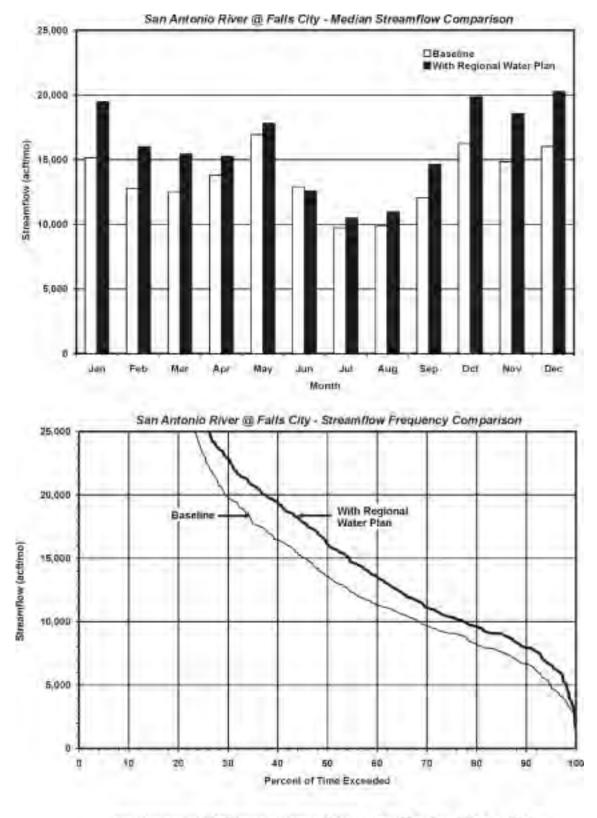




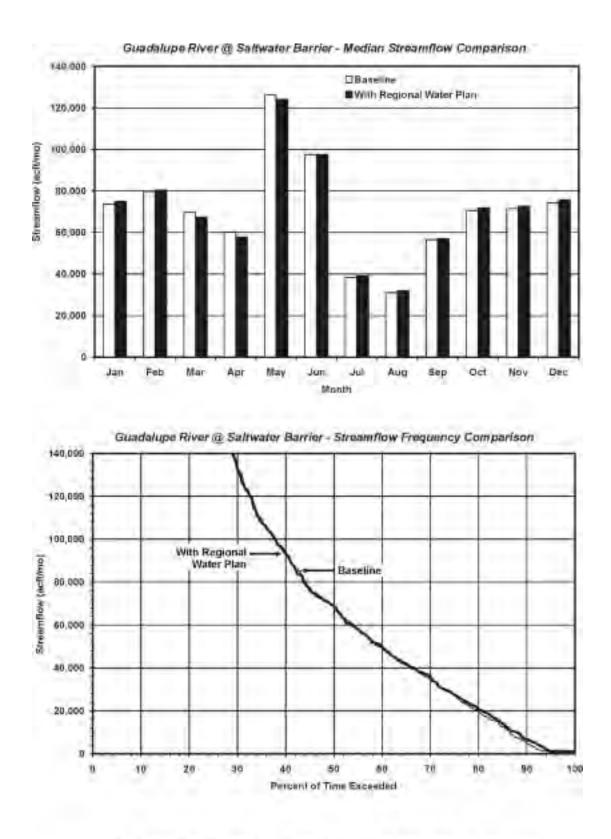




Environmental/Conservation Alternative Regional Water Plan Streamflow Comparisons



Environmental/Conservation Alternative Regional Water Plan Streamflow Comparisons



Environmental/Conservation Alternative Regional Water Plan Streamflow Frequency Comparisons

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Image:				of Water Supply Option	of Water		- W	5	n n		3	Water Quality			0	x	Time to Inglement It (yeard)	Land Impacted (acres)
Unit         Unit <thunit< th="">         Unit         Unit         <thu< td=""><td>÷</td><td>SCTN+17</td><td>Treated Woter Supply Options Destination of Deschiph Coundester</td><td>charo</td><td>reated Water Delivered</td><td>-</td><td>-</td><td>-</td><td>÷</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1.0</td><td>3</td><td>8</td><td></td><td></td></thu<></thunit<>	÷	SCTN+17	Treated Woter Supply Options Destination of Deschiph Coundester	charo	reated Water Delivered	-	-	-	÷	-	-	-	-	1.0	3	8		
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(0)         (0) <td>4044</td> <td>C-13C</td> <td></td> <td></td> <td>reated Whater Distributed reated Whater Delivered</td> <td></td> <td></td> <td></td> <td>ar 44</td> <td></td> <td></td> <td></td> <td></td> <td>00</td> <td>1,206</td> <td>50,000 1,048</td> <td>5 to 15 1 to 5</td> <td>4 5 1</td>	4044	C-13C			reated Whater Distributed reated Whater Delivered				ar 44					00	1,206	50,000 1,048	5 to 15 1 to 5	4 5 1
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(107)tm Among       (priorit system (statistic)       (mode statistic)	282.6	SCTN48	Edwards Aquifer Rucharge Enhanzement with Quadwipe River Diversions near Genzales (SCIN-86) Buadelana River Diversion mar Context to Ruchana Zona via Medina Luka		tee Water in Aquilier tee Water in Aquilier	~	- 01	~ +	C4 C4					<u> </u>	1,941	51,133	5 10 15	8 20
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Button Fluides Construction         Construction </td <td>64 B 3</td> <td>SCTN3a</td> <td>Smithen Aquiler Bastrop, Lee, and Milam Courties with Dalwary to Colorada River</td> <td>Ofher Aq</td> <td>Water</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>64.1</td> <td></td> <td>80</td> <td>25,000</td> <td>1 10 5</td> <td></td>	64 B 3	SCTN3a	Smithen Aquiler Bastrop, Lee, and Milam Courties with Dalwary to Colorada River	Ofher Aq	Water								64.1		80	25,000	1 10 5	
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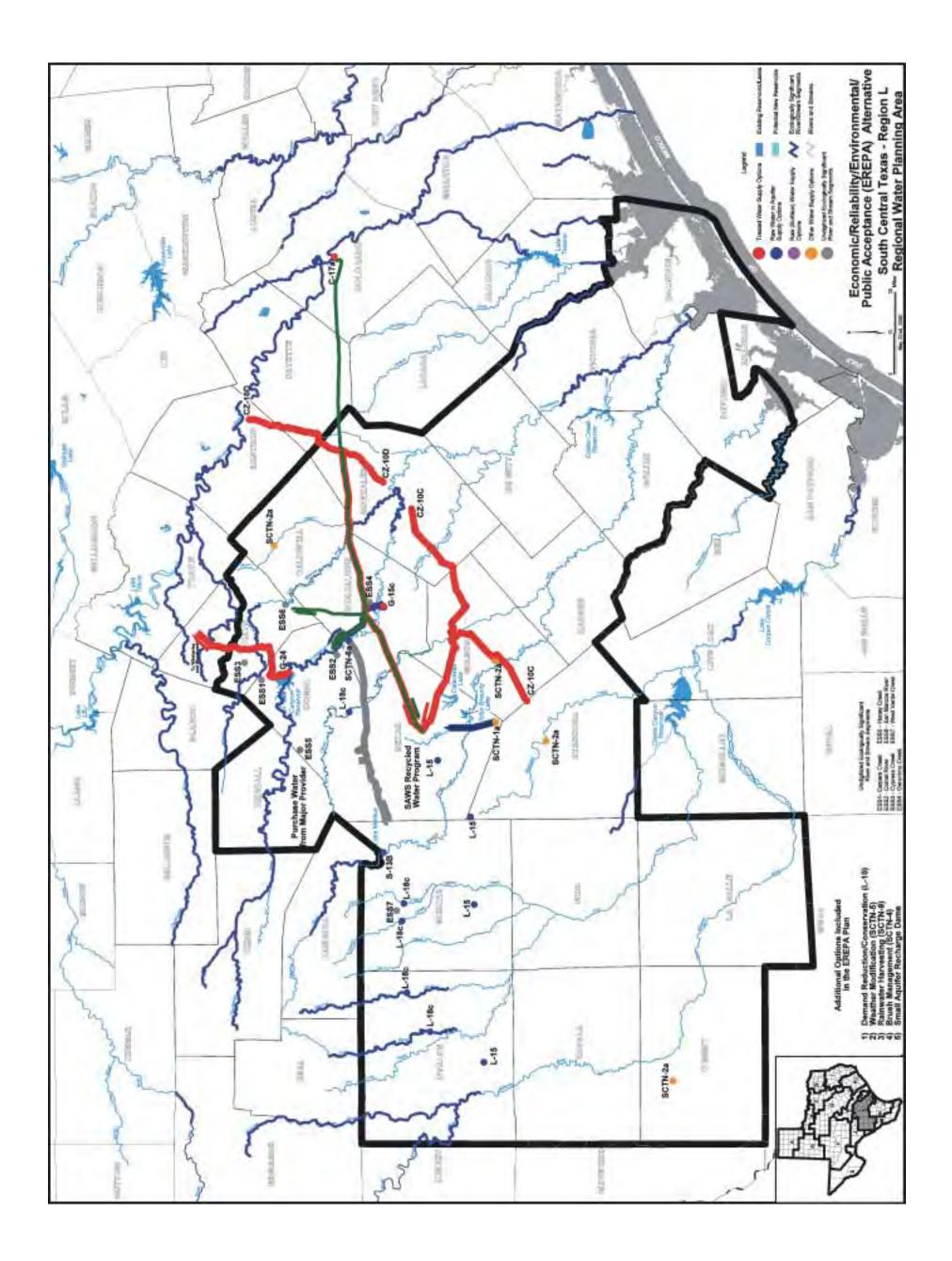
# "EREPA"

# Economic / Reliability / Environmental / Public Acceptance **Regional Water Management Alternative Plan**

# South Central Texas Regional Water Planning Group

San Antonio River Authority

HDR Engineering, Inc. June 13, 2000



### South Central Texas Region Alternative Water Plans

Alternative Name: Economic/Reliability/Environmental/Public Acceptance

#### Alternative ID: EREPA

Alternative Description: The Economic / Reliability / Environmental / Public Acceptance Alternative Regional Water Plan is predicated on the development of water supply options having the least expected annual unit cost of water. Environmental considerations are incorporated using the same qualitative measures employed for the Environmental / Conservation (E/C) Alternative Regional Water Plan. Public acceptance at the source location and reliability in drought conditions are also considered in this alternative regional water plan. The following water supply options are included in the Economic / Reliability / Environmental / Public Acceptance Alternative Regional Water Plan (in no particular order):

- 1. Demand Reduction / Conservation (L-10)
- 2. Edwards Irrigation Transfers (L-15)
- 3. Medina Lake Recharge Enhancement (S-13B)
- 4. Edwards Recharge Type 2 Projects (L-18c)
- 5. Edwards Recharge Guadalupe R. Diversions (SCTN-6a)
- 6. Carrizo Aquifer Wilson and Gonzales Counties (CZ-10C)
- 7. Carrizo Aquifer Atascosa, Gonzales, and Bastrop Counties (CZ-10D)
- 8. Colorado R. @ Columbus LCRA Irrigation & Stored Water (C-17A)
- 9. Canyon Reservoir (G-15C)
- 10. Wimberley & Woodcreek Canyon (G-24)
- 11. Carrizo Aquifer Local Supply (SCTN-2a)
- 12. Brush Management (SCTN-4)
- 13. Weather Modification (SCTN-5)
- 14. Rainwater Harvesting (SCTN-9)

### EREPA Alternative Regional Water Plan Summary of Key Information for South Central Texas Regional Water Planning Group

#### Quantity, Reliability, and Cost

- Plan includes management supplies to meet projected needs, ensure reliability, and maintain springflow, resulting in a quantity of additional water supplies sufficient to meet projected needs for municipal, industrial, steam-electric power, and mining uses through the year 2050.
- Cost is the least among the five alternative plans under consideration.

#### **Environmental Factors**

- Increased median annual streamflows in the San Antonio River.
- Below average concerns with respect to all environmental factors evaluated for the five alternative plans under consideration.
- Least concerns with Vegetation & Wildlife Habitat and Ecologically Significant Stream Segments among the five alternative plans under consideration.

#### Impacts on Water Resources

- No unmitigated reductions in water available to existing water rights.
- Long-term reductions in water levels in the Carrizo Aquifer. Drawdown would be the greatest for the five alternative plans under consideration.

#### **Impacts on Agriculture and Natural Resources**

- Major commitment to municipal and irrigation water Demand Reduction (Conservation) (L-10).
- Includes Brush Management (SCTN-4) and Weather Modification (SCTN-5).
- Inclusion of water supply options to meet projected irrigation needs in full is estimated to be economically infeasible at this time. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching).
- Includes maximum potential voluntary transfer of Edwards Aquifer irrigation permits to municipal permits through lease or purchase.
- Includes Medina Lake Recharge Enhancement (S-13B) which reduces or eliminates water supplies from the Medina Lake System for irrigation in Bexar, Medina, and Atascosa Counties.

#### **Other Relevant Factors per SCTRWPG**

#### **Comparison of Strategies to Meet Needs**

• Selection of water supply options comprising the alternative plan based primarily on least unit cost.

#### Interbasin Transfer Issues

- Projected non-irrigation needs in basin(s) of origin are met throughout the planning period.
- Plan includes two interbasin transfers: 1) Edwards Recharge Guadalupe River Diversions (SCTN-6a) from the Guadalupe River near Lake Dunlap to the outcrop of the Edwards Aquifer in the San Antonio River Basin; and 2) LCRA Irrigation & Stored Water (C-17A) from the Colorado River at Columbus to Bexar, Comal, Guadalupe, and Hays Counties.

#### **Third-Party Impacts of Voluntary Redistribution of Water**

- Potential positive or negative effects of Edwards Irrigation Transfers (L-15).
- Lower water levels in some portions of the Carrizo Aquifer.

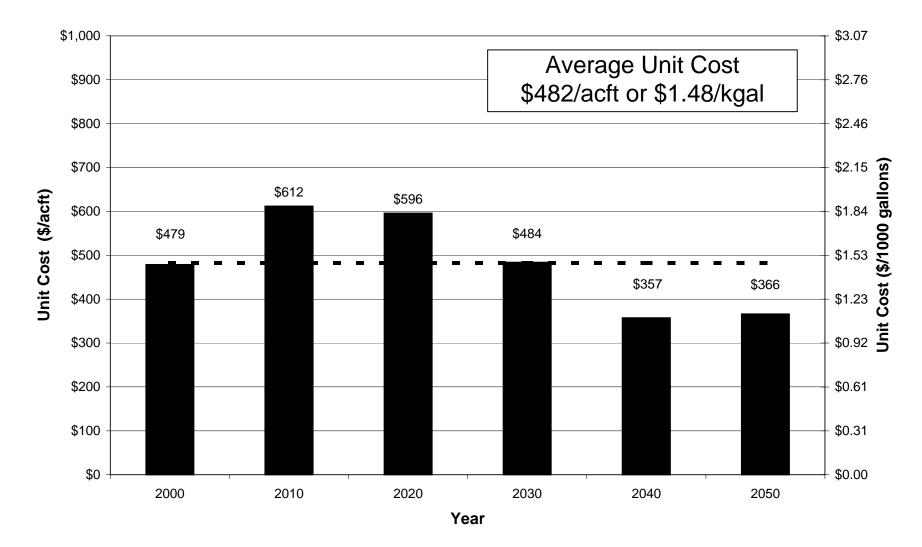
#### **Regional Efficiency**

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Terminal storage and regional water treatment facilities in Bexar and Guadalupe Counties increase efficiency, improve reliability, and reduce unit cost.
- Shared transmission facilities for Colorado River (C-17A), Carrizo Aquifer (CZ-10D), and Guadalupe River (G-15C) supplies reduce cost.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.
- Edwards Recharge Guadalupe River Diversions (SCTN-6a) provides for recovery and recirculation of enhanced Comal springflow resulting from implementation of Edwards Recharge Type 2 Projects (L-18c).

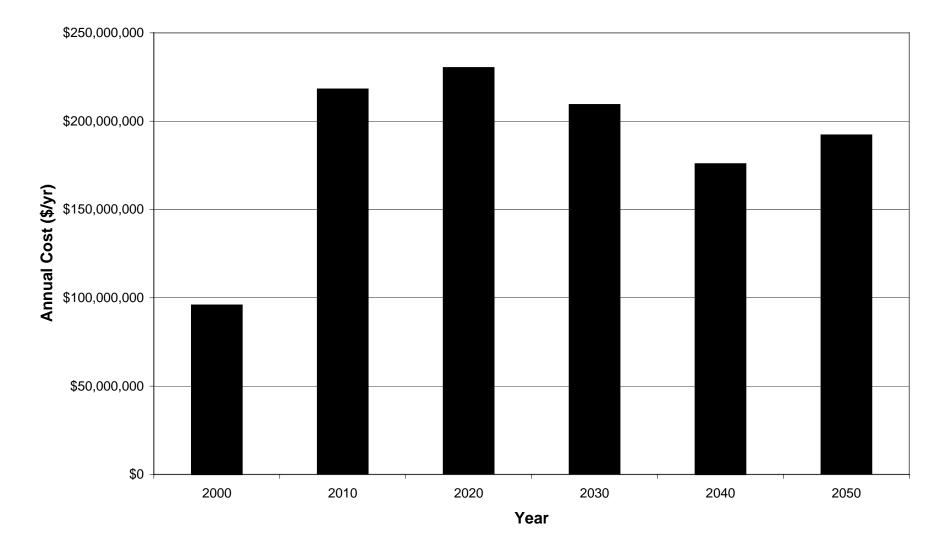
#### Effect on Navigation

• Not applicable.

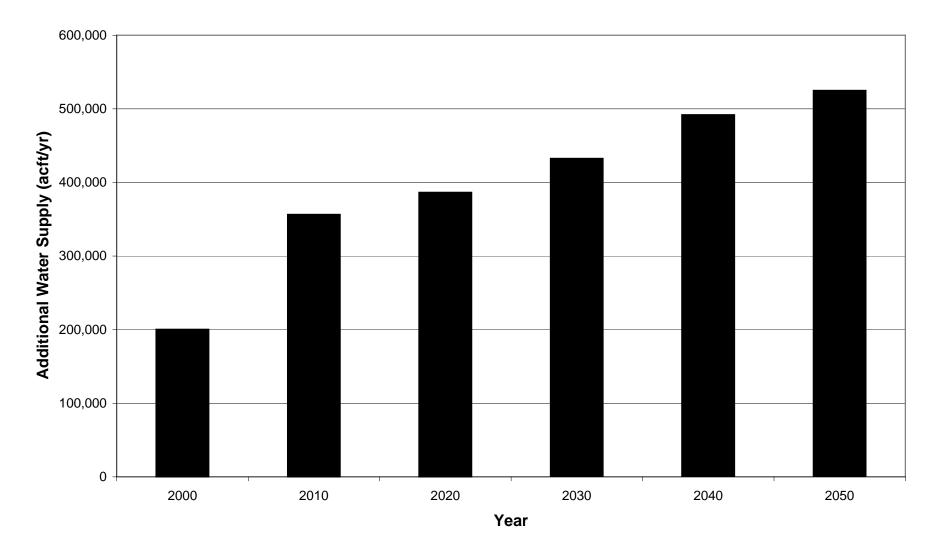
### EREPA Alternative Regional Water Plan Unit Cost of Cumulative Additional Water Supply

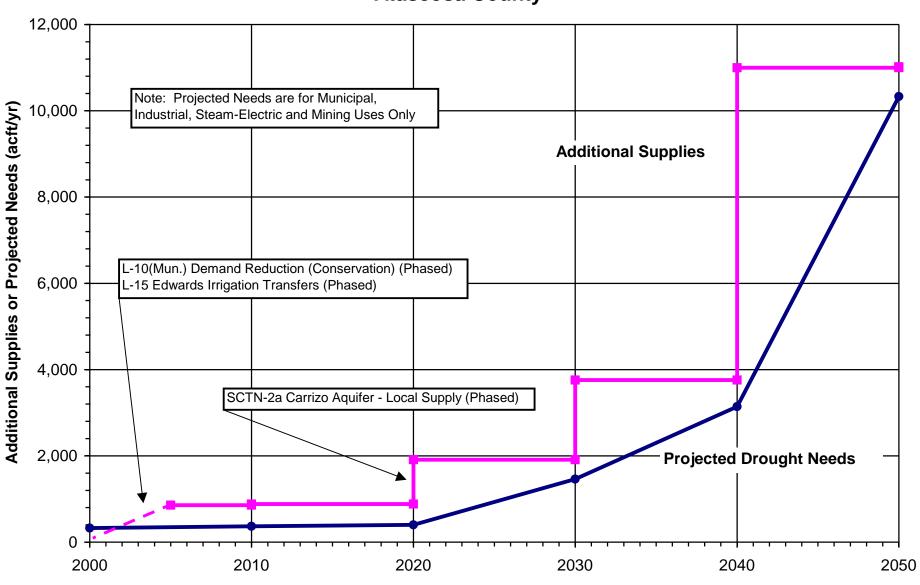


# EREPA Alternative Regional Water Plan Annual Cost of Cumulative Additional Water Supply



## EREPA Alternative Regional Water Plan Cumulative Additional Water Supply

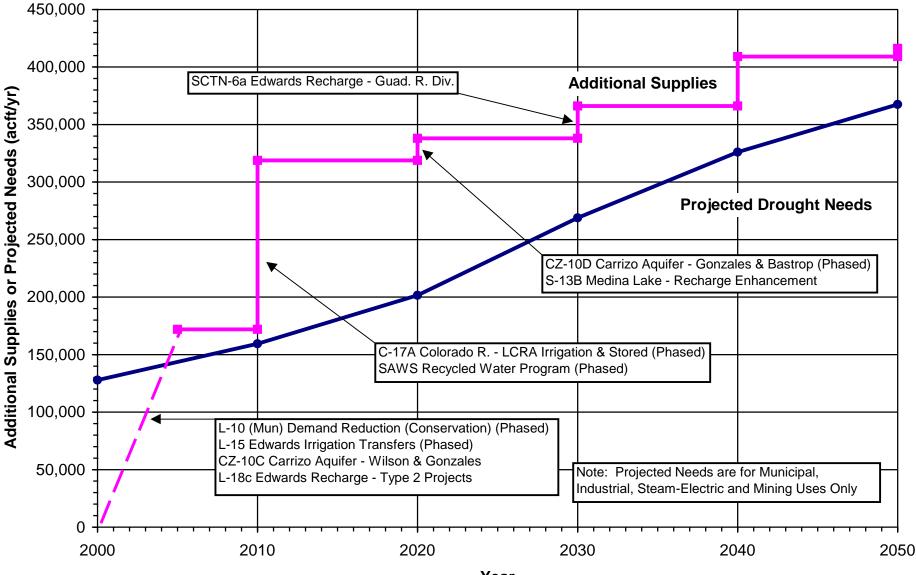




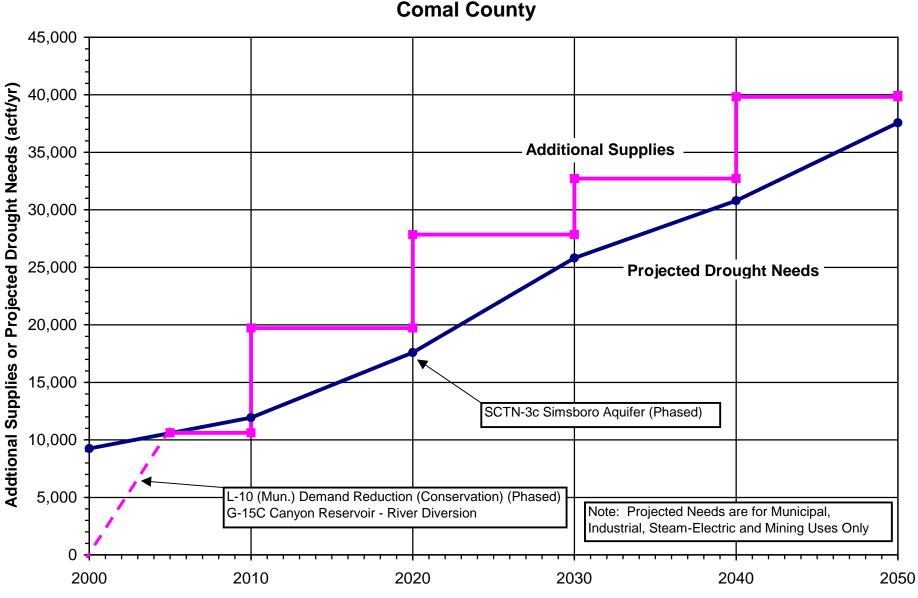
# EREPA Alternative Regional Water Plan Atascosa County

South Ce	entral Texas Region					Co	ounty =	Atascosa	3
County S	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	up(s) =	all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366	401	468	530	587	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0		1,504	,	
	Mining		0	0	0		1,109		
	Irrigation		38,418	36,718	35,170	43,726	42,190	,	
	Total Needs		38,743	37,084	35,571	45,189	45,333		
	Mun, Ind, S-E, & Min Needs		325	366	401	1,463	3,143		
	Irrigation Needs		38,418	36,718	35,170	43,726	42,190	40,713	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	) Demand Reduction (Conservation)		356	384	411	259	300		-
L-15	Edwards Irrigation Transfers	81,000	500	500	500	500	700		2, 3,
SCTN-2a	Carrizo Aguifer - Local Supply	. ,				1.000	3,000		5.
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams			0.000		0.000			
L-10 (Irr.)	Demand Reduction (Conservation)		3,962	3,962	3,962	3,962	3,962	,	
	Total New Supplies		4,818	4,846	4,873	5,721	7,962	14,981	
	Total System Mgmt. Supply / Deficit		-33,925	-32,238	-30,698	-39,468	-37,371	-36,062	
Mu	in, Ind, S-E, & Min System Mgmt. Supply / Deficit		531	518	510	296	857	689	
	Irrigation System Mgmt. Supply / Deficit		-34,456	-32,756	-31,208	-39,764	-38,228	-36,751	
Notes:									
*	Candidate New Supplies shown for year 2000 are i						nmediately		
1	Demand Reduction (Conservation) strategies assu								
2	Candidate New Supply to be shared among Uvalde							drought.	
3	Pursuant to draft EAA Critical Period Management								
	the estimated maximum potential annual transfer (	95,430 acft) bas	ed on Propo	sed Permit	s prorated	to 400,000 a	acft/yr.		
4	Additional Edwards supply is for City of Lytle.								
5	Additional Carrizo supply is for Steam-Electric and								
6	Early implementation of facilities assumed in cost e								
7	Option expected to provide additional water supply								
8	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997,	with conser	vation at 20	percent of	irrigation	
	application rate.								

### EREPA Alternative Regional Water Plan Bexar County



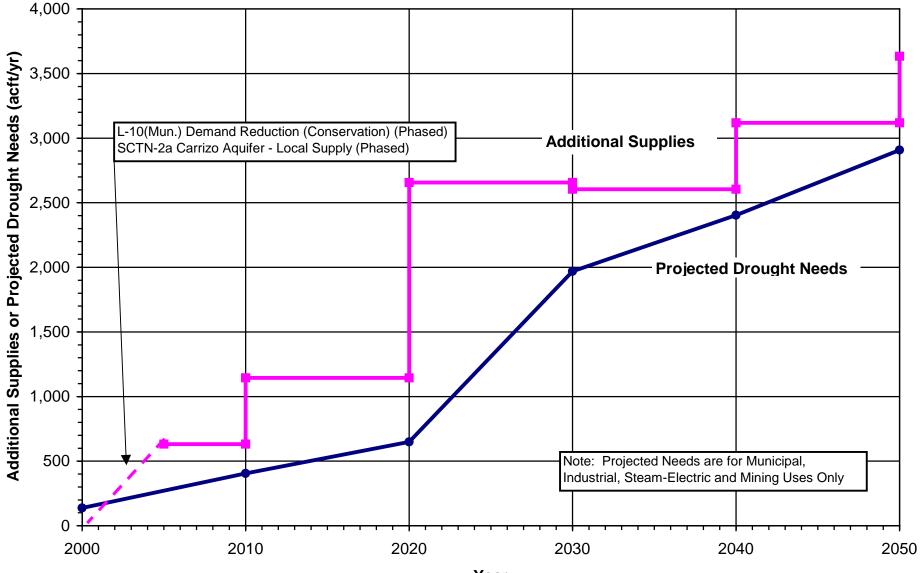
South Ce	ntral Texas Region					C	ounty =	Bexar	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		122,867	154,495	196,301		315,633		
	Industrial		0	0	0		4,759		
	Steam-Electric		0	0	0		0	,	
	Mining		4,963	4.936	5,201	5,406	5.645		
	Irrigation		22,575	20,374	19,585	19,015	18,385		
	Total Needs		150,405	179,805	221,087	287,921	344,422		
	Mun, Ind, S-E, & Min Needs		127,830	159,431	201,502		326,037		
	Irrigation Needs		22,575	20,374	19,585	19,015	18,385		
			, , , , , , , , , , , , , , , , , , ,	,	,	ļ	,	,	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		33,528	42,509	41,210	36,533	38,834	40,934	
L-15	Edwards Irrigation Transfers	81,000	50,000	55,000	60,000		70,000		2, 3
CZ-10C	Carrizo Aguifer - Wilson & Gonzales	75,000	75,000	75,000	75,000	75,000	75,000		
L-18c	Edwards Recharge - Type 2 Projects	13,451	13,451	13,451	13,451	13,451	13,451	13,451	
C-17A	Colorado R LCRA Irrigation & Stored	125,000	, 	113,000	93,500	70,000	48,000	23,000	5,6
	SAWS Recycled Water Program			19,826	26,737	35,824	43,561	52,215	7,8
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	145,000		,	20,000	20,000	70,000	90,000	4, 9, 10
S-13B	Medina Lake - Recharge Enhancement	8,136			8,136	8,136	8,136	8,136	
SCTN-6a	Edwards Recharge - Guad. R. Div.	42,121			,	42,121	42,121	42,121	
SCTN-1a	Aquifer Storage & Recovery - Regional								11
SCTN-4	Brush Management								12
SCTN-5	Weather Modification								12
SCTN-9	Rainwater Harvesting								12
	Small Aquifer Recharge Dams								12
L-10 (Irr.)	Demand Reduction (Conservation)		4,521	4,521	4,521	4,521	4,521	4,521	1:
	Total New Supplies		176,500	323,307	342,555	370,586	413,624	420,678	
	Total System Mgmt. Supply / Deficit		26,095	143,502	121,468		69,202	/ -	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		44,149	159,355	136,532	97,159	83,066		
	Irrigation System Mgmt. Supply / Deficit		-18,054	-15,853	-15,064	-14,494	-13,864	-12,847	
letee									
Notes:	Ora didata New Oversling alsows forward 2000 and i	dentifie difenserie	-14 - 1 1	and all and have	4	e ve ile ble in			
4	Candidate New Supplies shown for year 2000 are i Demand Reduction (Conservation) strategies assu					available in	imediately		
2	Candidate New Supply to be shared among Uvalde					may not be	rolioblo in r	drought	
3	Pursuant to draft EAA Critical Period Management							arougrit.	
J	the estimated maximum potential annual transfer (								
4	Effects on regional aquifer levels to be quantified.	JUS HOU AUTU DAS			s prorated	10 400,000 a	лон <i>у</i> уг.		
+5	Supply dependent upon future water needs in Regi	on K and/or inte	rhasin trans	fer issues (	120 Kacft/v	r decreasing	n to 80 Kar	ft/vr)	
5	Candidate New Supply to be shared among Bexar,						3 .0 00 Mac		
7	Current SAWS Recycled Water Program is include					nated need	s		
, B	Future use of recycled water for non-potable uses							and.	
9	Portion of 220,000 acft/yr considered under CZ-10								
10	90,000 acft/yr from Gonzales and Bastrop Counties						- • •		
10	SAWS ASR program in southern Bexar County inc		of Edwards	Aquifer su	pply and re	duces seaso	onal aquife	r demands	
12	Option expected to provide additional water supply								
13	Estimates based upon use of LEPA systems on 80	percent of acre	ages irrigate	ed in 1997	with conser	vation at 40	percent of	irrigation	



# EREPA Alternative Regional Water Plan Comal County

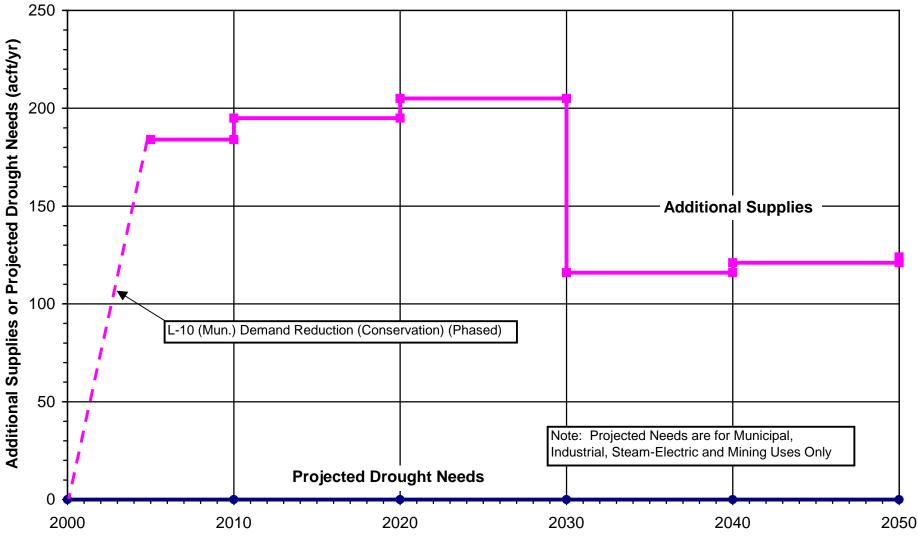
South Ce	entral Texas Region					C	ounty =	Comal	
	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,289	5,049	10,487		25,205		
	Industrial		1,388	1,425	1,486	1,737	2,009	2,289	
	Steam-Electric		0	0	0	-	0	-	
	Mining		5,570	5,464	5,628	5,796	3,590	2,224	
	Irrigation		30	14	0	0	0	-	
	Total Needs		9,277	11,952	17,601	25,815	30,804	37,575	
	Mun, Ind, S-E, & Min Needs		9,247	11,938	17,601	25,815	30,804	,	
	Irrigation Needs		30	14	0	0	0	0	
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		616	718	848	718	824	942	
G-15C	Canyon Reservoir - River Diversion	15,000	10,000	10,000	10,000	10,000	10,000	10,000	2, 3
C-17A	Colorado R LCRA Irrigation & Stored	125,000	- /	3,000	9,000	17,000	22,000	,	4, 5, 6
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
L 10 (iii.)									
	Total New Supplies		10,616	13,718	19,848	27,718	32,824	39.942	
			10,010	10,110	15,640	21,110	02,024	00,042	
	Total System Mgmt. Supply / Deficit		1,339	1,766	2,247		2,020	,	
Mu	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,369	1,780	2,247	1,903	2,020		
	Irrigation System Mgmt. Supply / Deficit		-30	-14	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prid	rity implem	entation, but	t may not b	e available	mmediatel	y.	
1	Demand Reduction (Conservation) strategies assu								
2	Portion of Canyon firm yield (with amendment) dive								
3	Candidate New Supply shared among Comal, Gua								
4	Supply dependent upon future water needs in Regi				120 Kacft/v	r decreasing	to 80 Kac	ft/yr).	
5	Candidate New Supply to be shared among Bexar,							- /	
6	Early implementation of facilities assumed in cost e					ht.			
	Option expected to provide additional water supply						nthunnauo	atified	

# EREPA Alternative Regional Water Plan Dimmit County

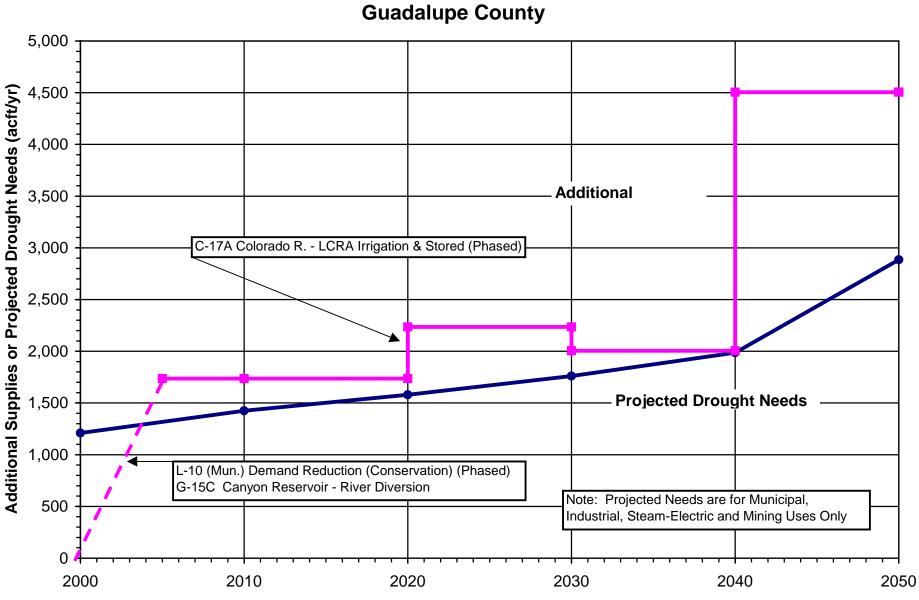


South Ce	ntral Texas Region					Co	ounty =	Dimmit	
County S	ummary of Projected Water Needs and V	Vater Supply	/ Options			User Gro	up(s) =	all	
Projected	Water Needs (acft/yr)								
Fillecteu	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		138	405	649	1,054	1,479		Notes
	Industrial		0	403	049	1,034	1,479	,	
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	915	925	-	
	Irrigation		0	0	0	2,133	1,737		
	Total Needs		138	405	649	4,102	4,141		
	Mun, Ind, S-E, & Min Needs		138	405	649	1,969	2,404		
	Irrigation Needs		0	0	045	2,133	1,737		
			-	-	-	_,	.,	.,	
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		131	144	156	104	118	133	
SCTN-2a	Carrizo Aquifer - Local Supply		500	1,000	1,000	2,500	3,000		2,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
	Total System Mgmt. Supply / Deficit		493	739	507	-1,498	-1,023	-606	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	635	714	725	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	-2,133	-1,737	-1,331	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prid	ority impleme	entation, but	will not be	available im	mediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Additional well(s) for Carrizo Springs and Mining su								
3	Early implementation of facilities assumed in cost e		sure sufficie	nt supply du	ring droual	nt.			
4	Option expected to provide additional water supply						ntlv unquai	ntified.	

EREPA Alternative Regional Water Plan Frio County



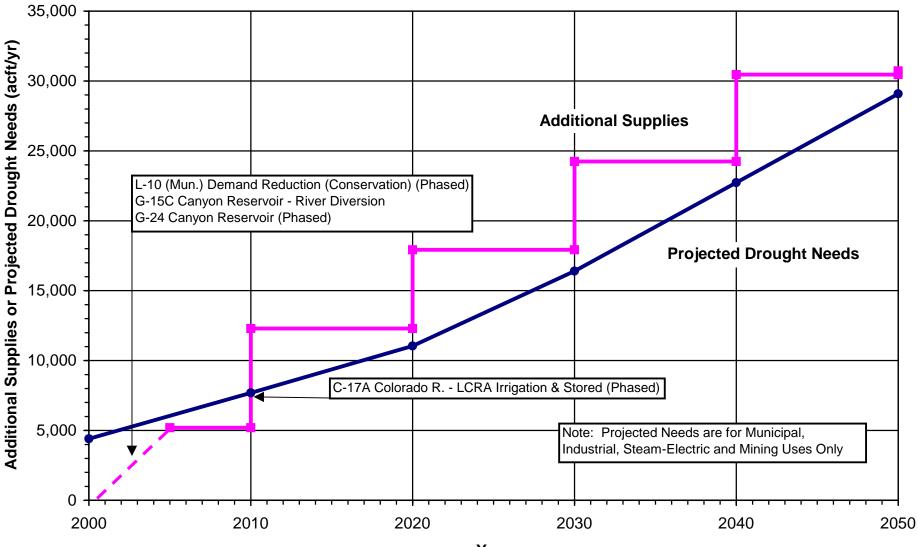
South Ce	entral Texas Region					Co	ounty =	Frio	
	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro		all	
							· [· ( - )		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	-	
	Irrigation		71,126	67,646	64,365	76,505	73,519	70,662	
	Total Needs		71,126	67,646	64,365	76,505	73,519	70,662	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		71,126	67,646	64,365	76,505	73,519	70,662	
	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		184	195	205	116	121	124	1
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams		5.0.17	5 0 17	= 0.17	5.0.17		5.0.17	2
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	
	Total New Supplies		6,131	6,142	6,152	6,063	6,068	6,071	
	Total System Mgmt. Supply / Deficit		-64,995	-61,504	-58,213	-70,442	-67,451	-64,591	
Mu	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		184	195	205	116	121	124	
	Irrigation System Mgmt. Supply / Deficit		-65,179	-61,699	-58,418	-70,558	-67,572		
	5		,	- ,		-,	- ,	.,	
Notes:									
1	Demand Reduction (Conservation) strategies assu								
2	Option expected to provide additional water supply	in many years,	but dependa	able supply of	during drou	ight is prese			
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997, v	with conser	vation at 20	percent of	irrigation	
	application rate.								



### EREPA Alternative Regional Water Plan Guadalupe County

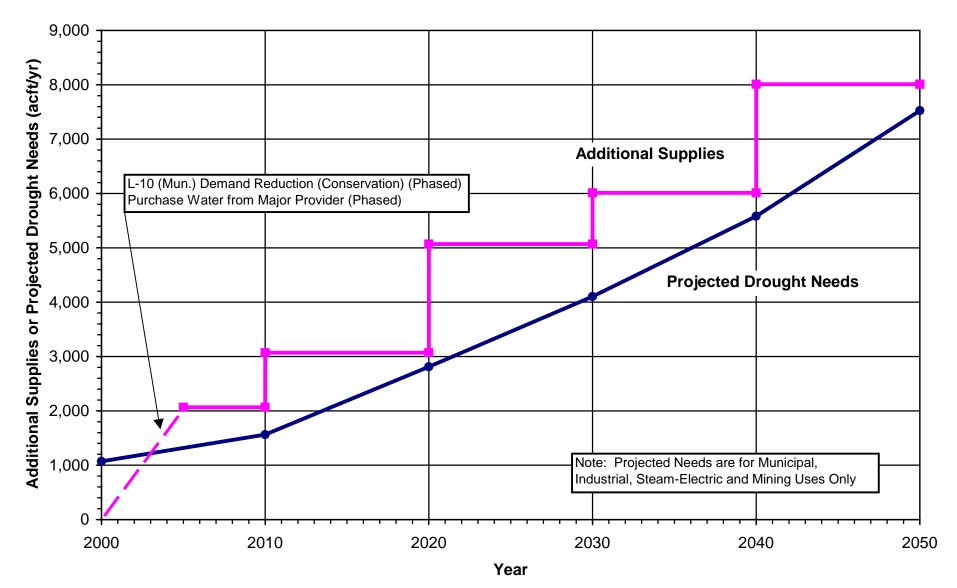
South Co	entral Texas Region					C	ounty =	Guadalu	pe
County S	Summary of Projected Water Needs and V	Nater Supply	/ Options			User Gro	oup(s) =	all	•
	Mater Neede (active)								
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
			====				=0.10		Notes
	Municipal		29	23	30		87	-	
	Industrial		985	1,204	1,350	1,487	1,692		
	Steam-Electric		0	0	0 200	0 202	0 207	-	
	Mining		196 985	198 879	200	202 684	207 594	-	
	Irrigation Total Needs				-				
	Mun, Ind, S-E, & Min Needs		2,195 1,210	2,304 1,425	2,359 1,580	2,444 1,760	2,580 1,986		
			985	1,425	1,580	684	1,986	,	
	Irrigation Needs		985	8/9	119	684	594	508	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.	) Demand Reduction (Conservation)		235	236	236	5	5	6	
G-15C	Canyon Reservoir - River Diversion	15,000	1,500	1,500	1,500	1,500	1,500	1,500	2, 3
C-17A	Colorado R LCRA Irrigation & Stored	125,000	,	,	500	500	1,000	,	4, 5,
	Small Aquifer Recharge Dams								· · ·
L-10 (Irr.)	Demand Reduction (Conservation)								
<u> </u>									
			4 705	4 700		0.005		4 500	
	Total New Supplies		1,735	1,736	2,236	2,005	2,505	4,506	
	Total System Mgmt. Supply / Deficit		-460	-568	-123	-439	-75	1,113	
Μι	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		525	311	656	245	519		
	Irrigation System Mgmt. Supply / Deficit		-985	-879	-779	-684	-594	-508	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for price	rity impleme	entation, but	t will not be	available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu		<u> </u>	, ,					
2	Portion of Canyon firm yield (with amendment) dive								
3	Candidate New Supply shared among Comal, Gua								
4	Supply dependent upon future water needs in Regi			fer issues (	120 Kacft/v	r decreasing	to 80 Kac	ft/yr).	
5	Candidate New Supply to be shared among Bexar,								
6	Early implementation of facilities assumed in cost e					nt.			
7	Option expected to provide additional water supply						ntly unqua	ntified	

### EREPA Alternative Regional Water Plan Hays County



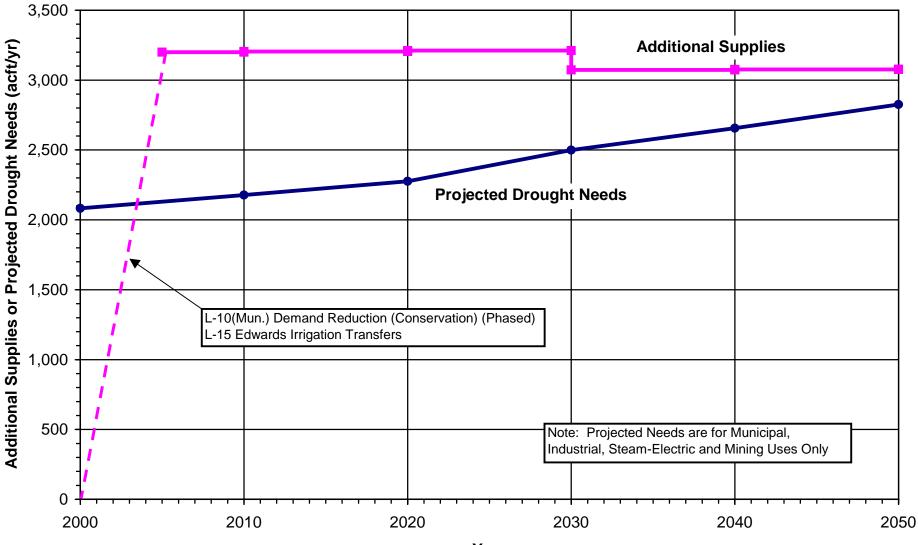
South Ce	entral Texas Region					C	ounty =	Hays	
	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	oup(s) =	all	
, ,			•				1 ( )		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000*	2010	2020	2030	2040	2050	Notes
	Municipal		4,325	7,609	10,980	16,349	22,696	29,059	
	Industrial		0	0	0	0	C	0	
	Steam-Electric		0	0	0	0	C	0	
	Mining		84	82	68	55	37	28	
	Irrigation		0	0	0	0	C	0	
	Total Needs		4,409	7,691	11,048	16,404	22,733	29,087	
	Mun, Ind, S-E, & Min Needs		4,409	7,691	11,048	16,404	22,733	29,087	
	Irrigation Needs		0	0	0	0	C	0	
	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)			647	747	873		906	,	1
G-15C	Canyon Reservoir - River Diversion	15,000	3500	3500	3500	3500	3500		2, 3
G-24	Canyon Reservoir	1,048	1,048	1,048	1,048	,	1,048	/	4
C-17A	Colorado R LCRA Irrigation & Stored	125,000		4,000	7,000	12,500	19,000	25,000	5, 6, 7
	Small Aquifer Recharge Dams								8
L-10 (Irr.)	Demand Reduction (Conservation)								
L 10 (III.)									
	Total New Supplies		5,195	9,295	12,421	17,747	24,454	30,722	
	Total System Mgmt. Supply / Deficit		786	1.604	1,373	1,343	1,721	1.635	
M.,	in, Ind, S-E, & Min System Mgmt. Supply / Deficit		786	1,604	1,373	,	1,721	,	
IVIU	Irrigation System Mgmt. Supply / Deficit		00/	1,004	1,373		1,721		
	ingation system mgnit. Supply / Dencit		U	U	0	U	, i	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	ritv implem	entation. but	t will not be	available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Portion of Canyon firm yield (with amendment) dive			,					
3	Candidate New Supply shared among Comal, Gua								
4	Candidate New Supply for Wimberley and Woodcre								
5	Supply dependent upon future water needs in Regi		rbasin trans	fer issues (	120 Kacft/v	r decreasing	g to 80 Kad	ft/yr).	
6	Candidate New Supply to be shared among Bexar,								
7	Early implementation of facilities assumed in cost e					ht.			
8	Option expected to provide additional water supply				<u> </u>		ently unqua	ntified.	

EREPA Alternative Regional Water Plan Kendall County



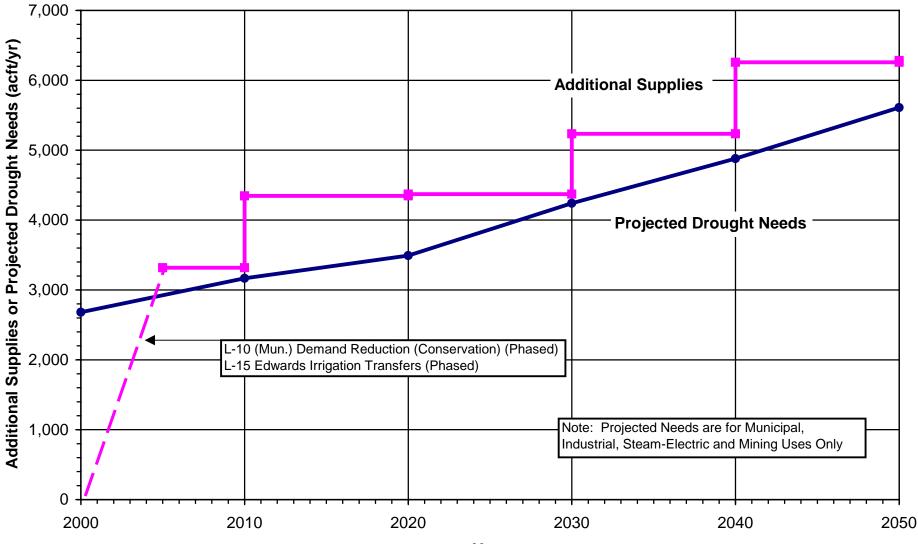
South Ce	entral Texas Region					Co	ounty =	Kendall	
	Summary of Projected Water Needs and	Water Supply	/ Options			User Gro		all	
Dreiseted	Weter Neede (actthin)								
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
			1,070	1,560			<b>2040</b> 5,578		Notes
	Municipal Industrial		1,070	1,560	2,808	4,099	5,578	7,518 6	
	Steam-Electric		2	0	4	4	5 0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		1,072	1,563	2,812	4,103	5,583	7,524	
	Mun, Ind, S-E, & Min Needs		1,072	1,563	2,812	4,103	5,583	7,524	
	Irrigation Needs		1,072	1,503	2,012	4,103	5,565	7,524	
	Ingation Needs		0	U	0	0	0	0	
Water Su	pply Options (acft/yr)	Candidate							
D#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
	) Demand Reduction (Conservation)	non ouppij	67	71	71	11	11	11	
	Purchase Water from Major Provider		2,000	2,000	3,000	5,000	6,000	8,000	2, 3
SCTN-4	Brush Management								
SCTN-4	Weather Modification								2
SCTN-9	Rainwater Harvesting								
301N-9	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
L 10 (III.)	Total New Supplies		2,067	2,071	3,071	5,011	6,011	8,011	
	Total Quatam Manut, Quantu / Datiait		995	508	259	908	428	487	
M.,	Total System Mgmt. Supply / Deficit In, Ind, S-E, & Min System Mgmt. Supply / Deficit		995	508	259	908	428	487	
IVIU	Irrigation System Mgmt. Supply / Deficit		995	508	259	908	420	407	
	inigation System Mgmt. Supply / Dencit		0	U	0	U	0	U	
Notes:									
*	Candidate New Supplies shown for year 2000 are	identified for pric	rity impleme	entation. but	will not be	available im	mediatelv.		
1	Demand Reduction (Conservation) strategies assu						,		
2	Assumed purchase from Bexar County major prov					in Bexar Co	ounty table.		
3	Early implementation of facilities assumed in cost						.,		
4	Option expected to provide additional water supply								

# EREPA Alternative Regional Water Plan Medina County



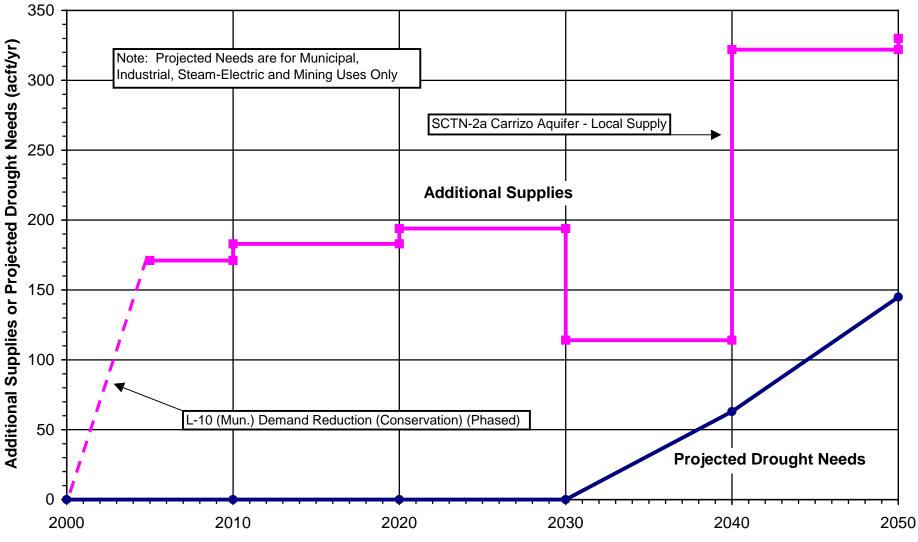
South Ce	entral Texas Region					C	ounty =	Medina	
County S	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	sup(s) =	all	
		,	1				1 ( )		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,015	2,110	2,206	2,427	2,582	2,750	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		68	68	70	72	74	76	
	Irrigation		98,916	95,268	91,320	92,320	88,925	84,692	
	Total Needs		100,999	97,446	93,596	94,819	91,581	87,518	
	Mun, Ind, S-E, & Min Needs		2,083	2,178	2,276	2,499	2,656	2,826	
	Irrigation Needs		98,916	95,268	91,320	92,320	88,925	84,692	
Wator Su	pply Options (acft/yr)	Candidate							
D#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)		New Supply	2000	2010	2020		2040		Notes
L-10 (Mun.) L-15		91.000	3,000	3,000	3,000		3,000		2,
L-15	Edwards Irrigation Transfers	81,000	3,000	3,000	3,000	3,000	3,000	3,000	Z,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
001110	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		11,867	11,867	11,867	11,867	11,867	11,867	
()	Total New Supplies		15,067	15,072	15,078		14,943		
	· · · · · · · · · · · · · · · · · · ·		,			,	,	,	
	Total System Mgmt. Supply / Deficit		-85,932	-82,374	-78,518	-79,879	-76,638	-72,573	
Mu	in, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,117	1,027	935	574	420	252	
	Irrigation System Mgmt. Supply / Deficit		-87,049	-83,401	-79,453	-80,453	-77,058	-72,825	
Notes:									
10103.	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	ntation but	will not be	availahle in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu						Inneulatery		
2	Candidate New Supply to be shared among Uvalde					may not be	reliable in (	drought	
3	Pursuant to draft EAA Critical Period Management								
	the estimated maximum potential annual transfer (								
1	Option expected to provide additional water supply							ntified	
		minuny years,	sat aspenda	iere ouppry t	annig urot	ignicio prese	may angua	nanou.	
5	Estimates based upon use of LEPA systems on 80	nercent of acro	anes irrinate	d in 1007 v	with conserv	vation at 10	) nercent of	irrigation	

EREPA Alternative Regional Water Plan Uvalde County



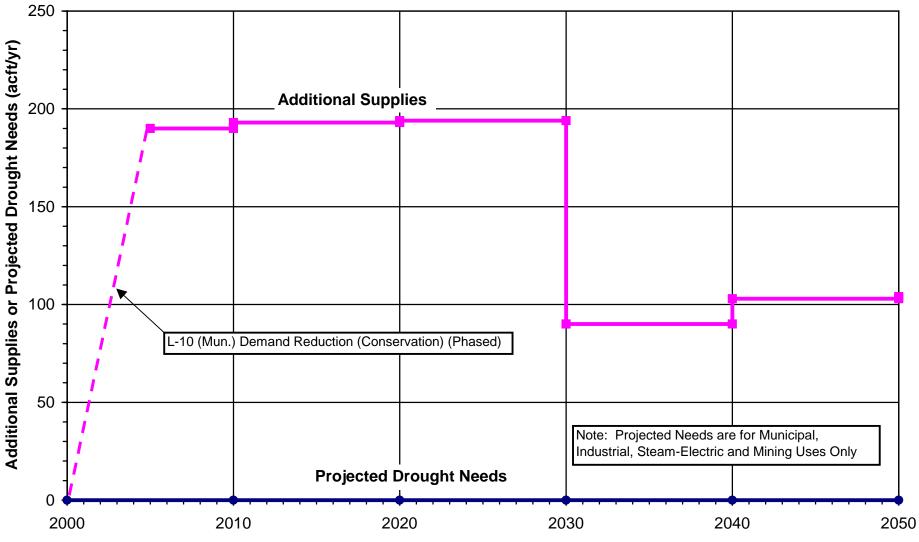
South Ce	ntral Texas Region					Co	ounty =	Uvalde	
	ummary of Projected Water Needs and W	ater Supply	Options			User Gro	up(s) =	all	
			•••••••						
Proiected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2.682	3.166	3,493	4.241	4.880	5.609	
	Industrial		0	0	0	0	0	- ,	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		75,263	72,798	70,154	71,022	68,880	65,676	
	Total Needs		77,945	75,964	73,647	75,263	73,760	71,285	
	Mun, Ind, S-E, & Min Needs		2,682	3,166	3,493	4,241	4,880	5,609	
	Irrigation Needs		75,263	72,798	70,154	71,022	68,880	65,676	
Water Sup	ply Options (acft/yr)	Candidate							
D#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
10 (Mun.)	Demand Reduction (Conservation)		318	346	371	235	258	283	
L-15	Edwards Irrigation Transfers	81,000	3,000	4,000	4,000	5,000	5,000	6,000	2, 3,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		14,143	14,143	14,143	14,143	14,143	14,143	
	Total New Supplies		17,461	18,489	18,514	19,378	19,401	20,426	
	Total System Mgmt. Supply / Deficit		-60,484	-57,475	-55,133	-55,885	-54,359		
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		636	1,180	878	994	378	-	
	Irrigation System Mgmt. Supply / Deficit		-61,120	-58,655	-56,011	-56,879	-54,737	-51,533	
Notes:									
	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, but	will not be	available in	mediately		
	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proje	ected water	demands.		,		
2	Candidate New Supply to be shared among Uvalde					may not be	eliable in o	drought.	
3	Pursuant to draft EAA Critical Period Management							<u> </u>	
	the estimated maximum potential annual transfer (s								
1	Early implementation of facilities assumed in cost e								
5	Option expected to provide additional water supply	in many years, I	out dependa	ble supply c	during drou	ight is presei	ntly unqua	ntified.	
6	Estimates based upon use of LEPA systems on 80								
	application rate, but applicable to only 50 percent o							-	

# EREPA Alternative Regional Water Plan Wilson County

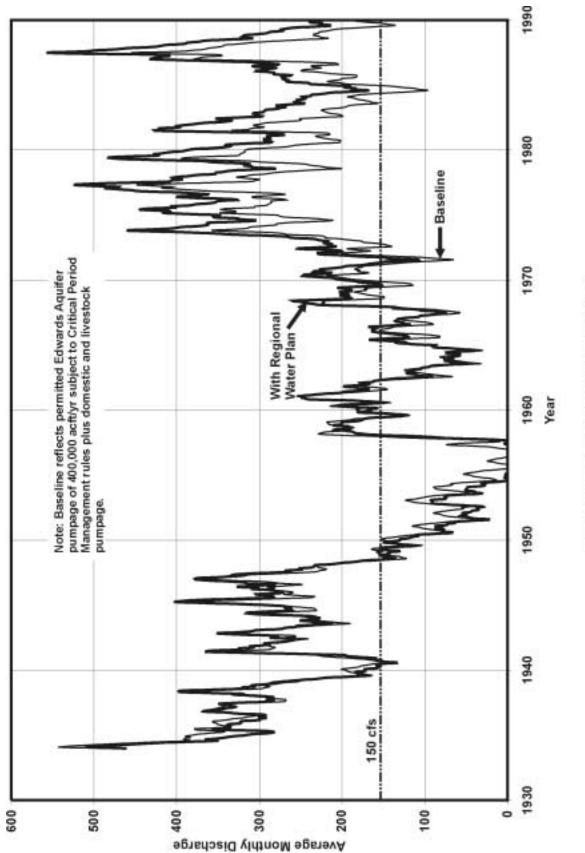


South Ce	ntral Texas Region					Co	ounty =	Wilson	
	ummary of Projected Water Needs and V	Vater Supply	<b>Options</b>			User Gro	up(s) =	all	
Due is steri	Weter Neede (setting)								
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
							<b>2040</b> 63		Notes
	Municipal Industrial		0	0	0	0	03	-	
	Steam-Electric		0	0	0	0	0	-	
			0	0	0	0	0	-	
	Mining		0	0	0	0	0	-	
	Irrigation		-	-	-	-		-	
	Total Needs		0	0	0	0	63	_	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	63		
	Irrigation Needs		0	0	0	0	0	0	
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
	Demand Reduction (Conservation)		171	183	194	114	122		
SCTN-2a	Carrizo Aquifer - Local Supply						200		
0011124									
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
00111-3	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								· · · · ·
L-10 (III.)	Total New Supplies		171	183	194	114	322	330	
	Total New Supplies		171	103	194	114	322	330	
	Total System Mgmt. Supply / Deficit		171	183	194	114	259	185	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		171	183	194	114	259	185	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0		
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proj	jected water	demands.				
2	Additional well(s) for Floresville.								
3	Option expected to provide additional water supply	in many years.	out dependa	able supply	during drou	ight is presei	ntly ungua	ntified.	

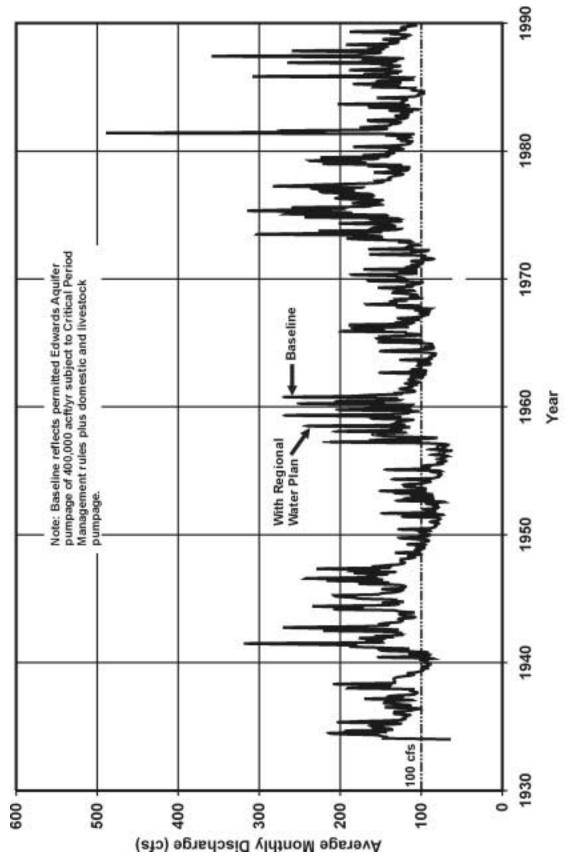
# EREPA Alternative Regional Water Plan Zavala County



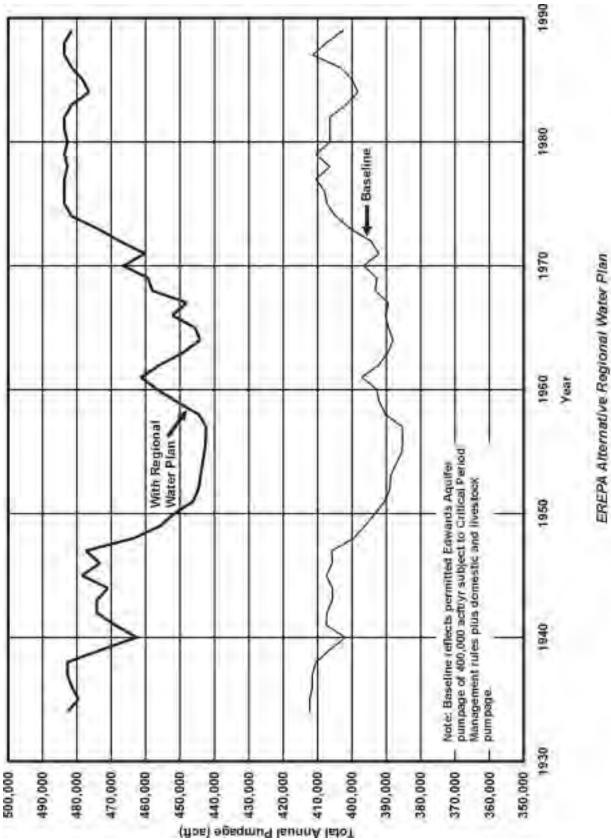
South Ce	entral Texas Region					С	ounty =	Zavala	
County S	Summary of Projected Water Needs and V	Vater Supply	/ Options			User Gro	oup(s) =	all	
Projected	Water Needs (acft/yr)								
riojecieu	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0		0	Notes
	Industrial		0	0	0	0		0	
	Steam-Electric		0	0	0	0	-	0	
	Mining		0	0	0	0		0	
	Irrigation		80,722	76,589	72,655	88.293	-	81.200	
	Total Needs		80,722	76,589	72,655	88,293	,	81,200	
	Mun, Ind, S-E, & Min Needs		00,122	0	0	00,200		01,200	
	Irrigation Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	, i i i i i i i i i i i i i i i i i i i		•	-					
Water Sup	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		190	193	194	90	103	104	
					-				
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	
	Total New Supplies		6,591	6,594	6,595	6,491	6,504	6,505	
	Total System Mgmt. Supply / Deficit		-74,131	-69,995	-66,060	,		-74,695	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		190	193	194	90		104	
	Irrigation System Mgmt. Supply / Deficit		-74,321	-70,188	-66,254	-81,892	-78,272	-74,799	
Notes:									
1	Demand Reduction (Conservation) strategies assu							CC - J	
2	Option expected to provide additional water supply								
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ea in 1997,	with conser	vation at 20	percent of	irrigation	
	application rate.								



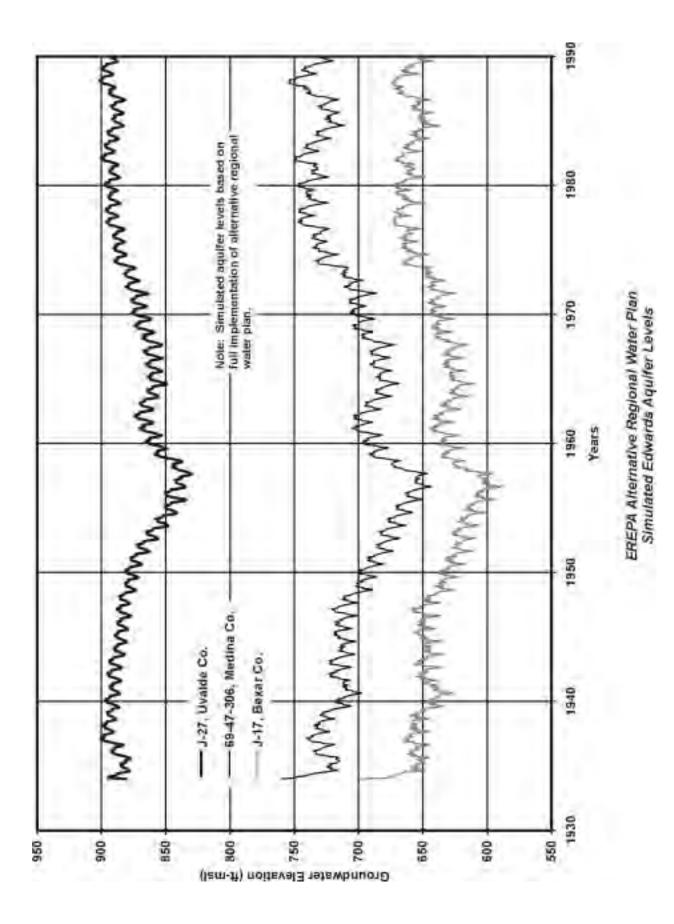
EREPA Alternative Regional Water Plan Simulated Comal Springs Discharge

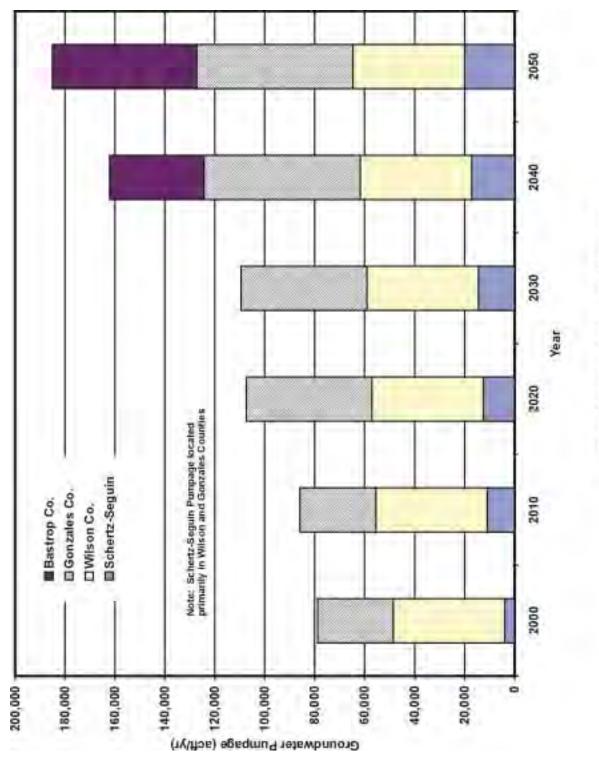


EREPA Alternative Regional Water Plan Simulated San Marcos Springs Discharge

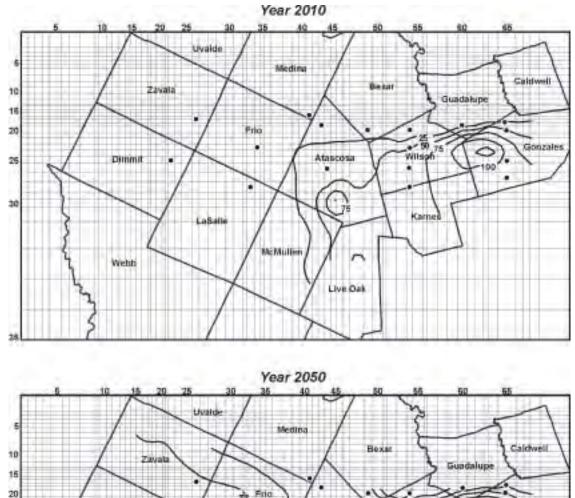


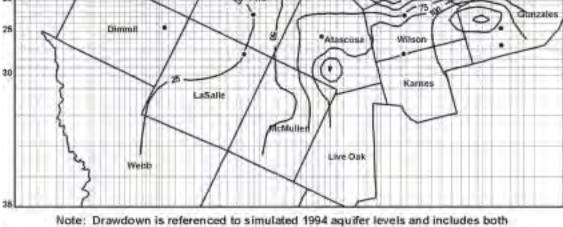
Simulated Edwards Aquiter Pumpage





EREPA Alternative Regional Water Plan Additional Carrizo Groundwater Pumpage

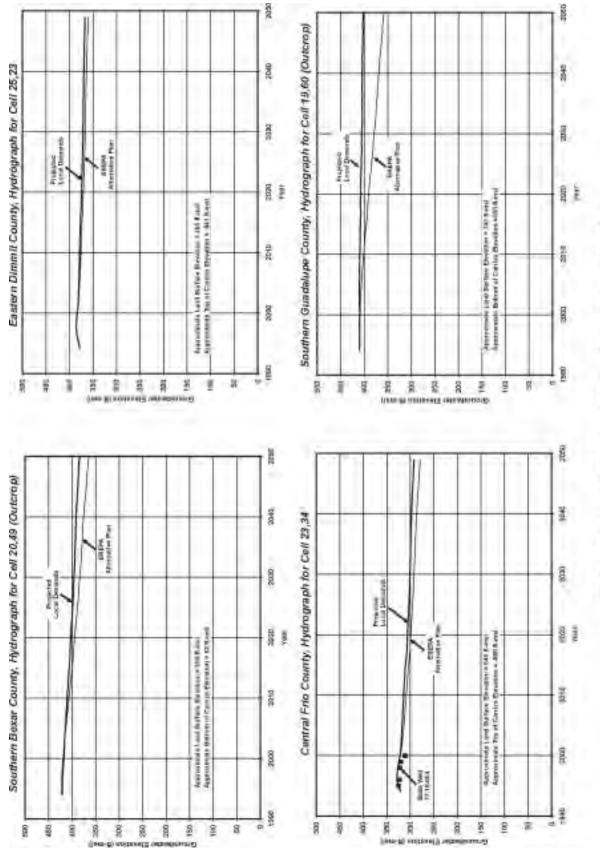




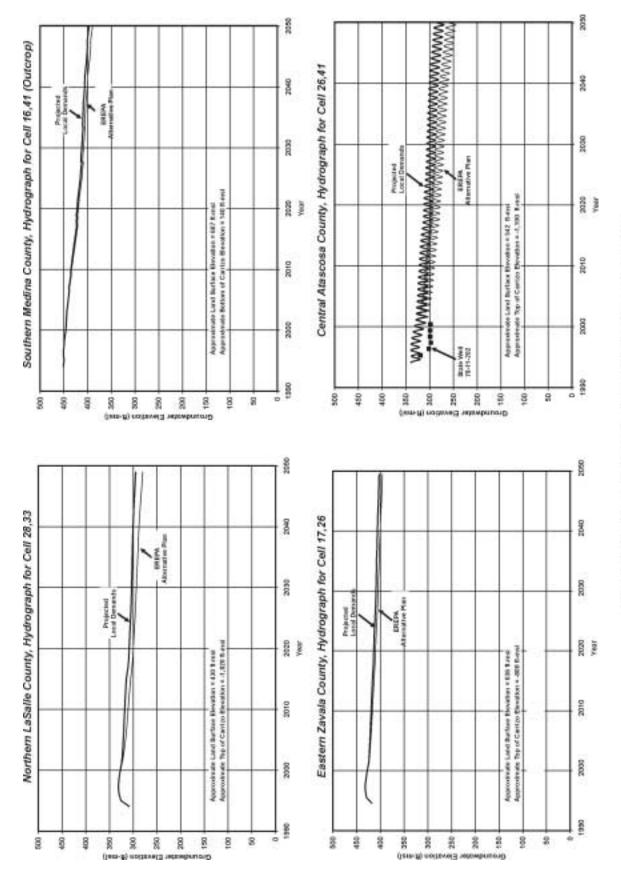
Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this alternative regional water plan.

Monitoring Well Location

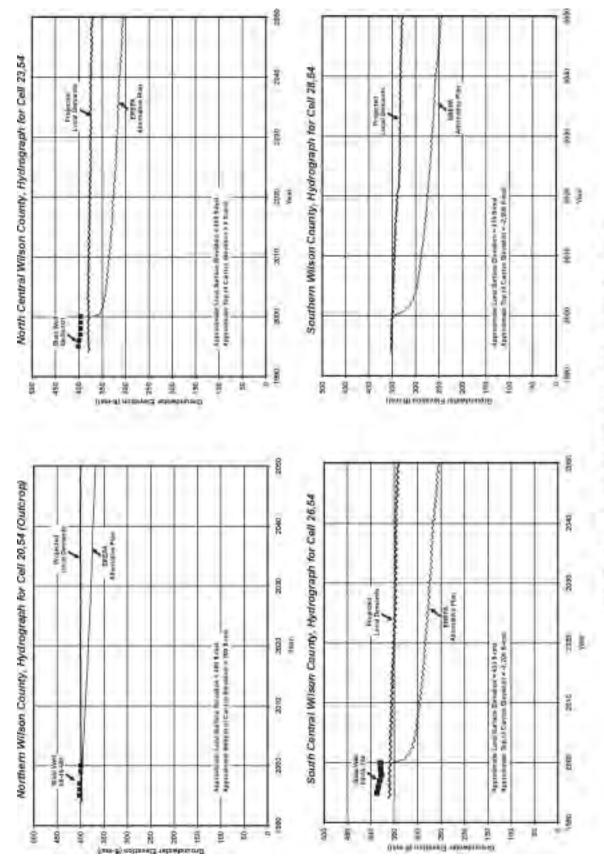
EREPA Alternative Regional Water Plan Simulated Carrizo Aquifer Drawdown



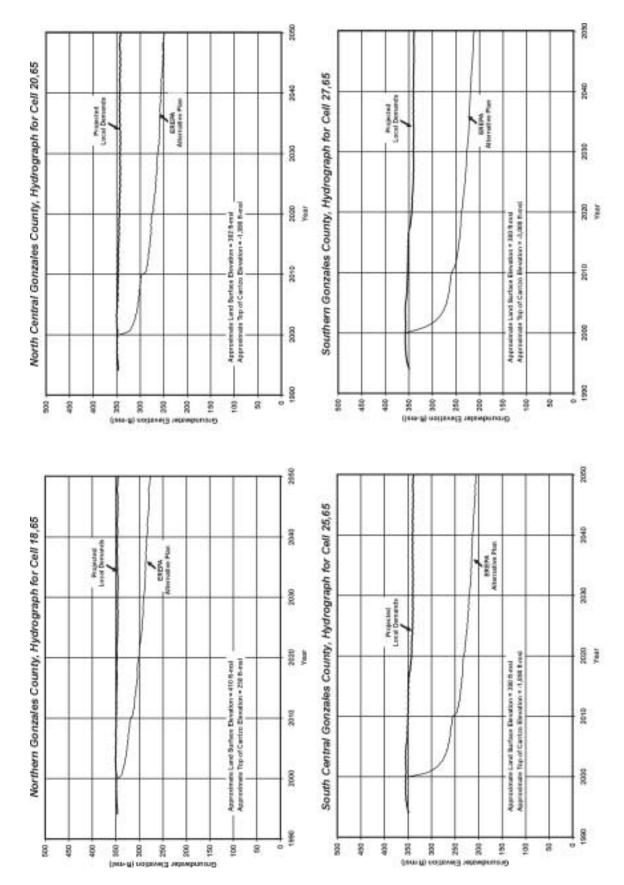




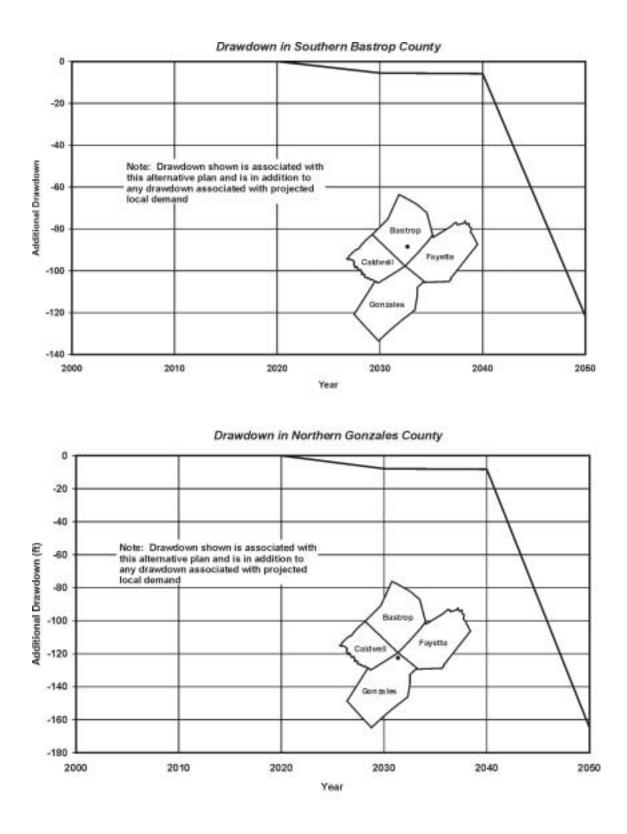




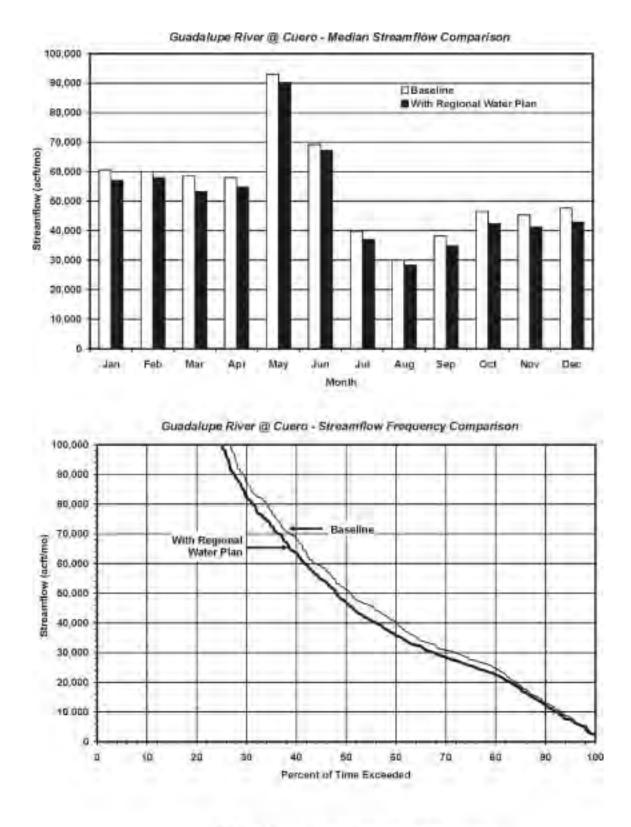




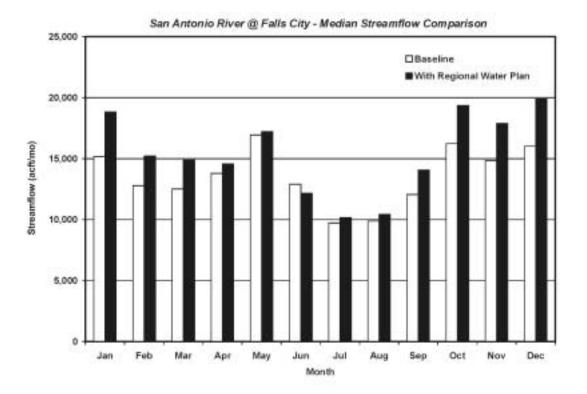


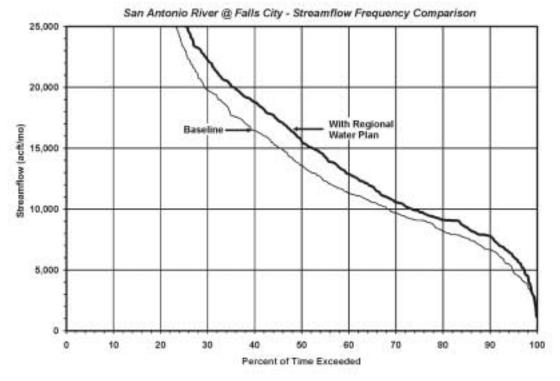


EREPA Alternative Regional Water Plan - Carrizo Aquifer

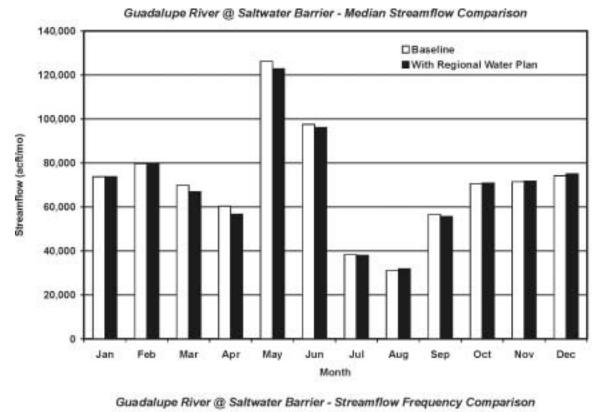


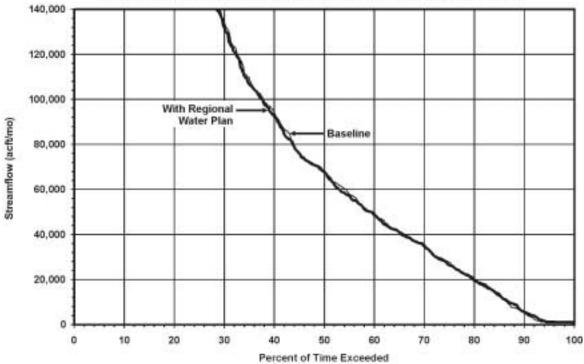
EREPA Alternative Regional Water Plan Streamflow Comparisons





EREPA Alternative Regional Water Plan Streamflow Comparisons





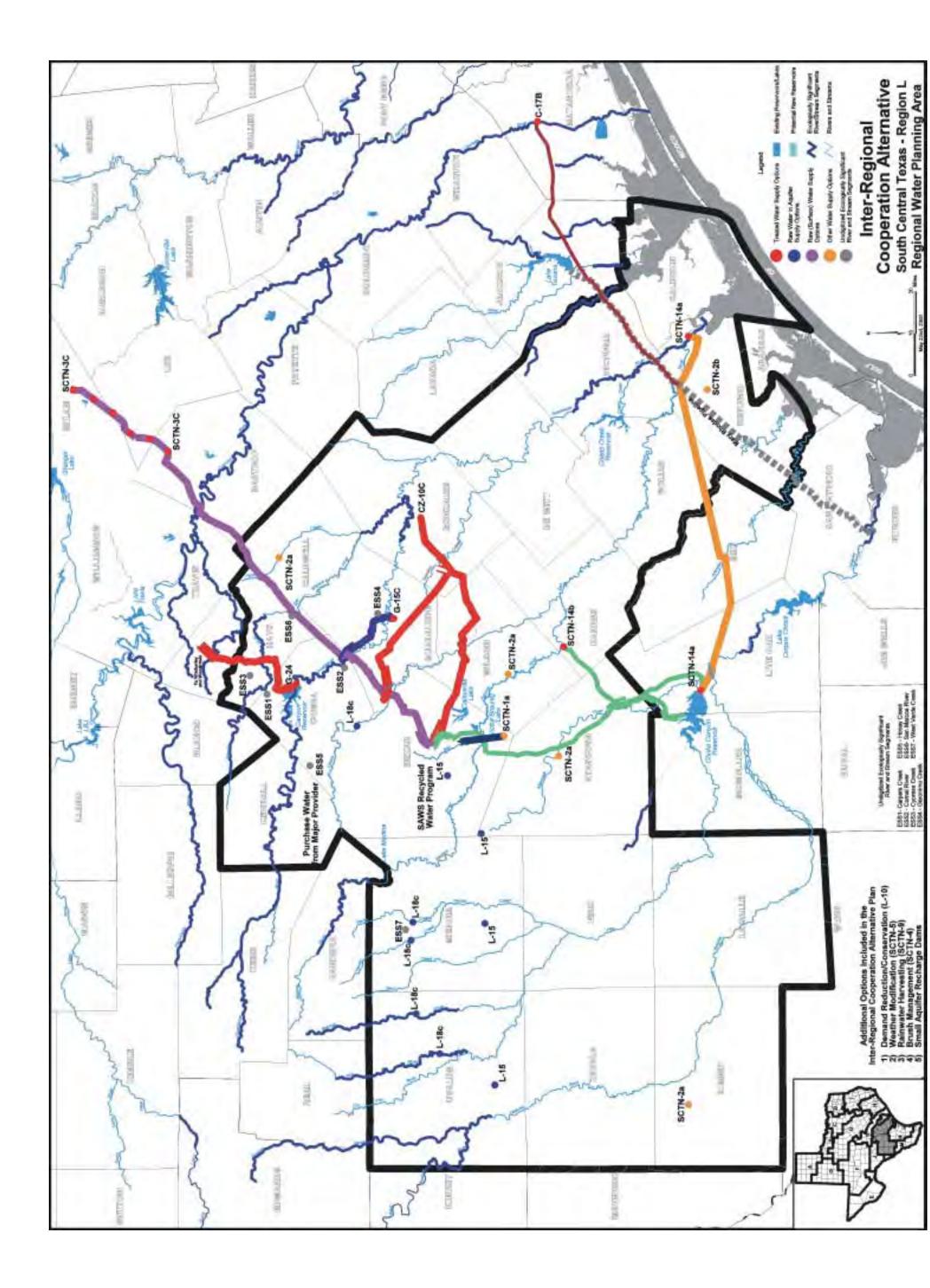
EREPA Alternative Regional Water Plan Streamflow Frequency Comparisons

Section	Option No.	Water Supply Options	Type of Wates Supply Option	Type of Water Supply	Efficiency / Unit Cest (\$/acfi)	Ouandity of Water (achtyn)	Errvironmental Cemposite Average <sup>1</sup>	Public Acceptability <sup>2</sup>	Reliability <sup>1</sup>	Time to Implement (years)	Land Impacte (acres)
9	CLIMIT 42	Developing of Brockick Connected and Water Supply Options	and the second on the function of	Control Mater Dolinered	107	207		ľ	• 0	7 40 2	
2	CZ10C	Frie Rivers (75,000 act/yr)	Carried and Other Aquifers	W/2	8	75,000	5	. (4)	0.1		
4.1	G-15C	one		Treated Water Distribulied	672	15,000	01	101	2 8 7	1 2 2 2	
T	C-17A	Mater and Imgation Rights; Firm Yield Also with Defears to Maior Manicipal Demond Conter	River Diversion with Starage 1 Carrier and Other Louises	$o_{1c}$	577	125,000 74,000		m e	1.0	5 to 15	
	1901	и соитнее жил цетмегу за жејат миласајен цетлепа септет	oirs	5 5	718	152,606		5 (7)	0.1	- 10 A	Ŧ
31	G-38C	er Treatment Plant	th Starage	Treated Water Delivered Treated Water Distributed	J182	29,217 94 mm	01		1.0	1 20 51	0
	130	ored Water - Firm Yield		er Distribute	769	000/09	01	- 173	1.0	5 to 15	
	S-15Db S-15Db	the Sam Antonio and Guadalupe Rivers - Firm Yield the Sam Antonio Diser - Firm Vield		Treated Water Distributed Treated Water Distributed	773	91 942 Pol 942	ei e	en e	1.0	5 to 15	1
	CTN-16b			12	1007	74,000	1.4	1	0.1	1 10 5	
			Potential New Reservoirs	er Distribute	956 9656	788,69 788,69	24	1	1.0	× 15	R 8
Γ	4	opus Christi - Firm Yield	Γ	Water	88	148,200	4.1		1.0	1 10 5	4
	SCTN-16a			Water Distribute	870	56,276	1.1	-	1.0	1 10 5	
Τ	C-17B	Capter Hesenoir with Imported Water from the San Artonio, Guadalupe, and Colorado Hivers - Firm Treid Colorado River in Whiarton County - Buy Impation Rights and Groundwater. Firm Yield	Potential New Horsemoirs	Treated Water Distributed	904	106,482	11	-	0.1	0 10 10	2
	S-16C			Water	906	33,200	1.8	m	1.0	5 to 15	16
Τ		attwater Bamer - Firm Tield ustrial Use		Water	2001	40,000	1.1	7 0	0.1	5 10 10	- (1)
	SCTN-14a	P		Treated Water Distributed	1,015	000/62	12	1	1.0	1 10 5	
				Water	1,016	67,800	0,0	- (*	1.0	5 to 15	w/ P
	18			V/at	1.178	51,576	2.1	5 (**)	1.0	5 to 15	1
		alkunder Barrier and the Calanada Dian made Day Chr.	change	12	1,333	112,016	- C	÷ 0	1.0	1 10 5	11
1.10	SCTM-17	Cause reserver with imported make rout are cuestance rerer carrier damate damate damate centado rerer near bay day in Desafration of Seawater (75 MGO)	change	Treated Wrater Distributed	1,407	84,012	14	r	1.0	1 10 5	
Τ		Desidination of Seawater (50 MGO)	e/Exchange	Treated Wrater Distributed		66,008	21	-	1.0	1 10 5	
1.10	4	wimiterney and wroodcreek water Suppry trom Canyon Hesenior, 2000 Liemands Desalination of Seawater (25 MGD)	e/Exchange	Treated Water Distributed	1231	28,004				1 1 1 1 1 1 1 1 1 1	
		Applewhtte Reservoir - Firm Yield	9	Treated Wrater Distributed		4,032	1.8	m	1.0	8	1
		Water in Aquiter Water Supply Uptions cts with initiation Use Reduction for Recharge Enhancement		Raw Water in Aguilier	159	9.873		(r)	1.0	1 10 5	
22	L-18c		Edwards Aquifer Recharge	Raw Water in Aquiter	486	13,451	22	01	1.0	5 to 15	N.
		nent (Nueces Kriver Atternative) with Guadaluse River Diversions at Lake Duntas (SCTN-6a)		Raw Water in Aquiter Raw Water in Aquiter	534	42.121			1.0	8 8	
		nent (Mascasa River Atternative)		Raw Water in Aquiter	627			-	1.0		1
		Eochange Rectaimed Wrater for Edwards Imgation Wrater Edwards Aquifer Rechange from Natural Drainage - Type 2 Projects (Program 26)	Lacal/Conservation/Reuse/Exchange F Edwards Aquiter Recharge	Raw Water in Aquifer Raw Water in Aquifer	5908	10,300	12	10	1.0		
	L-18a			Raw Water in Aquiter		49.1		-	1.0	-	00
2.6	SCTN6b	initry Aqurier Uptimization Edwards Aquifier Rechange Enhancement with Guadalupe River Diversions near Gonzales (SCTN6b)		Haw Water in Aquiter Raw Water in Aquiter	1,200	51,133			1.0	51 51 51	
	6.30	to Recharge Zone via Medina Lake	ands Aquifer Recharge	Raw Water in Aquiter		3,902			1.0	- 1	
21	L17b	cowards Aquifier Rescharge from Natural Drainage - Type 1. Projects (Program 10) Edwards Aquifier Rescharge from Natural Drainage - Type 1. Projects (Program 1A)	Edwards Aquifer Recharge P	Raw Water in Aquiter Raw Water in Aquiter	3,309	5,554	200	10	1.0	5 10 15	. 4
		olo Creak - Long-Term Average to Gentories	ards Aquifer Recharge	Raw Water in Aquifer		2,008		-	1.0	-	
		nge for CPEL Rights and GBRA Canyon Contract)	Exchange	Raw Water at Source	62	17,000		-	1.	1 to 5	
	SCTN3a 6.00	Colorado River	10	Raw Water Defrered	203 203	75,000		P1 +	+ · ·	1 10 5	PC
	CTN+3b	Plum Creek		Water De	282	75,000		- (7)		1 10 5	1
		Reservoir	e/Exchange	Raw Water at Reservoir Raw Water at Reservoir	282	23,903	51 21		1.0	1 10 5	91
	1.1.			Water De	131	28,200		-	÷.	5 to 15	
		Excriange of Unoundwater from the Your Loast Aquiter for imgation Surface Water Hights (Suadarupe-San Antonio Amer Da Dilworth Reservoir - Raw Water at the Reservoir	elExclange	Raw Water at Source Raw Water at Reservoir	446	19,705				> 15	- 15
53 5.10 a 1 a	G-40 SCTN112h	28	Enterne	atterr att	473	32,458	2.2		1.0	> 15	
Γ	TN-13	101011 0101	Patential New Reservoirs	Raw Water Delivered	680	30,200		-	-		
5.13	SCTN-13 G-19	2		Raw Water Delivered Raw Water at Reserver	585	28,100	41	100	1.0	5 to 15 > 15	40
8	1.0	Reser		Raw Water at Reservoir	764	5,627		1	1	5 to 15	1.4
-	L-10 (Mun.)		Lacal/Conservation/Reuse/Exchance		-400	-43 000	01			1 10 5	
	L-10 (m)		Lacal/Conservation/Reuse/Exchange		ដុ	00000-	01	-		1 10 5	
n 10	SCTN-4	water for municipal and industrial Use	Lacal/Conservation/Reuse/Exchange	Haw wrater in Adulter	i Liu	Undetermined	1.1			100	Undeterr
			Local/Conservation/Reuse/Exchange		Undetermined 16.178	Undetermined	0.1	+ +		1 10 5	Undetermi
		Of-Channel Lecal Storage (Guadalupe River near Victoria)	Lacal/Conservation/Reuse/Exchange 7	Water Delivere	140 0	000/01		0,1	000	1 10 5	
	CTN+10	Off-Charmel Local Storage (Suadatipe Hover near poeme) Off-Charmel Local Storage (Medria River near Von Ormy)	change	Treated Water Delivered	10017	2000/9	4 14			1 10 5	
6.5		Groundwater Supplies for Municipal Water Systems in the Cambo-Witcox Aquifer Groundwater Supplies the Municipal Water Sustems in the Carl Coset Achilier			N/A	N0A NCA	0.1			1 10 5	
	11	Groundwater Supplies for Municipal Water Systems in the Trinity Aquifer	Carried and Other Aquifers		Ш	141	01	-		1 10 5	
6.9	SCTN-1a SCTN-1b	Aquifer Storage and Recovery (ASR) - Regional Option Aquifer Storage and Recovery (ASR) - Local Option	Carrizo and Other Aquifers Carrizo and Other Aquifers		2428 ha 1009 2,089	2,792	10	1	1.0	1 10 5	
	L										

## South Central Texas Regional Water Planning Group

San Antonio River Authority

HDR Engineering, Inc. June 13, 2000



## South Central Texas Region Alternative Water Plans

Alternative Name: Inter-Regional Cooperation

Alternative ID: IRC

Alternative Description: The Inter-Regional Cooperation Alternative Regional Water Plan is based on the cooperative development of water supplies by Regions L, N, P, and K. This plan provides significant additional water supply to Region L without development of new reservoirs. The primary approach involves diversion and delivery of enhanced water supply in the Choke Canyon Reservoir / Lake Corpus Christi (CCR/LCC) System from Choke Canyon Reservoir to the major municipal demand center of the South Central Texas Region without impact to the water supply available to Corpus Christi. Enhanced water supply for Corpus Christi is created by purchase and delivery of water to Lake Corpus Christi from the Guadalupe River at the Saltwater Barrier under existing water rights, the delivery of groundwater from the Gulf Coast Aquifer near Refugio, and the purchase and delivery of unappropriated streamflow and treated effluent to Choke Canyon Reservoir from the San Antonio River near Falls City. Additional inter-regional supply for Region L is created by the purchase and delivery of Colorado River water diverted in Matagorda County and the delivery of groundwater pumped from the Simsboro Aquifer in Bastrop, Lee, and Milam Counties. The inter-regional supplies are augmented by pipeline linkage of Lake Corpus Christi and Choke Canyon Reservoir, pumpage of the Carrizo Aquifer in Wilson and Gonzales Counties, aquifer storage and recovery in Atascosa County, voluntary transfer of Edwards Aquifer irrigation rights to municipal use, and enhanced recharge of the Edwards Aquifer.

The following water supply options are included in the Inter-Regional Cooperation Alternative Regional Water Plan (in no particular order):

- 1. Demand Reduction / Conservation (L-10)
- 2. Joint Development of Water Supply with Corpus Christi (SCTN-14b)
- 3. Gulf Coast Aquifer near Refugio (SCTN-2b)
- 4. Carrizo Aquifer Wilson & Gonzales Counties (CZ-10C)
- 5. Aquifer Storage & Recovery (SCTN-1a)
- 6. Carrizo Aquifer Local Supply (SCTN-2a)
- 7. Simsboro Aquifer (SCTN-3c)
- 8. Colorado River in Matagorda County (C-17B)
- 9. Edwards Irrigation Transfers (L-15)
- 10. Edwards Recharge Type 2 Projects (L-18c)
- 11. SAWS Recycled Water Program
- 12. Canyon Reservoir (G-15C)
- 13. Wimberley & Woodcreek Canyon (G-24)
- 14. Weather Modification (SCTN-5)
- 15. Rainwater Harvesting (SCTN-9)
- 16. Brush Management (SCTN-4)

## Inter-Regional Cooperation Alternative Regional Water Plan Summary of Key Information for South Central Texas Regional Water Planning Group

#### Quantity, Reliability, and Cost

- Plan includes management supplies to meet projected needs, ensure reliability, and maintain springflow, resulting in a quantity of additional water supplies sufficient to meet projected needs for municipal, industrial, steam-electric power, and mining uses through the year 2050.
- Cost is the greatest among the five alternative plans under consideration.

#### **Environmental Factors**

- Increased median annual streamflows in the Guadalupe River and decreased median annual streamflows in the San Antonio River.
- Least concerns with Endangered & Threatened Species and greatest concerns with Water Quality & Aquatic Habitat and Cultural Resources among the five alternative plans under consideration.

#### **Impacts on Water Resources**

- No unmitigated reductions in water available to existing water rights.
- Long-term reductions in water levels in the Carrizo Aquifer. Drawdown would be less than the average for the five alternative plans under consideration.

#### Impacts on Agriculture and Natural Resources

- Major commitment to municipal and irrigation water Demand Reduction (Conservation) (L-10).
- Includes Brush Management (SCTN-4) and Weather Modification (SCTN-5).
- Inclusion of water supply options to meet projected irrigation needs in full is estimated to be economically infeasible at this time. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching).
- Includes limited potential voluntary transfer of Edwards Aquifer irrigation permits to municipal permits through lease or purchase.

#### **Other Relevant Factors per SCTRWPG**

• Negotiation of agreement(s) between the City of Corpus Christi, Nueces River Authority, Guadalupe-Blanco River Authority, San Antonio Water System, U.S. Bureau of Reclamation, and others.

#### **Comparison of Strategies to Meet Needs**

• Selection of water supply options comprising the alternative plan based on cooperative development and utilization of resources by the South Central Texas and Coastal Bend Regions as well as preferences expressed by planning units.

#### Interbasin Transfer Issues

- Projected non-irrigation needs in basin(s) of origin are met throughout the planning period.
- Plan includes four interbasin transfers that are integral to Joint Development with Corpus Christi (SCTN-14b). These interbasin transfers deliver water: 1) From the Guadalupe River Saltwater Barrier to Corpus Christi and Choke Canyon Reservoir; 2) From Choke Canyon Reservoir to Bexar County; 3) From the San Antonio River @ Falls City to Choke Canyon Reservoir; and 4) From the Colorado River @ Bay City to Corpus Christi.

#### **Third-Party Impacts of Voluntary Redistribution of Water**

- Potential positive or negative effects of Edwards Irrigation Transfers (L-15).
- Lower water levels in some portions of the Carrizo Aquifer.

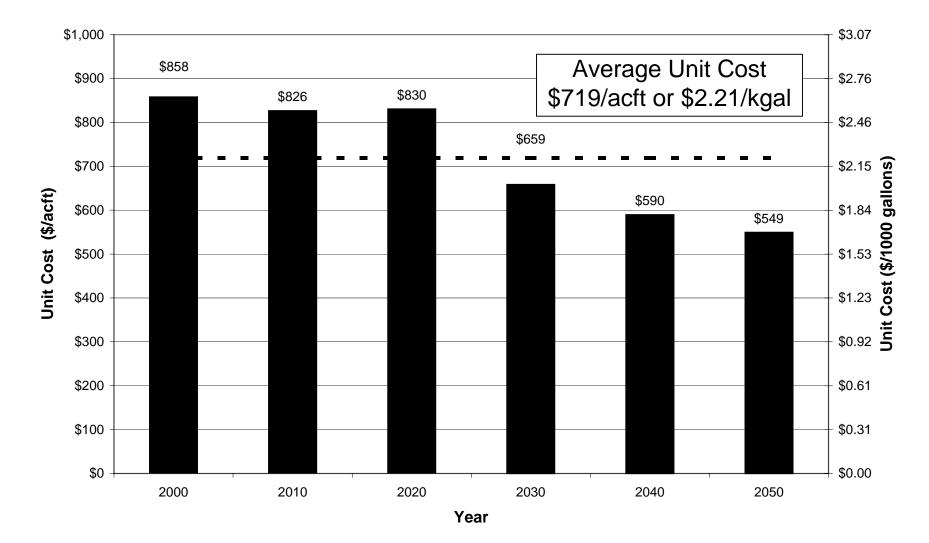
#### **Regional Efficiency**

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Terminal storage and regional water treatment facilities in Bexar County and aquifer storage and recovery in Atascosa County increase efficiency, improve reliability, and reduce unit cost.
- San Antonio Water System Regional Aquifer Storage & Recovery System (SCTN-1a) substantially reduces peak summer pumpage from the Edwards Aquifer.

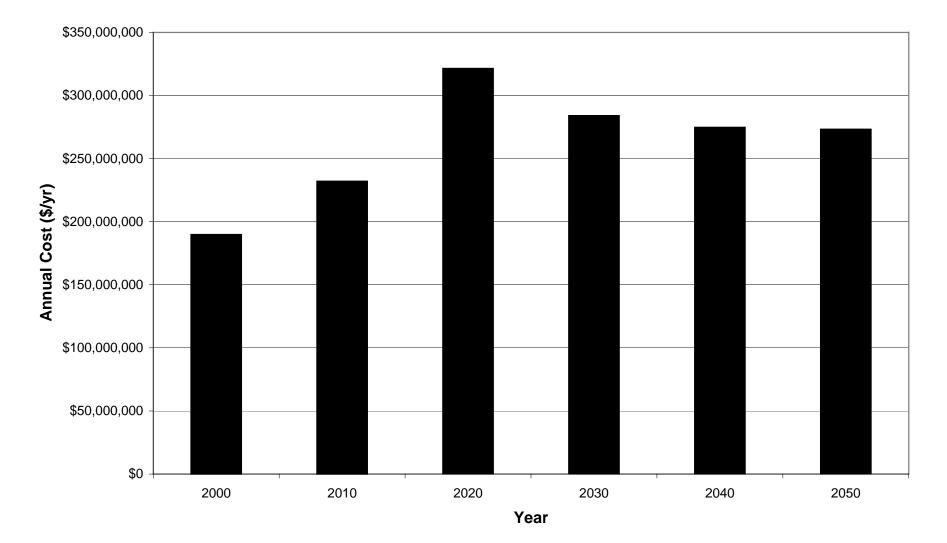
#### Effect on Navigation

• Not applicable.

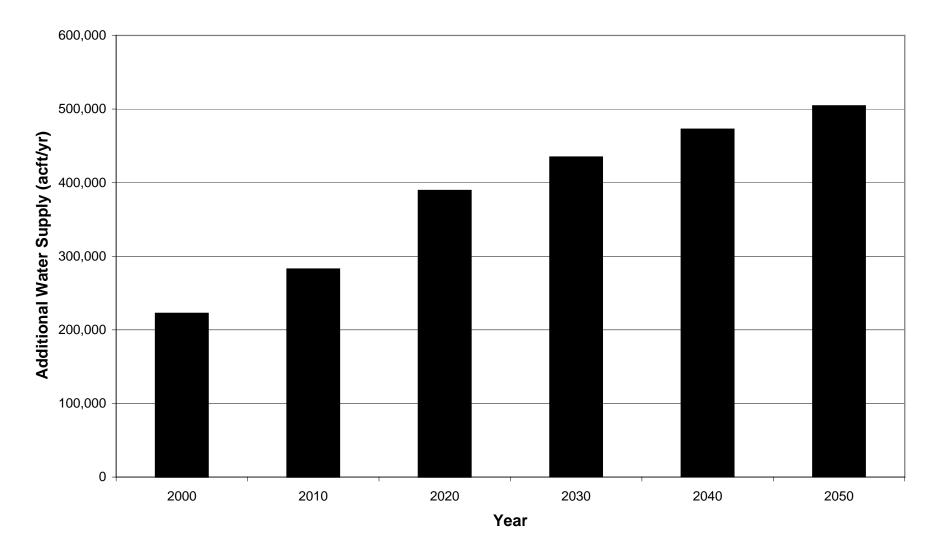
## Inter-Regional Cooperation Alternative Regional Water Plan Unit Cost of Cumulative Additional Water Supply

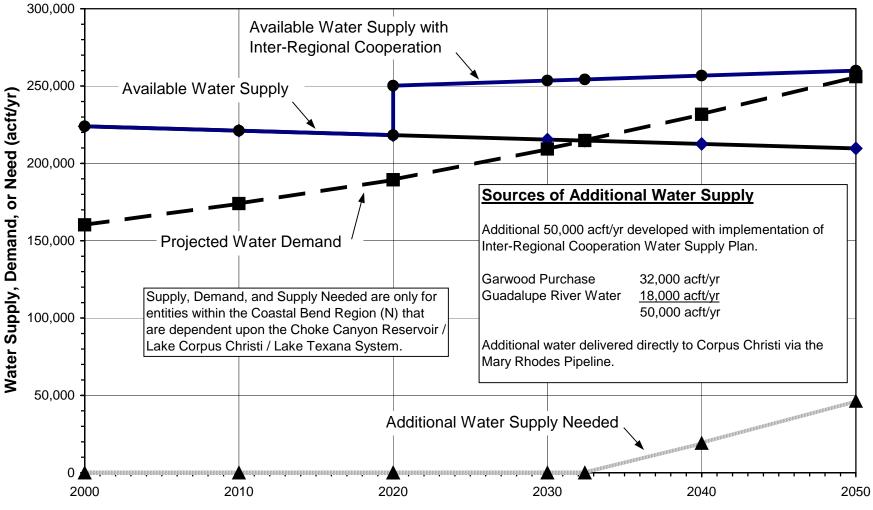


## Inter-Regional Cooperation Alternative Regional Water Plan Annual Cost of Cumulative Additional Water Supply



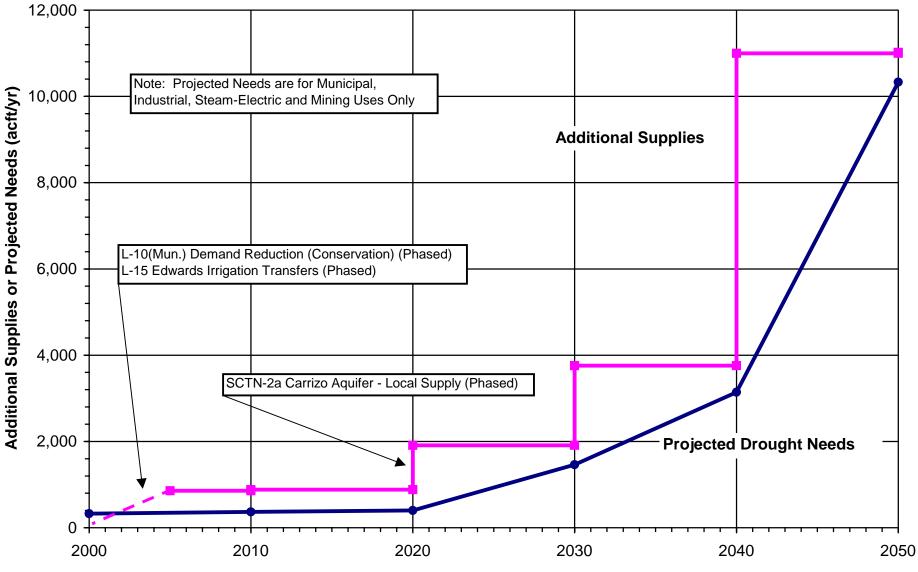
## Inter-Regional Cooperation Alternative Regional Water Plan Cumulative Additional Water Supply





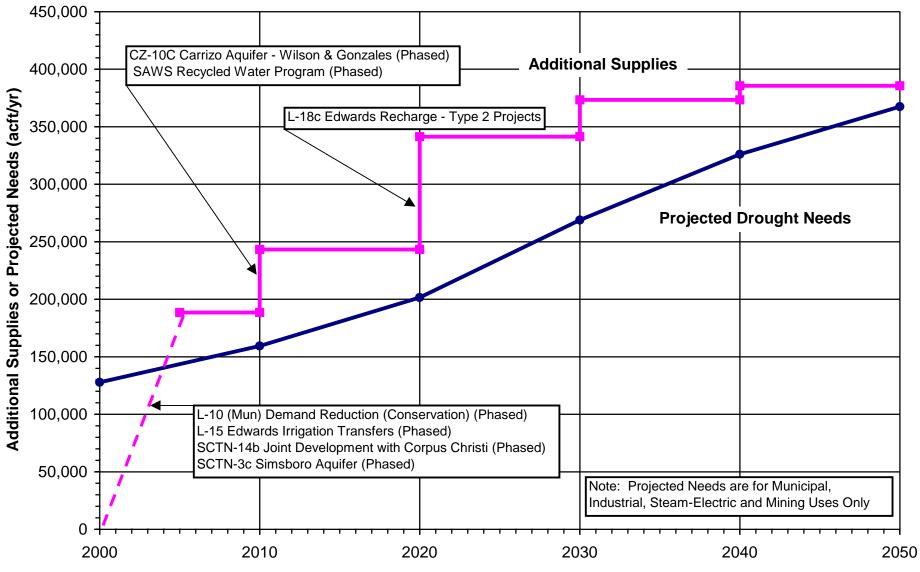
## Choke Canyon Reservoir / Lake Corpus Christi / Lake Texana System

## Inter-Regional Cooperation Alternative Regional Water Plan Atascosa County



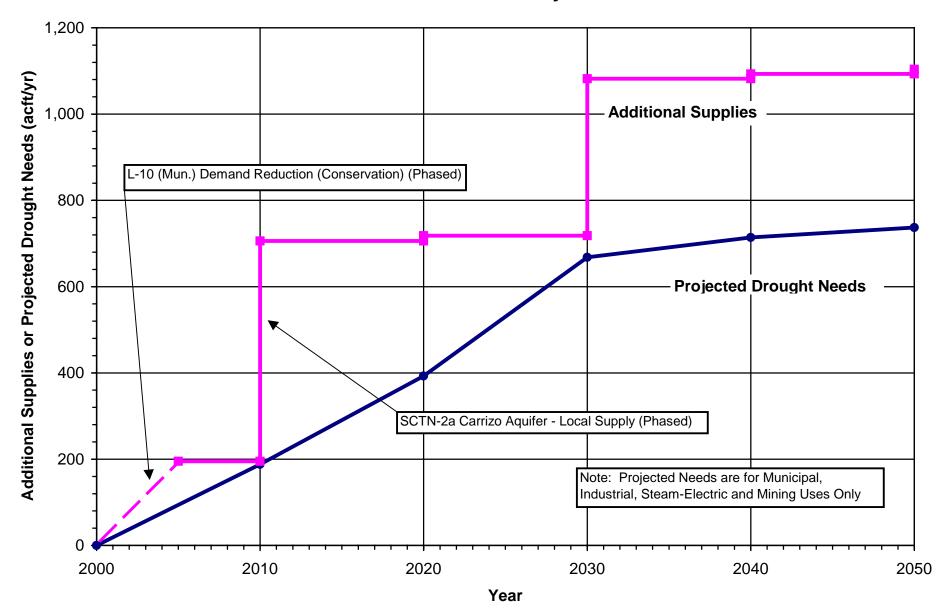
South Cer	ntral Texas Region					С	ounty =	Atascosa	1
	ummary of Projected Water Needs and W	ater Supply	Options			User Gro	$\frac{1}{2}$	all	
Projected \	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366	401	468	530	587	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	1,504	8,504	
	Mining		0	0	0	995	1,109	1,239	
	Irrigation		38,418	36,718	35,170	43,726	42,190	40,713	
	Total Needs		38,743	37,084	35,571	45,189	45,333	51,043	
	Mun, Ind, S-E, & Min Needs		325	366	401	1,463	3,143	10,330	
	Irrigation Needs		38,418	36,718	35,170	43,726	42,190	40,713	
Water Sup	ply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		356	384	411	259			
L-15	Edwards Irrigation Transfers	42,500	500	500	500	500			2, 3, 4
SCTN-2a	Carrizo Aquifer - Local Supply	,				1,000			5,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		3,692	3,692	3,692	3,692	3,692	3,692	
	Total New Supplies		4,548	4,576	4,603	5,451	7,692	14,711	
	Total System Mgmt. Supply / Deficit		-34,195	-32,508	-30,968	-39,738	-37,641	-36,332	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		531	518	510	,	,	,	
	Irrigation System Mgmt. Supply / Deficit		-34,726	-33,026	-31,478	-40,034	-38,498	-37,021	
Notes:	Condidate New Supplies about for year 2000 are	dentified for	vitu impolant	ontotion but	السنال ممالية	ovoiloble in	n madiatalı		
4	Candidate New Supplies shown for year 2000 are i					available ir	mediately		
1 2	Demand Reduction (Conservation) strategies assu Candidate New Supply to be shared among Uvalde					movinotha	rolioblo in	drought	
23	Pursuant to draft EAA Critical Period Management							urougni.	
3	an estimated potential annual transfer of 50,000 ac								
4	Additional Edwards supply is for City of Lytle.				10 400,000	, aony yr.			
<del>4</del> 5	Additional Carrizo supply is for Steam-Electric and	Mining use							
<u> </u>	Early implementation of facilities assumed in cost e		sure sufficie	nt supply du	ring droug	nt			
7	Option expected to provide additional water supply						ntly unqua	ntified	
•									
8	Estimates based upon use of LEPA systems on 50	percent of acre	ages irriget	ed in 1997 v	with conse	vation at 20	) percent of	irrigation	

Inter-Regional Cooperation Alternative Regional Water Plan Bexar County

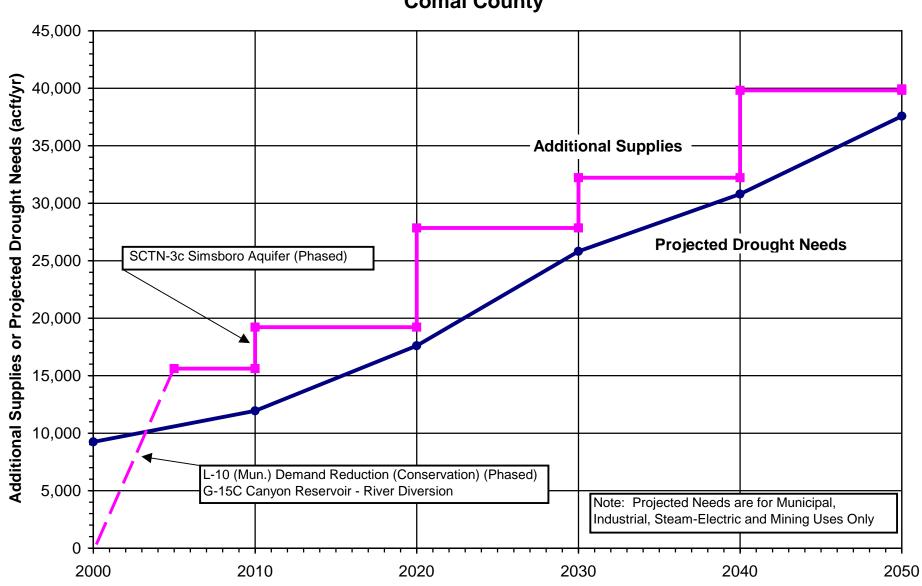


South Cen	tral Texas Region					C	ounty =	Bexar	
	mmary of Projected Water Needs and Wat	er Supply O	ntions			User Gro			
obuilty ou	minary of Projected Water Needs and Water		blions			0301 010	up(3) =	un	
Projected M	/ater Needs (acft/yr)								
FIOJECIEU W			2000	2010	2020	2030	2040	2050	Notes
	User Group(s)								Notes
	Municipal		122,867	154,495	196,301		315,633		
	Industrial		0	0	0		4,759	,	
	Steam-Electric		0	0	0	-	0	-	
	Mining		4,963	4,936	5,201		5,645	- ,	
	Irrigation		18,728	17,297	15,738		12,815		
	Total Needs		146,558	176,728	217,240		338,852	/	
	Mun, Ind, S-E, & Min Needs		127,830	159,431	201,502		326,037		
	Irrigation Needs		18,728	17,297	15,738	14,245	12,815	11,444	
	ly Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		33,528	42,509	41,210	36,533	38,834	40,934	
L-15	Edwards Irrigation Transfers	42,500	25,000	35,000	35,000	34,000	33,800	32,800	2, 3
SCTN-14b	Joint Development with Corpus Christi	218,000	79,000	79,000	155,000	191,000	204,000	218,000	4, 5
SCTN-3c	Simsboro Aquifer	55,000	51,000	48,000	41,000	27,000	16,500	0	6
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	40,000		19,000	29,000	35,500	35,500	35,500	7
	SAWS Recycled Water Program			19,826	26,737	35,824	43,561	52,215	8, 9
L-18c	Edwards Recharge - Type 2 Projects	13,451			13,451	13,451	13,451	13,451	
SCTN-1a	Aquifer Storage & Recovery - Regional								10
SCTN-4	Brush Management								11
SCTN-5	Weather Modification								11
SCTN-9	Rainwater Harvesting								11
	Small Aquifer Recharge Dams								11
L-10 (lrr.)	Demand Reduction (Conservation)		4,521	4,521	4,521	4,521	4,521	4,521	12
- \ /	Total New Supplies		193,049	247,856	345,919	,	390,167	397,421	
	· · · · · · · · · · · · · · · · · · ·		,	,		011,020	,	,	
	Total System Mgmt. Supply / Deficit		46,491	71,128	128,679	94,678	51,315	18,514	
М	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		60,698	83,904	139,896	104,402	59,609	25,437	
	Irrigation System Mgmt. Supply / Deficit		-14,207	-12,776	-11,217	-9,724	-8,294	-6,923	
		l l l l l l l l l l l l l l l l l l l							
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, bu	t will not be	available in	nmediately.		
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proj	ected water	demands.				
		Madina Ataas	osa and Be	exar Countie	es. Supply	may not be	reliable in o	drought.	
2	Candidate New Supply to be shared among Uvalde	e, Medina, Atasc							
2 3	Candidate New Supply to be shared among Uvalde Pursuant to draft EAA Critical Period Management					nately 85 per	rcent of		
		rules, Candidate	New Supp	ly represent	ts approxim		rcent of		
	Pursuant to draft EAA Critical Period Management	rules, Candidate ft based on Prop	New Supp	ly represent its prorated	ts approxim to 400,000	) acft/yr.			
3	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agree	rules, Candidate ft based on Prop ment(s) with City	New Supp bosed Perm of Corpus	ly represent its prorated Christi, Nue	ts approxim to 400,000 ces River /	) acft/yr. Authority, &	USBR.	past	
3	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac	rules, Candidate ft based on Prop ment(s) with City er water (Garwo	New Supp bosed Perm of Corpus	ly represent its prorated Christi, Nue	ts approxim to 400,000 ces River /	) acft/yr. Authority, &	USBR.	past	
3 4 5	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreer Requires delivery of 32,000 actf/yr of Colorado Rive Aquifer (SCTN-2b) at long-term average supply of 1	rules, Candidate ft based on Prop ment(s) with City er water (Garwo 21,000 acft/yr.	New Supp posed Perm of Corpus od) to Corpu	ly represent its prorated Christi, Nue us Christi in	ts approxim to 400,000 ces River / 2020 and	) acft/yr. Authority, & developmen	USBR. It of Gulf Co	past	
3	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agree Requires delivery of 32,000 acft/yr of Colorado Rive	rules, Candidate ft based on Prop ment(s) with City er water (Garwo 21,000 acft/yr. I Comal Countie	e New Supp posed Perm of Corpus od) to Corpu s. Effects c	ly represent its prorated Christi, Nue us Christi in on regional a	ts approxim to 400,000 ces River / 2020 and ( aquifer leve	) acft/yr. Authority, & developmen Is to be qua	USBR. at of Gulf Co ntified.	past	
3 4 5 6	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreer Requires delivery of 32,000 acft/yr of Colorado Rive Aquifer (SCTN-2b) at long-term average supply of Candidate New Supply shared by Bexar, Hays, and	rules, Candidate ft based on Prop ment(s) with City er water (Garwo 21,000 acft/yr. I Comal Countie alupe Counties.	e New Supp posed Perm of Corpus od) to Corpu s. Effects of Effects on	ly represent its prorated Christi, Nue us Christi in on regional a regional aqu	ts approxim to 400,000 cces River / 2020 and o aquifer levels	) acft/yr. Authority, & developmen Is to be qua to be quanti	USBR. It of Gulf Co Intified. fied.	past	
3 4 5 6 7	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreet Requires delivery of 32,000 acft/yr of Colorado Rive Aquifer (SCTN-2b) at long-term average supply of Candidate New Supply shared by Bexar, Hays, and Candidate New Supply shared by Bexar and Guad Current SAWS Recycled Water Program is include	rules, Candidate ft based on Prop ment(s) with City er water (Garwoo 21,000 acft/yr. I Comal Countie alupe Counties. d in the 24,941 a	e New Supp posed Perm of Corpus od) to Corpu s. Effects of Effects on acft/yr (cons	ly represent its prorated Christi, Nue us Christi in on regional a regional aqu sumptive rep	ts approxim to 400,000 ces River / 2020 and o aquifer levels use) in estin	) acft/yr. Authority, & developmen Is to be qua to be quanti mated need	USBR. It of Gulf Co Intified. fied. s.		
3 4 5 6 7 8 9	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreer Requires delivery of 32,000 acft/yr of Colorado Riw Aquifer (SCTN-2b) at long-term average supply of Candidate New Supply shared by Bexar, Hays, and Candidate New Supply shared by Bexar and Guadt Current SAWS Recycled Water Program is include Future use of recycled water for non-potable usesa	rules, Candidate ft based on Prop ment(s) with City er water (Garwoo 21,000 acft/yr. ] d Comal Countie alupe Counties. d in the 24,941 a and based on gc	New Supp posed Perm of Corpus od) to Corpu s. Effects on Effects on acft/yr (cons pal of meetir	ly represent its prorated Christi, Nue us Christi in n regional a regional aqu sumptive ren ng 20 perce	to 400,000 cces River / 2020 and a aquifer levels use) in estii nt of SAWS	actf/yr. Authority, & developmen els to be qua to be quanti mated need S projected v	USBR. tt of Gulf Co ntified. fied. s. water dema	Ind.	
3 4 5 6 7 8 9 10	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreer Requires delivery of 32,000 actf/yr of Colorado Rive Aquifer (SCTN-2b) at long-term average supply of Candidate New Supply shared by Bexar, Hays, and Candidate New Supply shared by Bexar and Guada Current SAWS Recycled Water Program is include Future use of recycled water for non-potable uses a SAWS ASR program in southern Bexar County inc	rules, Candidate ft based on Prop ment(s) with City er water (Garwo 21,000 acft/yr. ] d Comal Countie alupe Counties. d in the 24,941 and based on go reases reliability	New Supp posed Perm of Corpus od) to Corpus s. Effects on acft/yr (cons pal of meetir of Edwards	ly represent its prorated Christi, Nue us Christi in regional aque sumptive rea g 20 perce a Aquifer su	ts approxim to 400,000 ces River / 2020 and o aquifer levels use) in estii nt of SAWS ppply and re	activr. Authority, & developmen els to be qua to be quanti mated need S projected v duces sease	USBR. tt of Gulf Co ntified. fied. s. water dema onal aquife	Ind.	
3 4 5 6 7 8 9	Pursuant to draft EAA Critical Period Management an estimated potential annual transfer of 50,000 ac Candidate New Supply requires cooperative agreer Requires delivery of 32,000 acft/yr of Colorado Riw Aquifer (SCTN-2b) at long-term average supply of Candidate New Supply shared by Bexar, Hays, and Candidate New Supply shared by Bexar and Guadt Current SAWS Recycled Water Program is include Future use of recycled water for non-potable usesa	rules, Candidate ft based on Prop ment(s) with City er water (Garwoo 21,000 acft/yr. ] d Comal Counties. d in the 24,941 i and based on g reases reliability in many years, t	New Supp posed Perm of Corpus od) to Corpus b) to Corpus s. Effects on Effects on Effects on of Corpus s. Effects on of Edwards post depende	ly represent its prorated Christi, Nue us Christi in cregional aq sumptive ret g 20 perce Aquifer su able supply	ts approxim to 400,000 ces River / 2020 and o aquifer levels use) in estii nt of SAWS pply and re during drou	acti/yr. Authority, & developmen Is to be qua to be quanti mated need S projected v duces seaso ught is prese	USBR. tt of Gulf Co intified. fied. s. water dema onal aquife ently unquar	Ind. r demands. ntified.	

## Inter-Regional Cooperation Alternative Regional Water Plan Caldwell County



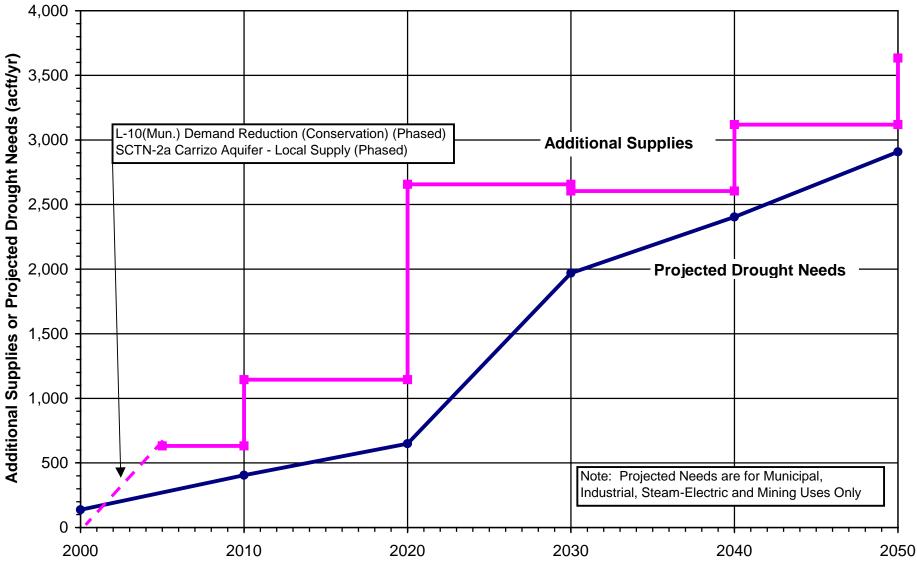
South Centr	al Texas Region					Co	ounty =	Caldwell	
County Sum	mary of Projected Water Needs and Wat	er Supply O	ptions			User Gro	up(s) =	all	
Projected Wa	ter Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	188	393		714	737	
	Industrial		0	0	0	-	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	-	0	0	
	Total Needs		0	188	393		714	737	
	Mun, Ind, S-E, & Min Needs		0	188	393	668	714	737	
	Irrigation Needs		0	0	0	0	0	0	
Water Supply	Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		195	206	218	82	93	104	
SCTN-2a	Carrizo Aquifer - Local Supply			500	500	1,000	1,000	1,000	
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		195	706	718	1,082	1,093	1,104	
			155	100	710	1,002	1,055	1,104	
	Total System Mgmt. Supply / Deficit		195	518	325		379	367	
Mui	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		195	518	325	414	379	367	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proi	ected water	demands.				
2	Additional well(s) for Lockhart.		[]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]						
3	Option expected to provide additional water supply	in many years.	but dependa	ble supply	during drou	ight is prese	ntly unquar	ntified.	



## Inter-Regional Cooperation Alternative Regional Water Plan Comal County

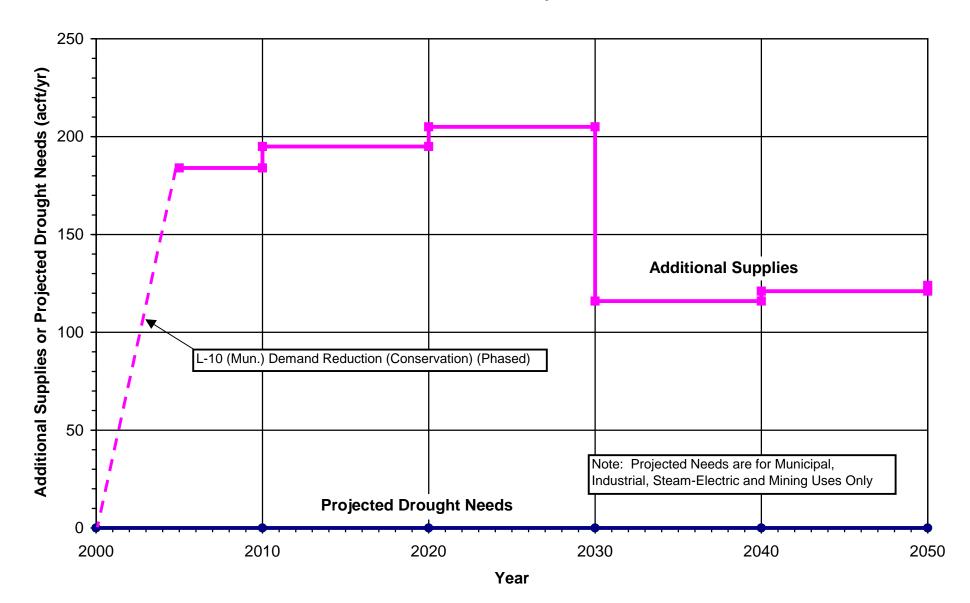
South Cen	tral Texas Region					Co	ounty =	Comal	
	mmary of Projected Water Needs and Wat	er Supply O	ptions			User Gro		all	
Drainated M	/ater Needs (acft/yr)								
FIOJECIEU W	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,289	5,049	10,487	18,282	25,205	33,062	NOLES
	Industrial		1,388	1,425	1.486	1,737	23,203	2,289	
	Steam-Electric		1,500	0	0	0	2,003	2,209	
	Mining		5,570	5,464	5,628	5,796	3,590	2,224	
	Irrigation		30	14	0,020	0,700	0,000	2,224	
	Total Needs		9,277	11,952	17,601	25,815	30,804	37,575	
	Mun, Ind, S-E, & Min Needs		9,247	11,938	17,601	25,815	30,804	37,575	
	Irrigation Needs		30	14	0	0	0	0	
Water Supp	ly Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)	New Suppry	616	718	848	718	<b>2040</b> 824	942	10165
G-15C	Canyon Reservoir - River Diversion	15,000	15,000	15,000	15,000	15,000	15,000	15,000	1
SCTN-3c	Simsboro Aquifer	55,000	15,000	15,000	3,500	12,000	16,500	24,000	3, 4
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		15,616	15,718	19,348	27,718	32,324	39,942	
	Total System Mgmt. Supply / Deficit		6,339	3,766	1,747	1,903	1,520	2,367	
М	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		6,369	3,780	1,747	1,903	1,520	2,367	
	Irrigation System Mgmt. Supply / Deficit		-30	-14	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, but	will not be	available im	mediately.		
1	Demand Reduction (Conservation) strategies assu			ected water	demands.				
2	Portion of Canyon firm yield (with amendment) dive								
3	Candidate New Supply shared by Bexar, Hays, and						ntified.		
4	Early implementation of facilities assumed in cost e								-
5	Option expected to provide additional water supply	in many years, b	out dependa	ble supply o	luring drou	ght is preser	ntly unquant	tified.	

## Inter-Regional Cooperation Alternative Regional Water Plan Dimmit County



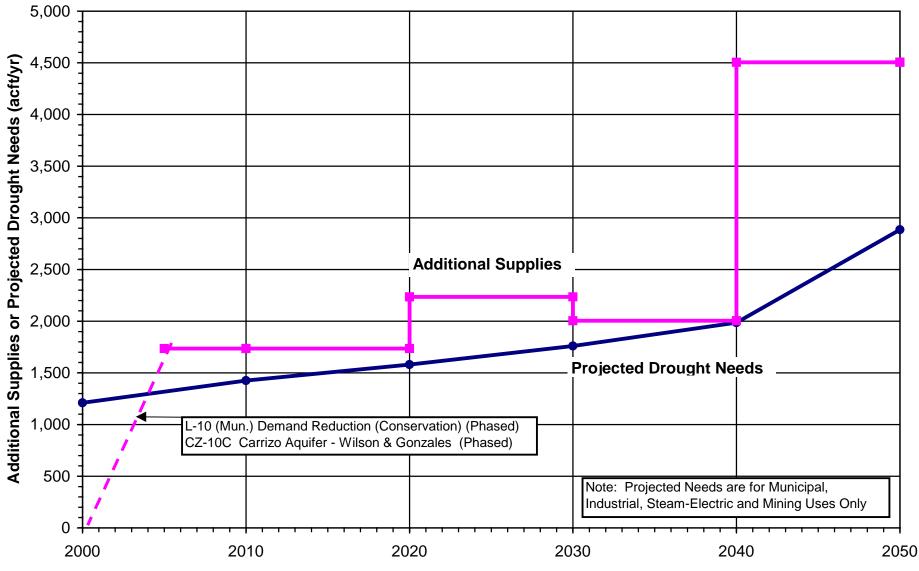
South Cen	ral Texas Region					Co	ounty =	Dimmit	
	mmary of Projected Water Needs and Wat	er Supply O	ptions			User Gro		all	
Dreiseted M	later Nanda (astthin)								
Projected w	ater Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
									Notes
	Municipal Industrial		138	405	649	1,054	1,479	1,959	
	Industrial Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	915	925	949	-
	Irrigation		0	0	0	2,133	925	1,331	
	Total Needs		138	405	-				
	Mun, Ind, S-E, & Min Needs		138	405	649 649	4,102 1,969	4,141 2,404	4,239 2,908	
	Irrigation Needs		130	405	049	2,133	1,737	1,331	
	Ingation Needs		U	U	0	2,133	1,737	1,331	
Water Sunn	ly Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)	New Supply	131	144	156	104	118	133	Notes
SCTN-2a	Carrizo Aquifer - Local Supply		500	1,000	1,000	2,500	3,000	3,500	2,
				.,	.,		-,		,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
	Total System Mgmt. Supply / Deficit		493	739	507	-1,498	-1,023	-606	
М	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	635	714	725	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	-2,133	-1,737	-1,331	
Notes:									
*	Candidate New Supplies shown for year 2000 are in					available im	mediately.		
1	Demand Reduction (Conservation) strategies assu		ected in proj	ected water	demands.				
2	Additional well(s) for Carrizo Springs and Mining su								
3	Early implementation of facilities assumed in cost e								
4	Option expected to provide additional water supply	in many years, I	out dependa	able supply (	during drou	ight is presei	ntly unquan	tified.	

## Inter-Regional Cooperation Alternative Regional Water Plan Frio County



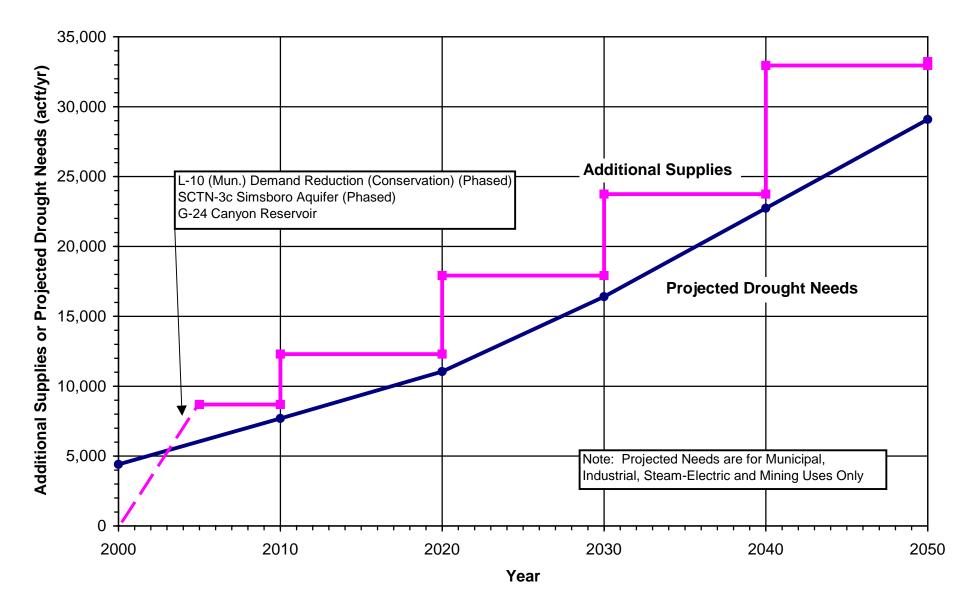
South Cen	tral Texas Region					Co	ounty =	Frio	
County Su	mmary of Projected Water Needs and Wa	ter Supply O	ptions			User Gro	up(s) =	all	
_									
Projected V	Vater Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		71,126	67,646	64,365	76,505	73,519	70,662	
	Total Needs		71,126	67,646	64,365	76,505	73,519	70,662	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		71,126	67,646	64,365	76,505	73,519	70,662	
Motor Curr	he Options (soft(un)	Osmaliatera							
	oly Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		184	195	205	116	121	124	1
									-
0.071									
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams		5.0.17	5.0.17	5 0 17	5.0.47	5.0.17	5.0.47	2
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	3
	Total New Supplies		6,131	6,142	6,152	6,063	6,068	6,071	
	Total System Mgmt. Supply / Deficit		-64,995	-61,504	-58,213	-70,442	-67,451	-64,591	
M	lun, Ind, S-E, & Min System Mgmt. Supply / Deficit		-0 <del>-</del> ,995 184	195	205	116	121	124	
	Irrigation System Mgmt. Supply / Deficit		-65,179	-61,699	-58,418	-70,558	-67,572	-64,715	
Notes:									
1	Demand Reduction (Conservation) strategies assu								
2	Option expected to provide additional water supply								
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997,	with conser	vation at 20	percent of	irrigation	
	application rate.								

## Inter-Regional Cooperation Alternative Regional Water Plan Guadalupe County



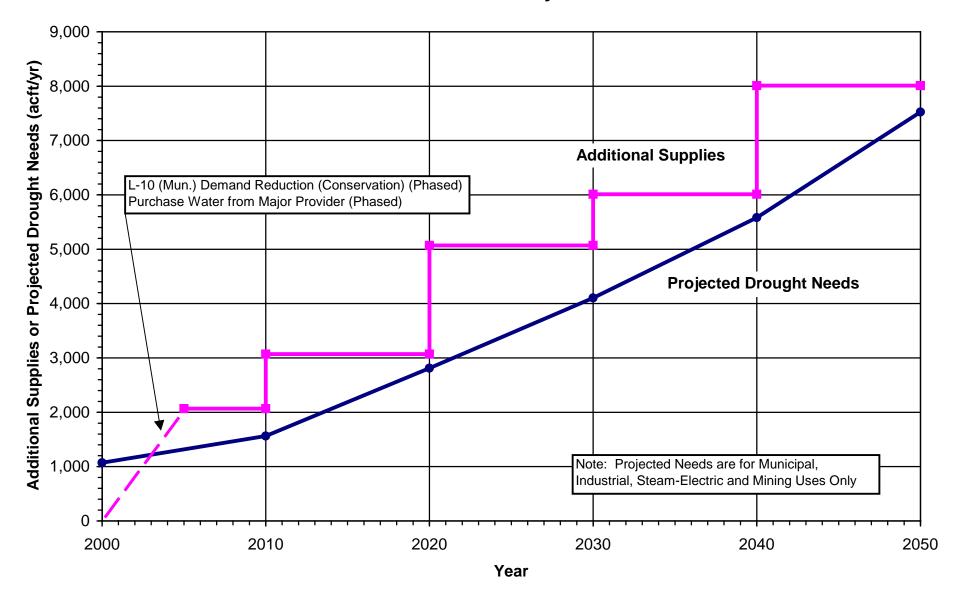
South Cent	ral Texas Region					Co	ounty =	Guadalu	ре
County Sur	nmary of Projected Water Needs and Wat	ter Supply O	otions			User Gro	up(s) =	all	
Projected W	ater Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		29	23	30		87	773	
	Industrial		985	1,204	1,350	1,487	1,692	1,899	
	Steam-Electric		0	0	0	0	0	0	
	Mining		196	198	200	202	207	213	
	Irrigation		985	879	779		594	508	
	Total Needs		2,195	2,304	2,359		2,580	3,393	
	Mun, Ind, S-E, & Min Needs		1,210	1,425	1,580	1,760	1,986	2,885	
	Irrigation Needs		985	879	779	684	594	508	
Water Suppl	y Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
		New Supply							Notes
L-10 (Mun.)	Demand Reduction (Conservation)	40,000	235	236	236	-	5	-	
CZ-10C	Carrizo Aquifer - Wilson & Gonzales	40,000	1,500	1,500	2,000	2,000	2,500	4,500	2, 3
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
L-10 (III.)									
	Total New Supplies		1,735	1,736	2,236	2,005	2,505	4,506	
			.,	.,	_,	_,	_,	.,	
	Total System Mgmt. Supply / Deficit		-460	-568	-123	-439	-75	1,113	
Μι	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		525	311	656	245	519	1,621	
	Irrigation System Mgmt. Supply / Deficit		-985	-879	-779	-684	-594	-508	
Notes:	Candidate New Supplies shown for year 2000 are i	doptified for aria	ritu implanta	ntation by	مطلوم الأسد	ovoiloble in	modiotely		
1						avaliable In	mediately.		
2	Demand Reduction (Conservation) strategies assu Candidate New Supply shared by Bexar and Guada					to be questi	lind		
		AUTOR L'OUTINES							
3	Early implementation of facilities assumed in cost e						icu.		

## Inter-Regional Cooperation Alternative Regional Water Plan Hays County



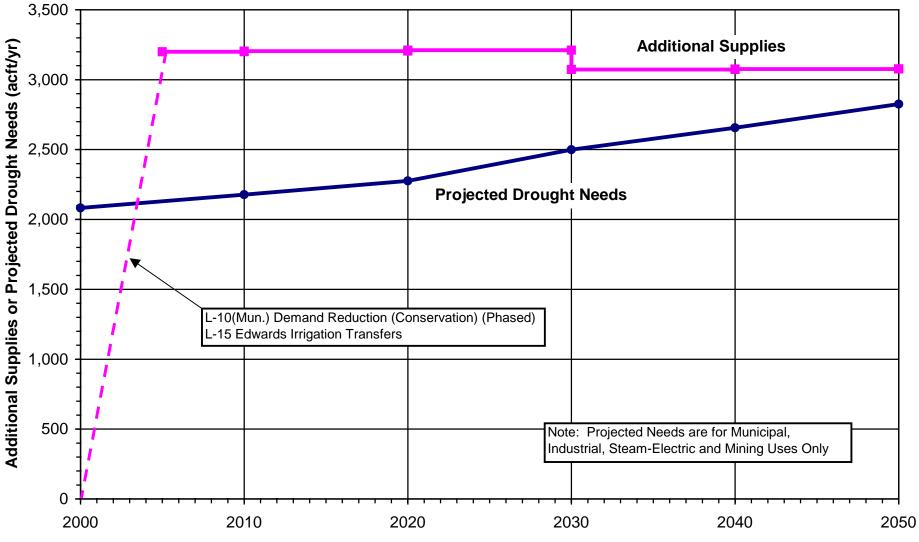
South Cent	ral Texas Region					Co	ounty =	Hays	
	nmary of Projected Water Needs and Wat	ter Supply Or	otions			User Gro		all	
· · · · · · · · · · · · · · · · · · ·									
Projected W	ater Needs (acft/yr)								
-	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		4,325	7,609	10,980	16,349	22,696	29,059	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		84	82	68	55	37	28	
	Irrigation		0	0	0	0	0	0	
	Total Needs		4,409	7,691	11,048	16,404	22,733	29,087	
	Mun, Ind, S-E, & Min Needs		4,409	7,691	11,048	16,404	22,733	29,087	
	Irrigation Needs		0	0	0	0	0	0	
Water Suppl	y Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		647	747	873	699	906	1,174	1
SCTN-3c	Simsboro Aquifer	55,000	4,000	7,000	10,500	16,000	22,000	31,000	2, 3
G-24	Canyon Reservoir	1,048	1,048	1,048	1,048	1,048	1,048	1,048	4
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		5,695	8,795	12,421	17,747	23,954	33,222	
	Total System Mgmt. Supply / Deficit		1 200	1 104	4 272	1,343	4 004	4,135	
M.	Ind, S-E, & Min System Mgmt. Supply / Deficit		1,286 1,286	1,104 1,104	1,373 1,373	1,343	1,221 1,221	4,135	
IVIL	Irrigation System Mgmt. Supply / Deficit		1,200	1,104	1,373	1,343	0		
	inigation System Mgmt. Supply / Dencit		U	U	U	U	0	U	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	ntation but	t will not be	available im	mediately		
1	Demand Reduction (Conservation) strategies assu						inculatory.		
2		Comal Counties	s Effects o	n regional a	acuifer leve	ls to be qua	ntified		
	Candidate New Supply shared by Bexar, Have and								
	Candidate New Supply shared by Bexar, Hays, and Early implementation of facilities assumed in cost of								
3 4	Candidate New Supply shared by Bexar, Hays, and Early implementation of facilities assumed in cost e Candidate New Supply for Wimberley and Woodcr	estimation to ens							

## Inter-Regional Cooperation Alternative Regional Water Plan Kendall County



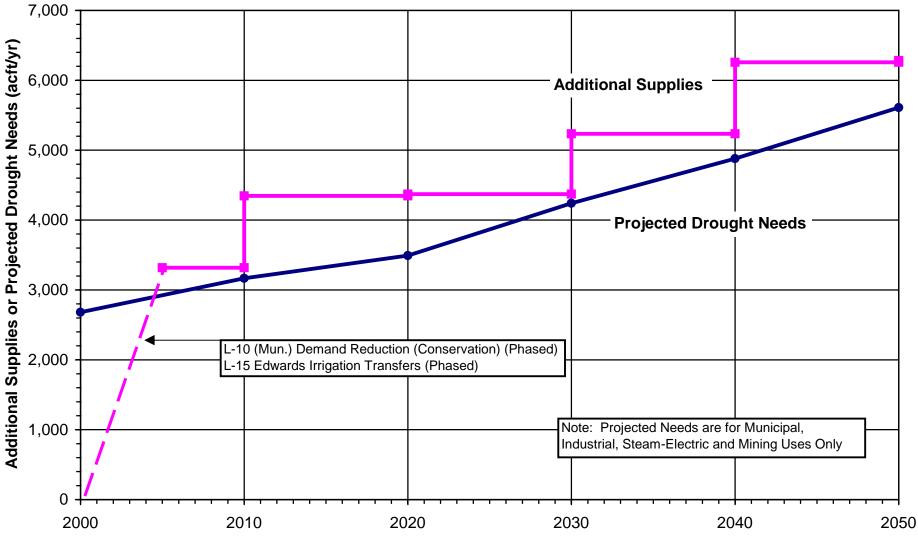
South Cent	ral Texas Region					Co	ounty =	Kendall	
	nmary of Projected Water Needs and Wat	er Supply O	ptions			User Gro	up(s) =	all	
Desire 114									
Projected w	ater Needs (acft/yr)		0000	0040	0000	0000	0040	0050	Natas
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		1,070	1,560	2,808	4,099	5,578		
	Industrial		2	3	4	4	5	-	
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	0	0	-	
	Irrigation Total Needs		0	U	•	•	-	-	
			1,072	1,563	2,812	4,103	5,583 5,583		
	Mun, Ind, S-E, & Min Needs Irrigation Needs		1,072 0	1,563 0	<u>2,812</u> 0	4,103 0	<u> </u>		
	Inigation Needs		U	U	0	0	0	U	
Water Suppl	y Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		67	71	71	11	11	11	1
- ( - )	Purchase Water from Major Provider		2,000	2,000	3.000	5,000	6,000	8,000	2, 3
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		2,067	2,071	3,071	5,011	6,011	8,011	
	Total System Mgmt. Supply / Deficit		995	508	259	908	428	487	
M	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		995	508	259	908	428	487	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are in	dentified for pric	rity impleme	entation, bu	t will not be	available im	mediately	-	
1	Demand Reduction (Conservation) strategies assu						oulatory.	· · · · · · · · · · · · · · · · · · ·	
2	Assumed purchase from Bexar County major provi					l in Bexar Co	ounty table	<u> </u>	
3	Early implementation of facilities assumed in cost e							-	
4	Option expected to provide additional water supply						athunana	مغافاته ما	

## Inter-Regional Cooperation Alternative Regional Water Plan Medina County



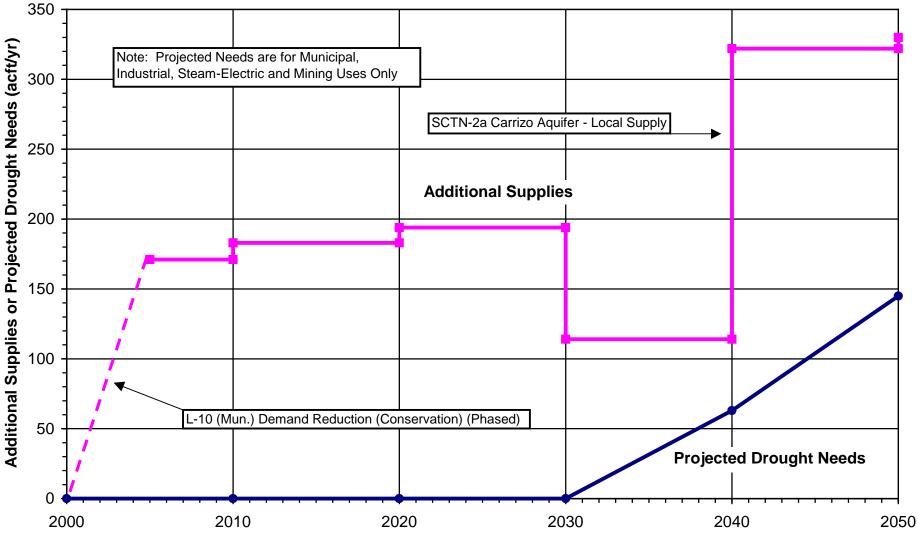
South Cent	tral Texas Region					С	ounty =	Medina	
County Sur	mmary of Projected Water Needs and Wat	er Supply O	ptions			User Gro	oup(s) =	all	
Projected W	/ater Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2.015	2,110	2,206	2,427	2,582	2,750	
	Industrial		2,010	2,110	2,200	0	2,002	2,100	
	Steam-Electric		0	0	0	-	0	0	
	Mining		68	68	70		74	76	
	Irrigation		89,757	87,941	82,161	80,963	75,663	70,587	
	Total Needs		91,840	90,119	84,437	83,462	78,319	73,413	
	Mun, Ind, S-E, & Min Needs		2,083	2,178	2,276	,	2,656	2,826	
	Irrigation Needs		89,757	87,941	82,161	80,963	75,663	70,587	
Nator Suppl	ly Options (acft/yr)	Candidate							
D#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
-10 (Mun.)	Demand Reduction (Conservation)	New Supply	2000	2010	2020	73	76	78	Notes
10 (Mull.) 15	Edwards Irrigation Transfers	42,500	3,000	3,000	3,000	3,000	3,000	3,000	2,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
40 (1	Small Aquifer Recharge Dams		44.007	44.007	44.007	44.007	44.007	44.007	
10 (Irr.)	Demand Reduction (Conservation)		11,867	11,867	11,867	11,867	11,867	11,867	
	Total New Supplies		15,067	15,072	15,078	14,940	14,943	14,945	
	Total System Mgmt. Supply / Deficit		-76,773	-75,047	-69,359	-68,522	-63,376	-58,468	
М	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,117	1,027	935	574	420	252	
	Irrigation System Mgmt. Supply / Deficit		-77,890	-76,074	-70,294	-69,096	-63,796	-58,720	
lotes:									
	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, bu	t will not be	available ir	nmediately.		
	Demand Reduction (Conservation) strategies assu								
	Candidate New Supply to be shared among Uvalde	, Medina, Atasc	osa, and Be	exar Counti	es. Supply	may not be	reliable in o	drought.	
3	Pursuant to draft EAA Critical Period Management							Ŭ	·
	an estimated potential annual transfer of 50,000 ac								
Ļ	Option expected to provide additional water supply						ently unquar	ntified.	
5	Estimates based upon use of LEPA systems on 80								
	application rate, but applicable to only 50 percent o							Ŭ	

Inter-Regional Cooperation Alternative Regional Water Plan Uvalde County



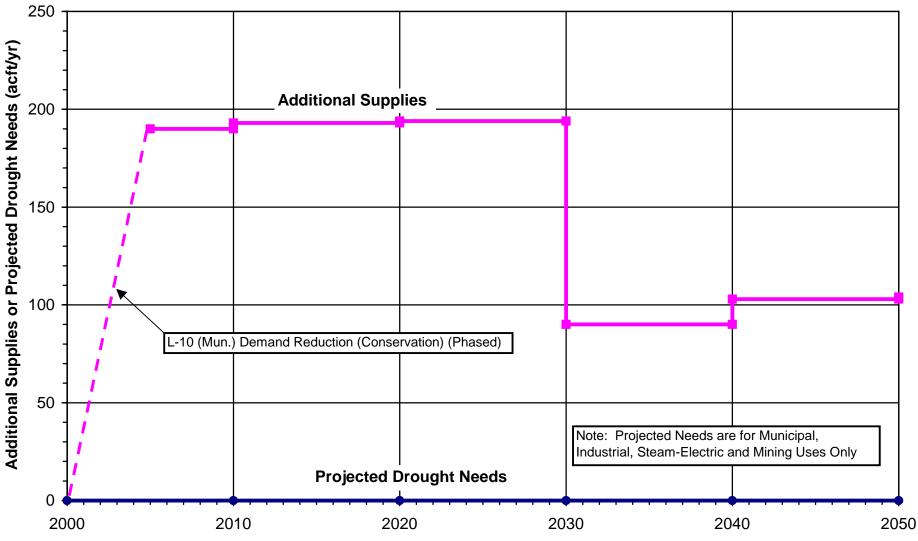
South Cent	tral Texas Region					C	ounty =	Uvalde	
	mmary of Projected Water Needs and Wat	ter Supply O	ptions			User Gro	up(s) =	all	
Projected W	/ater Needs (acft/yr)			0040	0000	0000	00.40	0050	Neter
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,682	3,166	3,493	4,241	4,880	5,609	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		Ű	63,343	0 58,335	Ű	0 51,766	47,475	
	Irrigation		63,443			56,366	-	,	
	Total Needs Mun, Ind, S-E, & Min Needs		66,125 2.682	66,509	61,828 3,493	60,607 4,241	56,646 4.880	53,084 5,609	
	Irrigation Needs		63,443	3,166 63,343	3,493 58.335	4,241	4,880	5,609	
	Irrigation needs		63,443	63,343	58,335	50,300	51,700	41,415	
Wator Supp	ly Options (acft/yr)	Candidate							
ID#	Description		2000*	2010	2020	2030	2040	2050	Notes
		New Supply							Notes
L-10 (Mun.)	Demand Reduction (Conservation)	42,500	318	346	371	235	258	283	
L-15	Edwards Irrigation Transfers	42,500	3,000	4,000	4,000	5,000	5,000	6,000	2, 3,
0.0711									
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		14,143	14,143	14,143	14,143	14,143	14,143	
	Total New Supplies		17,461	18,489	18,514	19,378	19,401	20,426	
	Total System Mgmt. Supply / Deficit		-48,664	-48,020	-43,314	-41,229	-37,245	-32,658	
M	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		636	1,180	878	994	378	674	
	Irrigation System Mgmt. Supply / Deficit		-49,300	-49,200	-44,192	-42,223	-37,623	-33,332	
Notoo									
Notes:	Candidata Naw Cumplica about farur - 2000	dentified for a si-	بالإستام الم	antation but	المومر الأربين	available in	and all at a less		
1	Candidate New Supplies shown for year 2000 are i					avaliable in	imediately.		
<u>ו</u> ר	Demand Reduction (Conservation) strategies assu					moursth-	rolioble in i	lrought	
2	Candidate New Supply to be shared among Uvalde							irought.	
3	Pursuant to draft EAA Critical Period Management						cent of		
4	an estimated potential annual transfer of 50,000 ac								
4	Early implementation of facilities assumed in cost e							(f)1	
5	Option expected to provide additional water supply								
6	Estimates based upon use of LEPA systems on 80					vation at 40	percent of	irrigation	
	application rate, but applicable to only 50 percent o	t Edwards Aquif	er irrigation	permitted q	uantities.				

## Inter-Regional Cooperation Alternative Regional Water Plan Wilson County



South Central Texas Region						Co	ounty =	Wilson	
	er Supply Options						all		
Projected W	/ater Needs (acft/yr)			0010				0050	
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	-	63	145	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		÷	-	Ŧ	÷	-	-	
	Total Needs		0	0	0	-	63	145	
	Mun, Ind, S-E, & Min Needs		-	0	0	0	63	145	
	Irrigation Needs		0	0	0	0	0	0	
Water Supp	ly Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		171	183	194	114	122	130	1
SCTN-2a	Carrizo Aquifer - Local Supply						200	200	2
SCTN-4	Brush Management								3
SCTN-5	Weather Modification								3
SCTN-9	Rainwater Harvesting								3
	Small Aquifer Recharge Dams								3
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		171	183	194	114	322	330	
	Total System Mgmt. Supply / Deficit		171	183	194	114	259	185	
м	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		171	183	194	114	259	185	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proj	ected wate	r demands.				
2	Additional well(s) for Floresville.								
3	Option expected to provide additional water supply	in many years, l	but dependa	able supply	during drou	ight is prese	ntly unquar	ntified.	

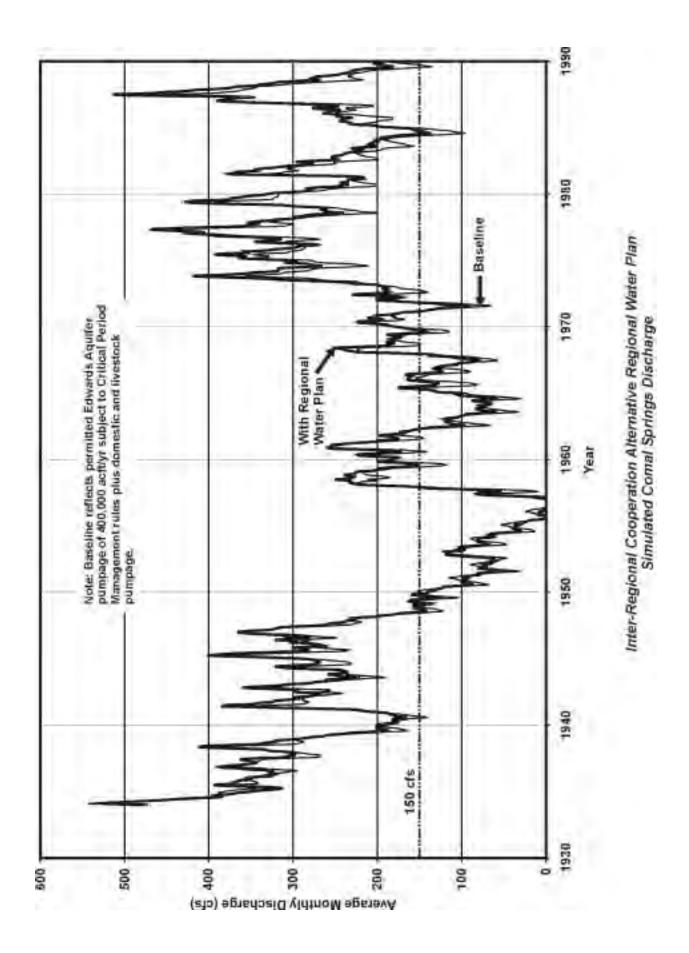
# Inter-Regional Cooperation Alternative Regional Water Plan Zavala County

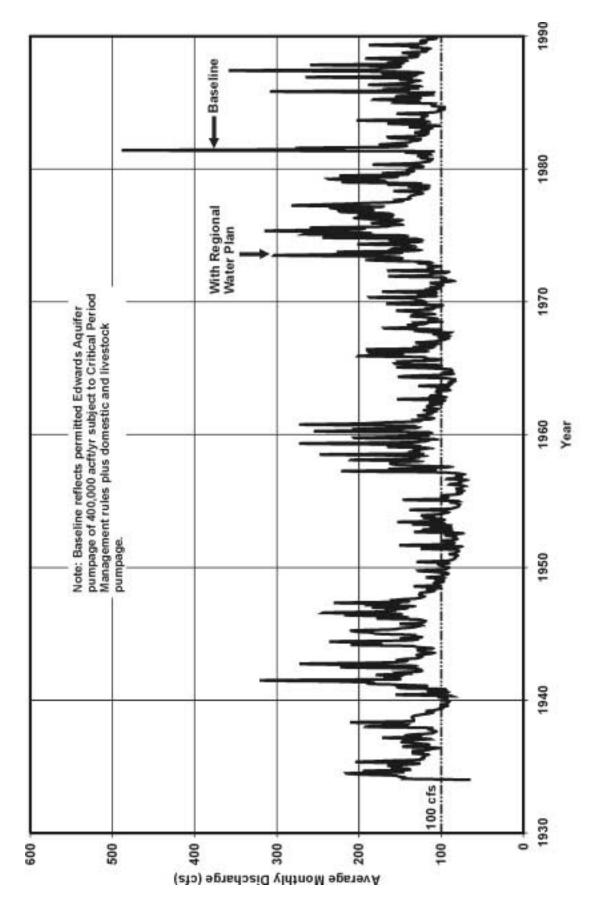


Year

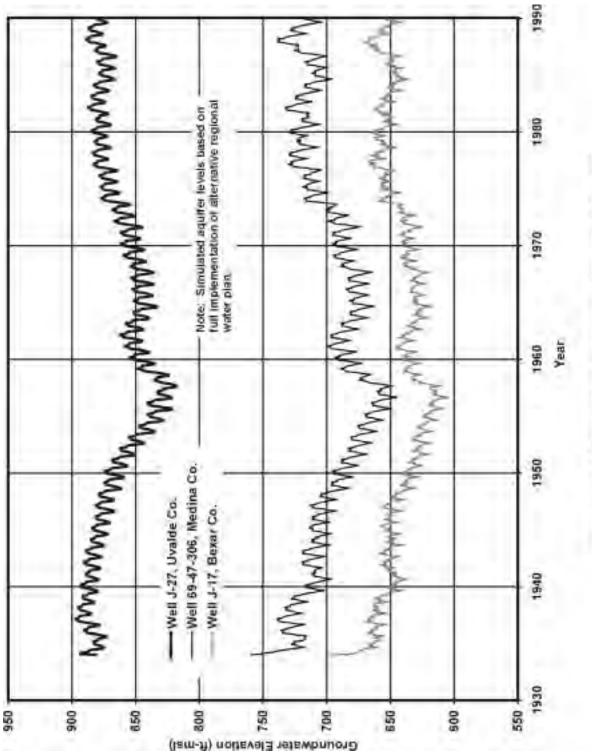
South Centr	al Texas Region					C	ounty =	Zavala	
	mary of Projected Water Needs and Water	ter Supply O	ptions			User Group(s) =		all	
Projected Wa	ter Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0		110100
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	-	
	Irrigation		80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	Mun, Ind, S-E, & Min Needs		00,722	0,505	12,000	00,233	0,013	,	
	Irrigation Needs		80,722	76,589	72,655	88,293	84,673	-	
			•••,: ==	. 0,000	,	00,200	• 1,01 •	01,200	
Water Supply	<pre>v Options (acft/yr)</pre>	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		190	193	194	90	103	104	
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								2
L-10 (Irr.)	Demand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	3
	Total New Supplies		6,591	6,594	6,595	6,491	6,504	6,505	
	Total System Mgmt. Supply / Deficit		-74,131	-69,995	-66,060	-81,802	-78,169	-74,695	
Mur	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		190	193	194	90	103	104	
	Irrigation System Mgmt. Supply / Deficit		-74,321	-70,188	-66,254	-81,892	-78,272	-74,799	
Notes:	Demonstration (Operation) at the i		a sta dia a l'	tl t					
1	Demand Reduction (Conservation) strategies assu					aht in			
2	Option expected to provide additional water supply								
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997,	with conser	vation at 20	percent of	irrigation	
	application rate.								

#### Inter-Regional Cooperation Regional Water Management Alternative Plan

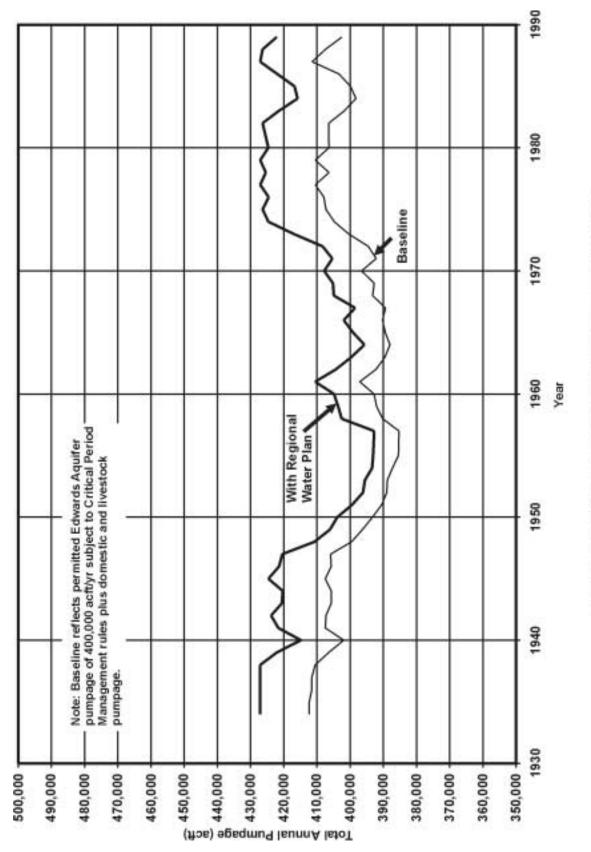




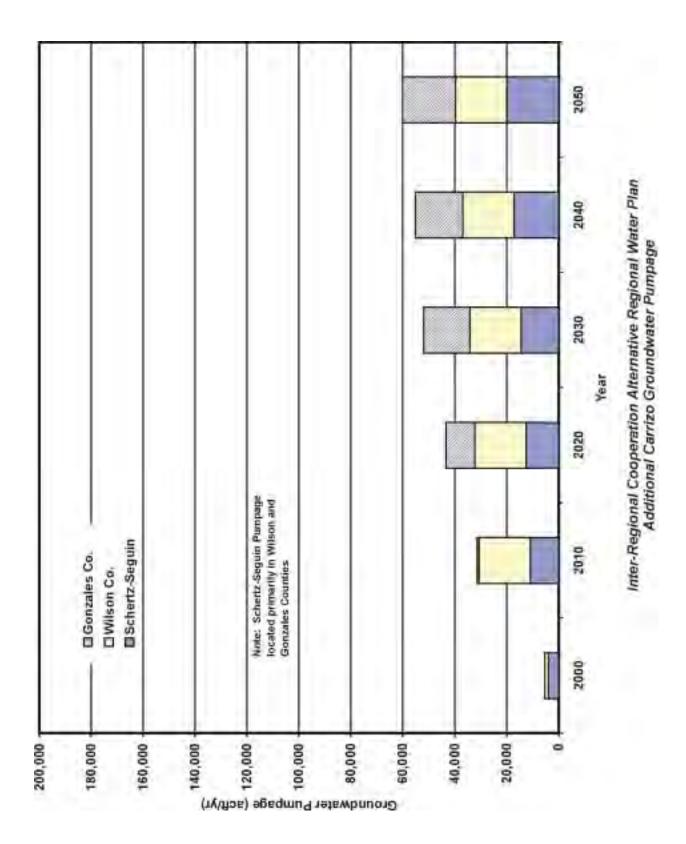
Inter-Regional Cooperation Alternative Regional Water Plan Simulated San Marcos Springs Discharge

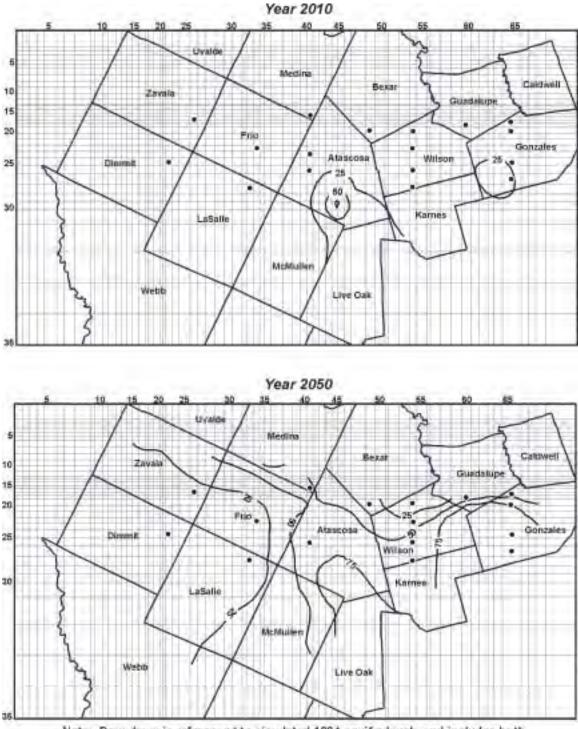








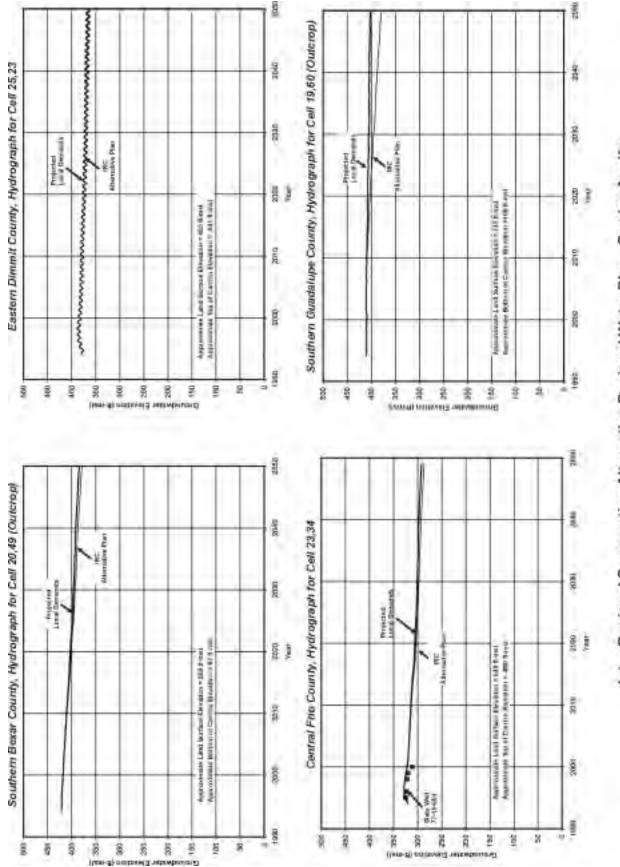




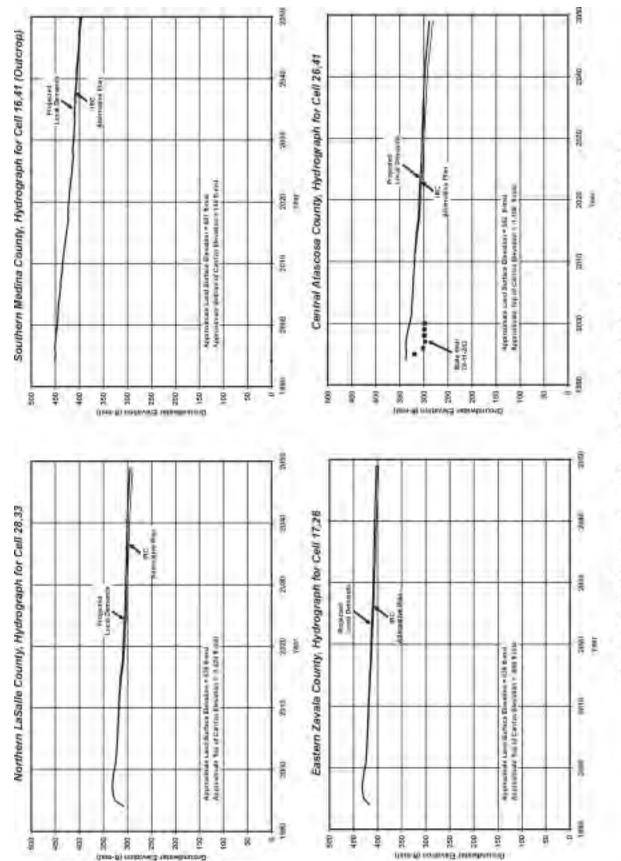
Note: Drawdown is referenced to simulated 1994 aquifer levels and includes both projected local demands and development of water supply options in this alternative regional water plan.

Monitoring Well Location

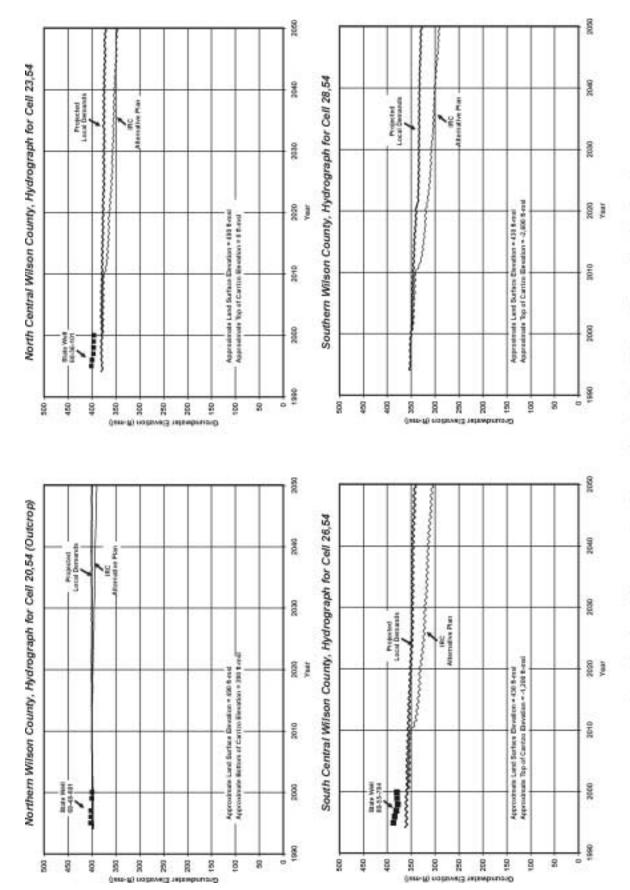
Inter-Regional Cooperation Alternative Regional Water Plan Simulated Carrizo Aquifer Drawdown



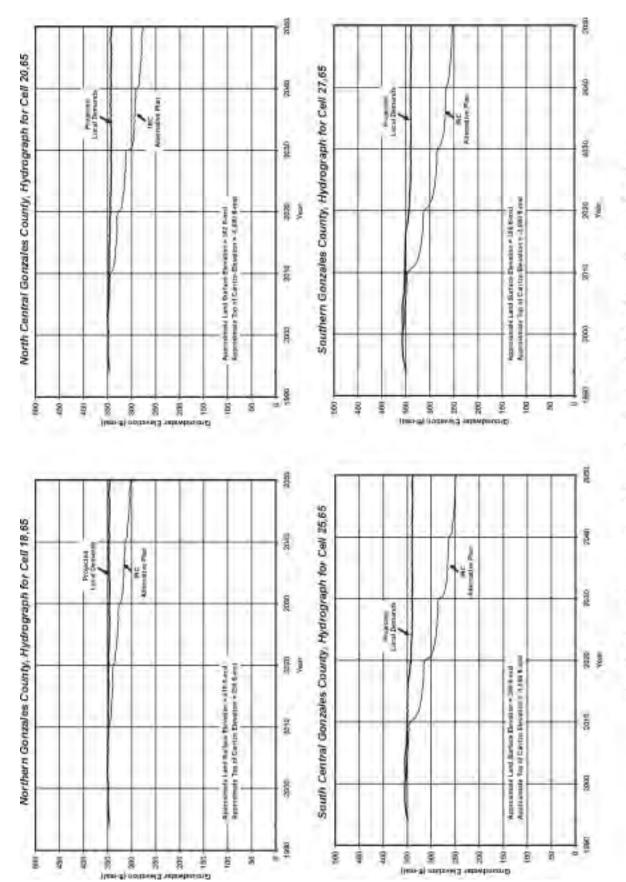
Inter-Regional Cooperation Alternative Regional Water Plan - Carrizo Aquifer



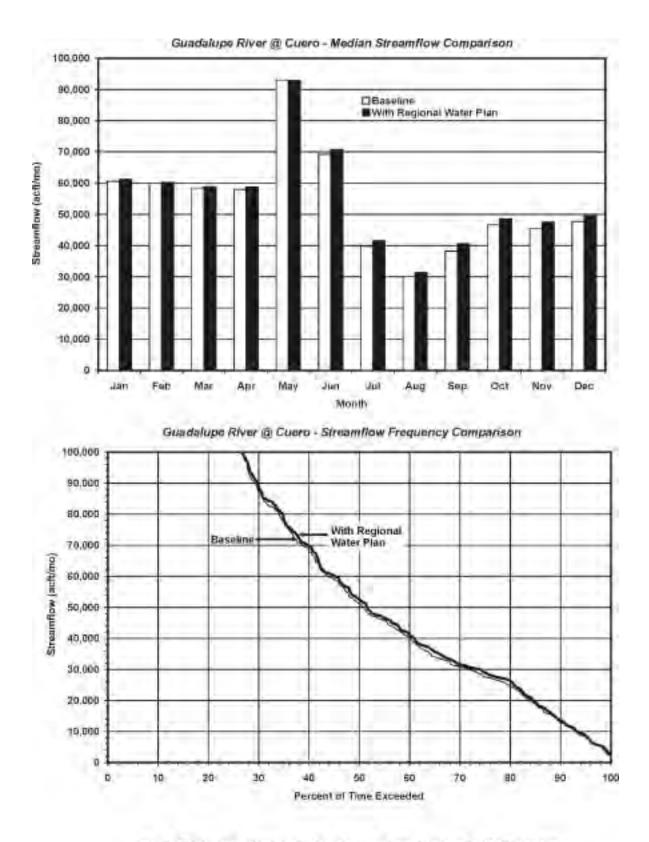




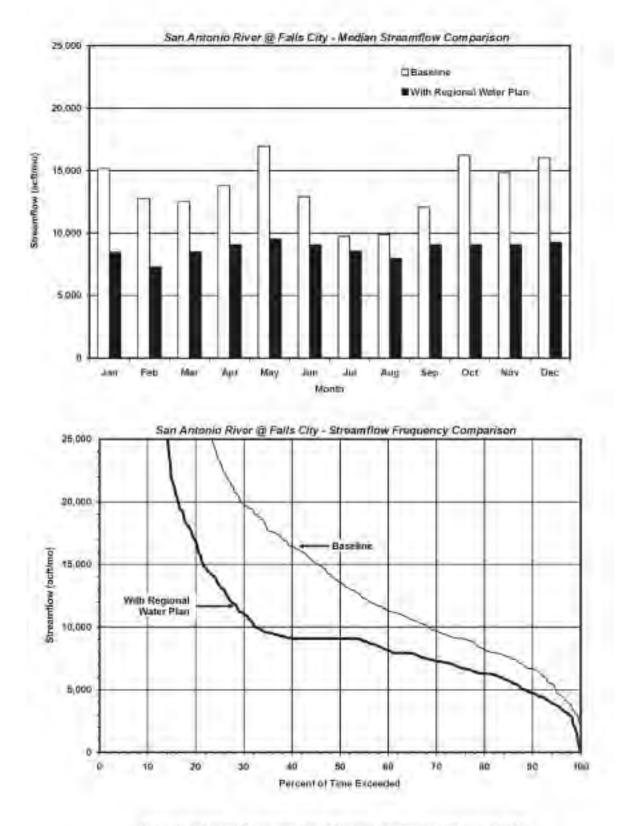




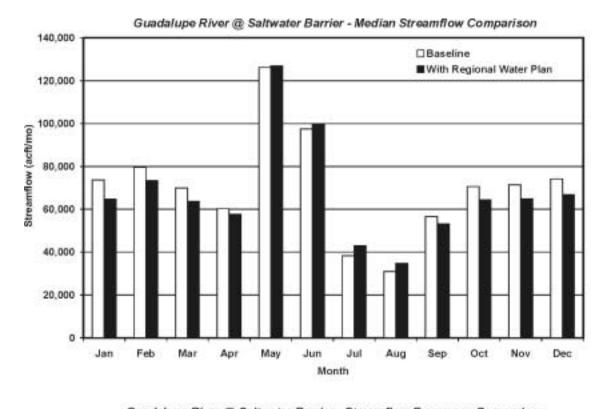


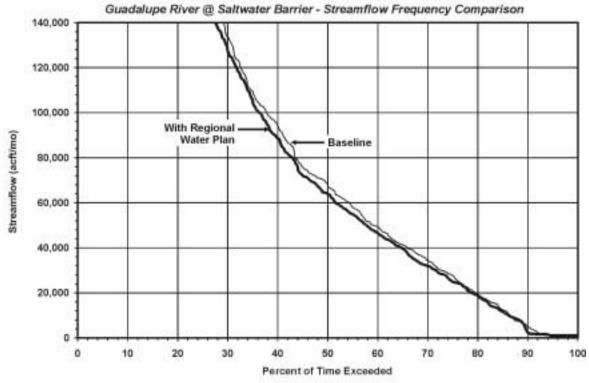


Inter-Regional Cooperation Alternative Regional Water Plan Streamflow Comparisons

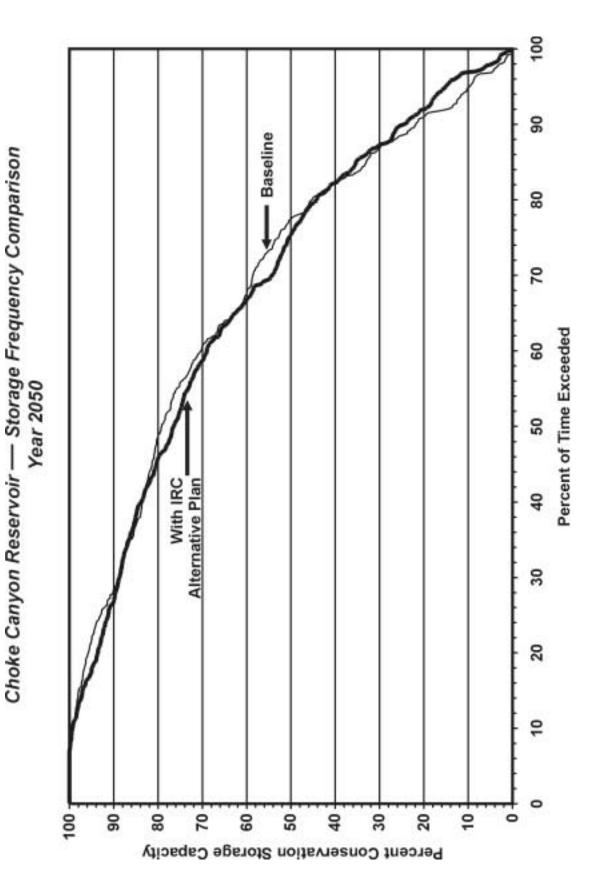


Inter-Regional Cooperation Alternative Regional Water Plan Streamflow Comparisons



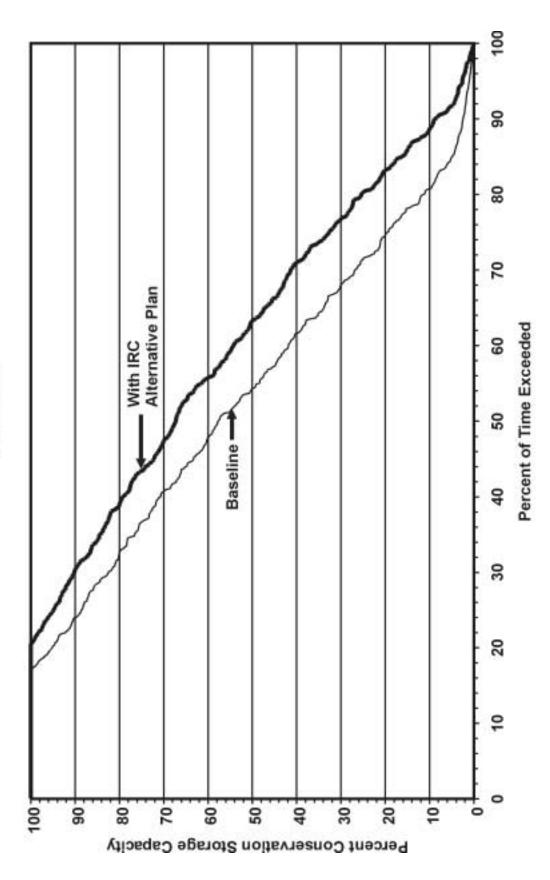


Inter-Regional Cooperation Alternative Regional Water Plan Streamflow Frequency Comparisons



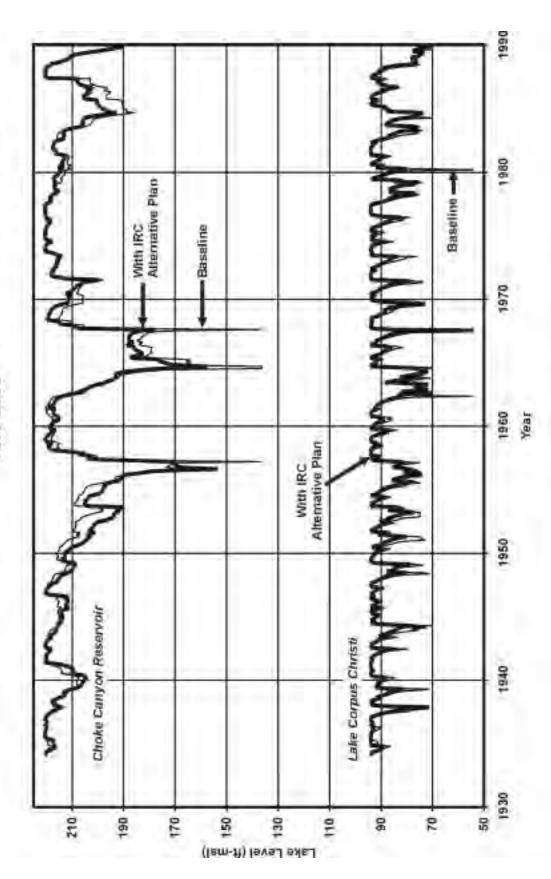


Lake Corpus Christi — Storage Frequency Comparison Year 2050





Choke Canyon Reservoir/Lake Corpus Christi — Lake Level Trace Year 2050



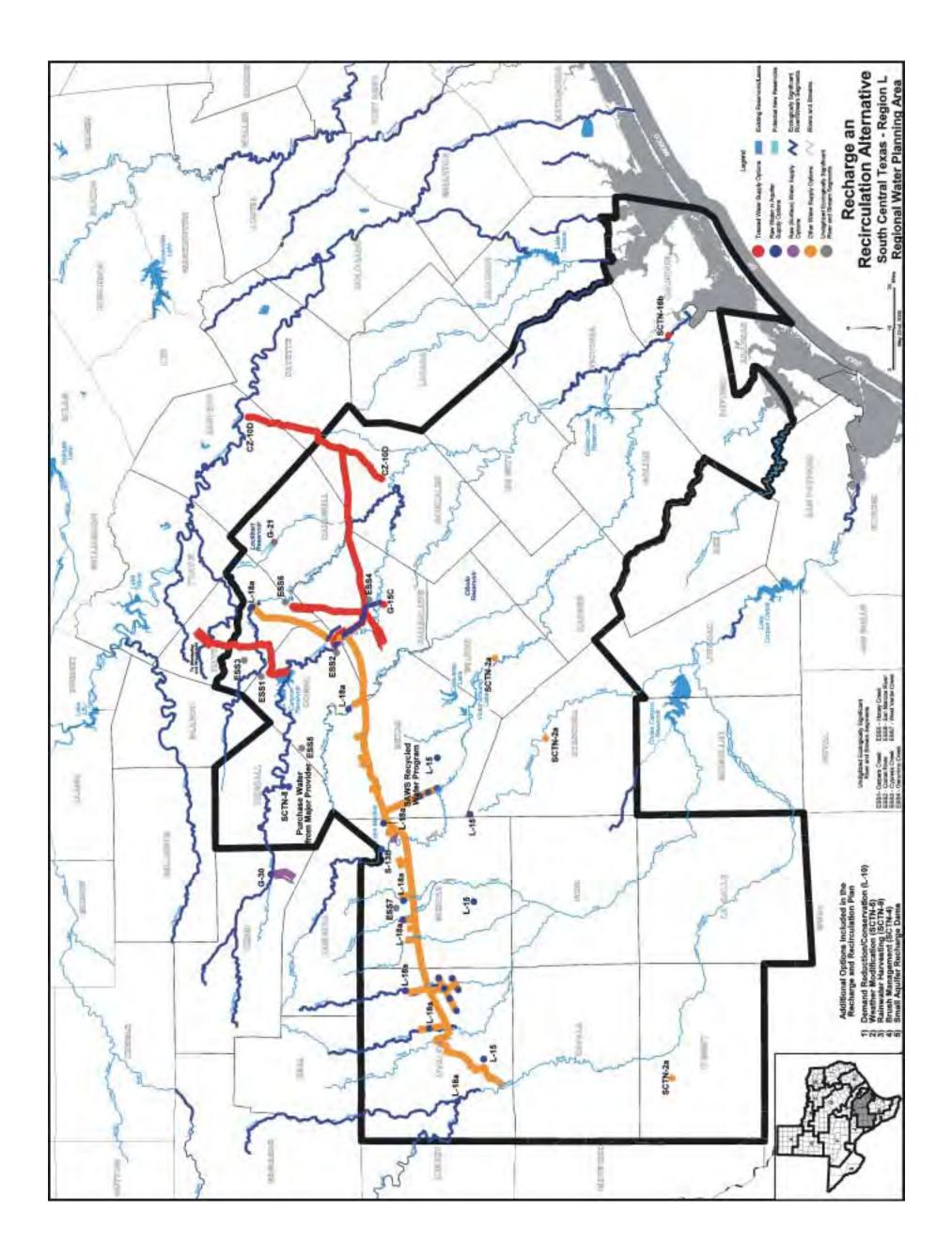
Inter-Regional Cooperation Alternative Plan

# "Recharge & Recirculation" Regional Water Management Alternative Plan

# South Central Texas Regional Water Planning Group

San Antonio River Authority

HDR Engineering, Inc. June 13, 2000



# South Central Texas Region Alternative Water Plans

#### Alternative Name: Recharge and Recirculation Alternative

#### Alternative ID: R&R

**Alternative Description:** The Recharge and Recirculation Alternative Regional Water Plan, proposes a comprehensive integration of recharge enhancement and recirculation to maximize supply available from the Edwards Aquifer. **One test** for a maximized supply is conditioned on not allowing an increase in pumpage to reduce flow from Comal Springs below baseline conditions (400,000 acft/yr of permitted pumpage); and, a **second test** maintains a minimum flow from Comal Springs at 60 cfs (which is not subject to diversion for recirculation).

The objectives of this plan are to be accomplished through:

- 1. Developing all reasonably economical recharge enhancement options;
- 2. Increasing recharge to the aquifer by diverting unappropriated flow at Lake Dunlap and recirculating enhanced springflow from Comal Springs back to streams and recharge structures on the Edwards Aquifer Recharge Zone in Bexar, Medina, and Uvalde Counties; and
- 3. Transferring groundwater from west to east to maintain water levels, municipal pumpage, and springflow in the eastern part of the aquifer during drought conditions.

The following simulations are proposed to determine the maximized water supply for this recharge and recirculation alternative. Two tests, as described above, will be performed for each Run.

- Run 1: Include all recharge enhancement features, voluntary transfer of Edwards irrigation rights to municipal use, and transfer and recirculate available water from Lake Dunlap to the recharge zone in Bexar, Medina, and Uvalde Counties;
- Run 2: Include same recharge enhancement and recirculation features in Run 1 and add the feature of transferring all the available flow from Lake Dunlap to Cibolo Creek when flow from Comal Springs approaches critical conditions (assumed to be about 150 cfs);
- Run 3: Include same recharge enhancement and recirculation features in Run 1 and 2 and add the feature of transferring groundwater from the western part of the aquifer to Cibolo Creek when flow from Comal Springs approaches critical conditions (assumed to be about 150 cfs); and
- Run 4: Include same recharge enhancement and recirculation features in Run 1, 2, and 3 and add a feature of transferring groundwater from the western part of the aquifer to Bexar County when flow from Comal Springs approaches critical conditions (assumed to be about 150 cfs).

The following water supply options are included in the Recharge & Recirculation Alternative Regional Water Plan (in no particular order):

- 1. Demand Reduction / Conservation (L-10)
- 2. Edwards Irrigation Transfers (L-15)
- 3. Edwards Recharge Type 2 Projects (L-18a)
- 4. Guadalupe River Diversion to Recharge Zone (G-30)
- 5. Medina Lake Recharge Enhancement (S-13B)
- 6. Edwards Aquifer Recirculation Systems
- 7. Carrizo Aquifer Gonzales & Bastrop Counties (CZ-10D)

- 8. Carrizo Aquifer Local Supply (SCTN-2a)
- 9. Canyon Reservoir (G-15C)
- 10. Wimberley and Woodcreek Canyon (G-24)
- 11. Lockhart Reservoir (G-21)
- 12. Trinity Aquifer Optimization (SCTN-8)
- 13. Rainwater Harvesting (SCTN-9)
- 14. Weather Modification (SCTN-5)
- 15. Brush Management (SCTN-4)

## Recharge and Recirculation Alternative Regional Water Plan Summary of Key Information for South Central Texas Regional Water Planning Group

#### Quantity, Reliability, and Cost

- Plan includes management supplies to meet projected needs, ensure reliability, and maintain springflow, resulting in a quantity of additional water supplies sufficient to meet projected needs for municipal, industrial, steam-electric power, and mining uses only through the year 2020 or 2030. In order to meet projected needs through the year 2050 and allow for direct comparison with other alternative regional water plans, additional water supplies sufficient to provide about 60,000 acft (in year 2030) to about 100,000 acft (in year 2050) will need to be added to this alternative plan.
- Unit cost is above the average of the five alternative plans under consideration.

#### **Environmental Factors**

- Greatest decrease in median annual streamflow in the Guadalupe River at Cuero and at the Saltwater Barrier among the five alternative plans under consideration.
- Greatest concerns with respect to Ecologically Significant Stream Segments among the five alternative plans under consideration.
- Least concerns with Water Quality & Aquatic Habitat and Cultural Resources among the five alternative plans under consideration, however, inclusion of necessary additional water supplies could increase concerns.

#### Impacts on Water Resources

- No unmitigated reductions in water available to existing water rights.
- Long-term reductions in water levels in the Carrizo Aquifer in Gonzales and Bastrop Counties.

#### Impacts on Agriculture and Natural Resources

- Major commitment to municipal and irrigation water Demand Reduction (Conservation) (L-10).
- Includes Brush Management (SCTN-4) and Weather Modification (SCTN-5).
- Inclusion of water supply options to meet projected irrigation needs in full is estimated to be economically infeasible at this time. Weather Modification (SCTN-5) assists irrigation and dry-land agriculture (crops and ranching).
- Includes maximum potential voluntary transfer of Edwards Aquifer irrigation permits to municipal permits through lease or purchase.
- Includes Medina Lake Recharge Enhancement (S-13B) which reduces or eliminates water supplies from the Medina Lake System for irrigation in Bexar, Medina, and Atascosa Counties.

#### **Other Relevant Factors per SCTRWPG**

#### **Comparison of Strategies to Meet Needs**

• Selection of water supply options comprising the alternative plan based on integration of recharge enhancement and recirculation to maximize supply available from the Edwards Aquifer, preferences expressed by planning units, and closest available supply.

#### Interbasin Transfer Issues

- Projected non-irrigation needs in basin(s) of origin are met throughout the planning period.
- Plan includes one interbasin transfer: 1) Recirculation Systems from the Guadalupe River near Lake Dunlap and the Blanco River near Kyle to the outcrop of the Edwards Aquifer in the San Antonio and Nueces River Basins.

#### **Third-Party Impacts of Voluntary Redistribution of Water**

- Potential positive or negative effects of Edwards Irrigation Transfers (L-15).
- Lower water levels in some portions of the Carrizo Aquifer.

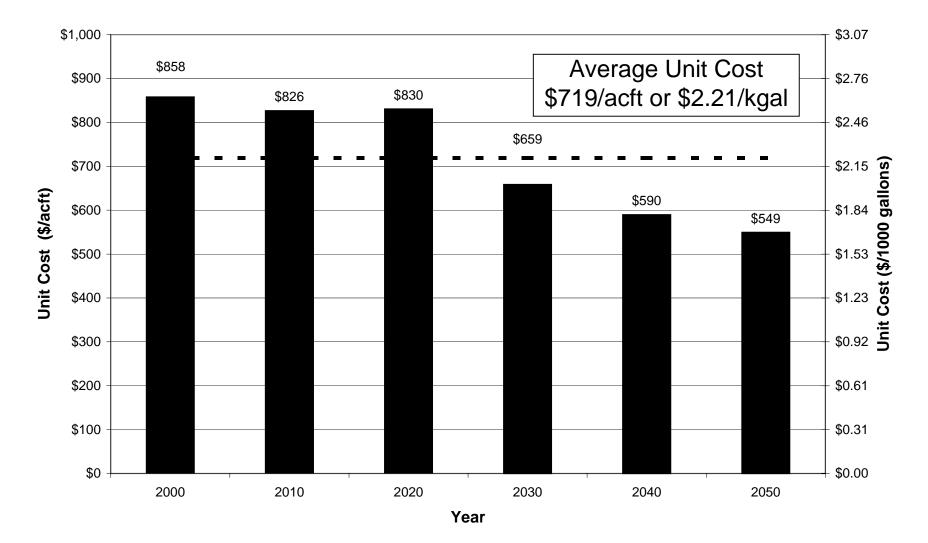
#### **Regional Efficiency**

- Edwards Irrigation Transfers (L-15) require no new facilities. Transferred water would likely be available at or very near locations having projected municipal, industrial, steam-electric power, and mining needs in Uvalde, Medina, Atascosa, and Bexar Counties.
- Recirculation Systems provide for recovery and recirculation of enhanced Comal springflow resulting from implementation of Edwards Recharge Type 2 Projects (L-18a), Medina Lake
   Recharge Enhancement (S-13B), and Guadalupe River Diversions to Recharge Zone (G-30).
- Consider reduced transmission capacity in the Recirculation Systems and elimination of Guadalupe River Diversions to Recharge Zone (G-30) to moderate unit cost.

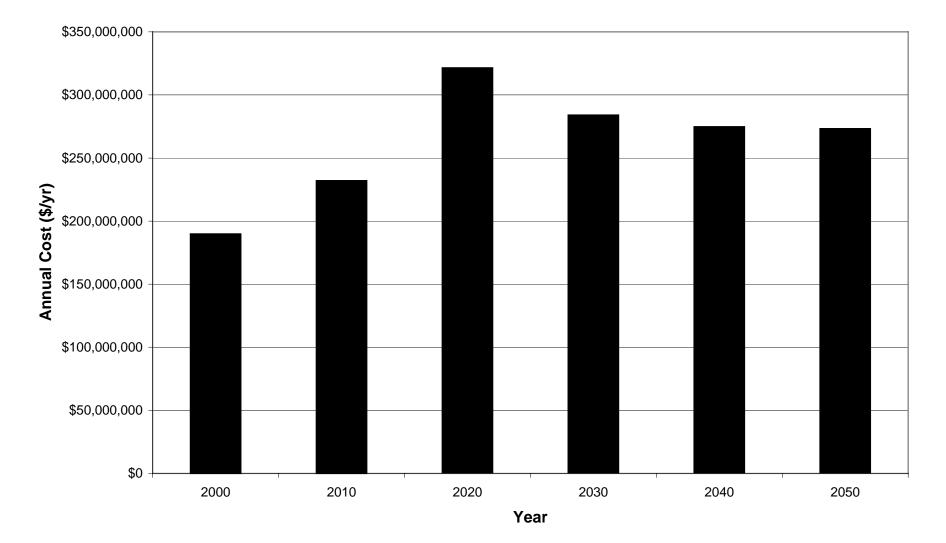
#### Effect on Navigation

• Not applicable.

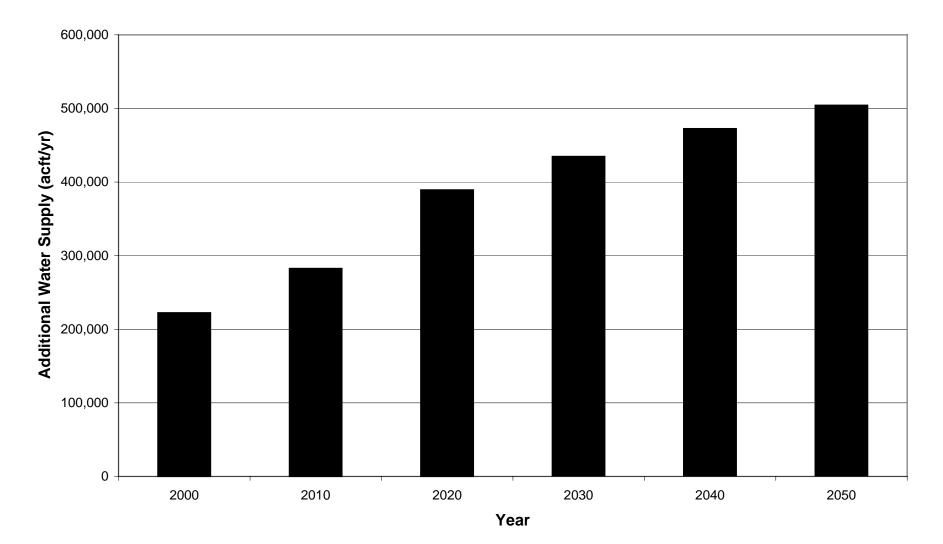
## Inter-Regional Cooperation Alternative Regional Water Plan Unit Cost of Cumulative Additional Water Supply



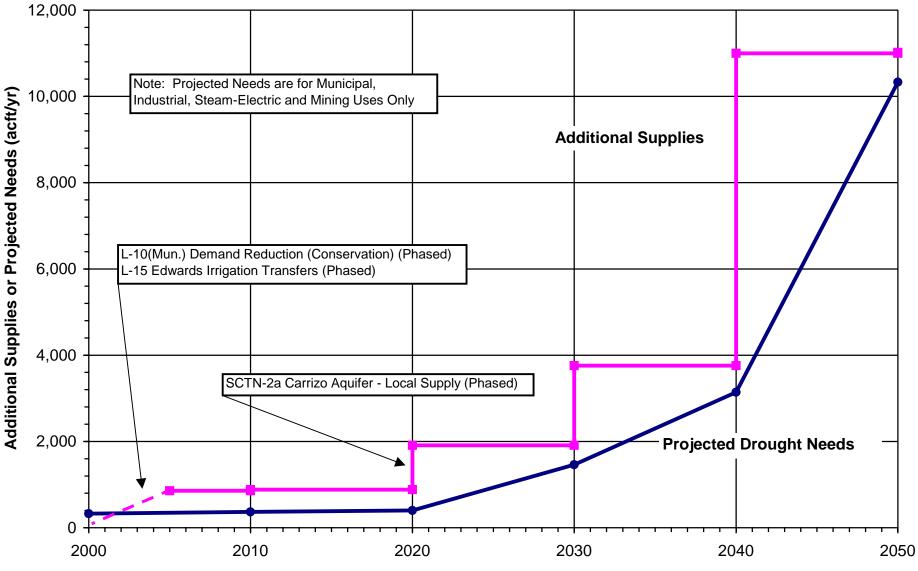
# Inter-Regional Cooperation Alternative Regional Water Plan Annual Cost of Cumulative Additional Water Supply



# Inter-Regional Cooperation Alternative Regional Water Plan Cumulative Additional Water Supply



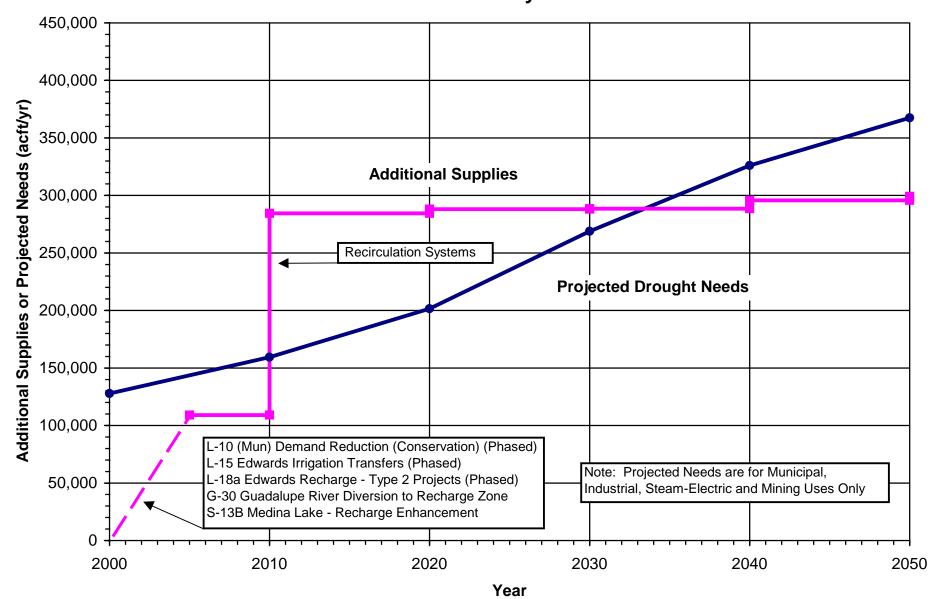
# Recharge and Recirculation Alternative Regional Water Plan Atascosa County



Year

South Ce	ntral Texas Region					C	ounty =	Atascosa	1
County S	ummary of Projected Water Needs and V	Vater Supply	Options			User Gro	up(s) =	all	
Proiected	Water Needs (acft/yr)								
•	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		325	366	401	468	530	587	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	1,504	8,504	
	Mining		0	0	0	995	1,109		
	Irrigation		38,418	36,718	35,170	43,726	42,190	40,713	
	Total Needs		38,743	37,084	35,571	- ,	45,333	- ,	
	Mun, Ind, S-E, & Min Needs		325	366	401	1,463	3,143		
	Irrigation Needs		38,418	36,718	35,170	43,726	42,190	40,713	
Water Sun	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
10 (Mun.)	Demand Reduction (Conservation)	,	356	384	411	259	300	319	
L-15	Edwards Irrigation Transfers	81,000	500	500	500	500	700	700	2, 3,
SCTN-2a	Carrizo Aquifer - Local Supply					1,000	3,000	10,000	5,
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		3,692	3,692	3,692	3,692	3,692	,	
	Total New Supplies		4,548	4,576	4,603	5,451	7,692	14,711	
	Total System Mgmt. Supply / Deficit		-34,195	-32,508	-30,968	-39,738	-37,641	-36,332	
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		531	518	510	296	857	689	
	Irrigation System Mgmt. Supply / Deficit		-34,726	-33,026	-31,478	-40,034	-38,498	-37,021	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation. bu	t will not be	available in	nmediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Candidate New Supply to be shared among Uvalde	, Medina, Atasc	osa, and Be	exar Countie	es. Supply	may not be	reliable in	drought.	
3	Pursuant to draft EAA Critical Period Management	rules, Candidate	New Supp	ly represen	ts approxim	nately 85 pe	rcent of	-	
	the estimated maximum potential annual transfer (§	95,430 acft) bas	ed on Propo	osed Permit	s prorated	to 400,000 a	acft/yr.		
4	Additional Edwards supply is for City of Lytle.								
5	Additional Carrizo supply is for Steam-Electric and								
6	Early implementation of facilities assumed in cost e								
7	Option expected to provide additional water supply								
8	Estimates based upon use of LEPA systems on 50	percent of acrea	ages irrigate	ed in 1997,	with conser	vation at 20	percent of	irrigation	
	application rate.								

#### Recharge and Recirculation Regional Water Management Alternative Plan

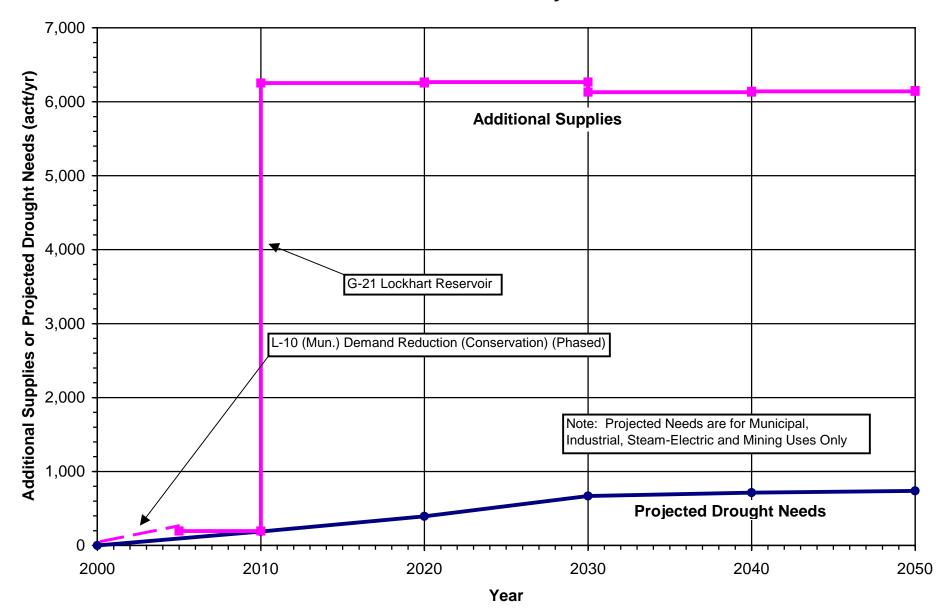


# Recharge and Recirculation Alternative Regional Water Plan Bexar County

South Ce	entral Texas Region					C	ounty =	Bexar	
	Summary of Projected Water Needs and V	Vater Supply	Ontions			User Gro		all	
oounty c		ater ouppry	options				up(3) =	an	
Projected	Water Needs (acft/yr)								
rojecieu	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		122,867	154,495	196,301	262,070	315,633		Notes
	Industrial		0	0	0	,	4,759	,	
	Steam-Electric		0	0	0	0		,	
	Mining		4,963	4,936	5,201	5,406	5,645	-	
	Irrigation		22,575	20,374	19,585	19,015	18,385		
	Total Needs		150,405	179.805	221,087	287,921	344.422	,	
	Mun, Ind, S-E, & Min Needs		127,830	159,431	201,502		326,037	,	
	Irrigation Needs		22,575	20.374	19,585	19,015	18,385	,	
	inigation Accus		22,373	20,014	13,505	13,013	10,000	17,500	
Nater Su	pply Options (acft/yr)	Candidate							
D#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
10 (Mun.)			33,528	42,509	41,210		38,834		
15 (Man.)	Edwards Irrigation Transfers	81,000	50,000	55,000	60,000		70,000		2,
18a	Edwards Recharge - Type 2 Projects	21,577	13,451	21,577	21,577	21,577	21,577	21,577	_,
G-30	Guadalupe River Diversion to Recharge Zone	3,902	3,902	3,902	3,902	3,902	3,902		
S-13B	Medina Lake - Recharge Enhancement	8,136	8,136	8,136	8,136	8,136	8,136	,	
	Recirculation Systems	0,100	0,100	153,297	153,297	153,297	153,297	153,297	
				,	,	,	,	,	
SCTN-4	Brush Management								
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
10 (Irr.)	Demand Reduction (Conservation)		4,521	4,521	4,521	4,521	4,521	4,521	
	Total New Supplies		113,538	288,942	292,643	292,966	300,267	303,667	
	Total System Mgmt. Supply / Deficit		-36,867	109,137	71,556	5,045	-44,155	-81,164	
M	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		-36,867	124,990	86,620	,	-30,291		
IVIO	Irrigation System Mgmt. Supply / Deficit		-18,013	-15,853	-15,064		-13,864	,	
	inigation bystein light. Supply / Denet		-10,034	10,000	-10,004	-14,434	-10,004	-12,047	
lotes:									
	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	entation, but	will not be	available in	nmediately		
	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proj	ected water	demands.				
	Candidate New Supply to be shared among Uvalde	e, Medina, Atasc	osa, and Be	xar Countie	s. Supply	may not be	reliable in	drought.	
	Pursuant to draft EAA Critical Period Management	rules, Candidate	e New Supp	ly represent	s approxim	nately 85 per	rcent of		
	the estimated maximum potential annual transfer (								
	Supply values shown for this option are based on ir							with	
	Recirculation Systems for alternative plan evaluations.								
5	The basis of this alternative plan is to meet the pro		Bexar Coun	ty with rech	arge and re	ecirculation p	orojects. T	he	
	Recirculation Systems were simulated in combination with Options L-18a, G-30, and S-13B.								
;	Option expected to provide additional water supply					ight is prese	ntly unqua	ntified.	
7	Estimates based upon use of LEPA systems on 80								
	application rate, but applicable to only 50 percent o	f Edwards Aquif	er irrigation	permitted q	uantities.				
1	Additional supplies of approximately 60,000 acft/yr					eded for dire	ct compari	son	
	of this alternative plan to others.	~ ~							

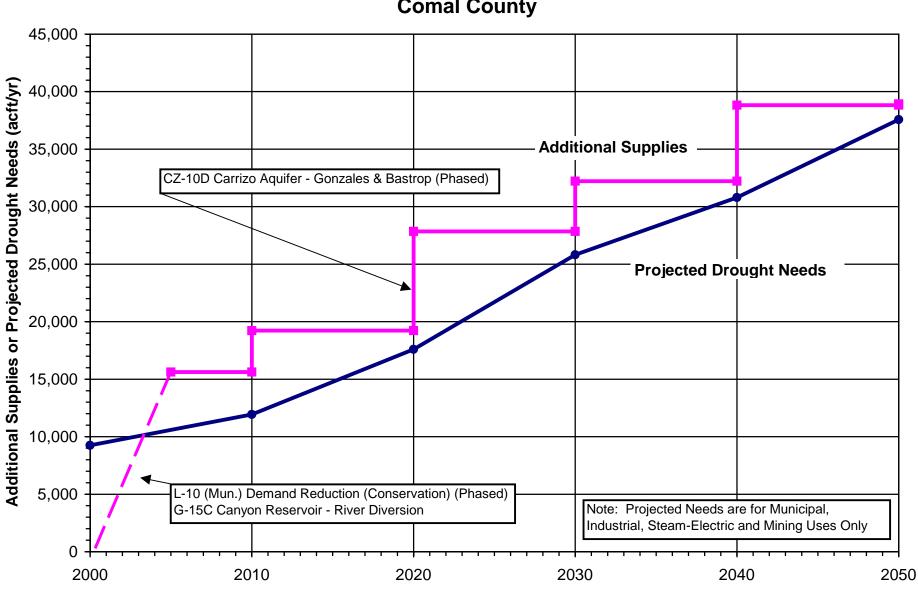
#### Recharge and Recirculation Regional Water Management Alternative Plan

# Recharge and Recirculation Alternative Regional Water Plan Caldwell County



South Ce	entral Texas Region					Co	ounty =	Caldwell	
	Summary of Projected Water Needs and V	Vater Supply	<b>Options</b>			User Gro		all	
							/		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	188	393	668	714	737	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	0	0	-	
	Irrigation		0	0	0	0	0	0	
	Total Needs		0	188	393	668	714	-	
	Mun, Ind, S-E, & Min Needs		0	188	393	668	714	737	
	Irrigation Needs		0	0	0	0	0	0	
	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	) Demand Reduction (Conservation)		195	206	218	82	93	104	1
G-21	Lockhart Reservoir			6,048	6,048	6,048	6,048	6,048	2
	Small Aquifer Recharge Dams								3
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		195	6,254	6,266	6,130	6,141	6,152	
	Total System Mgmt. Supply / Deficit		195	6,066	5,873		5,427		
Μι	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		195	6,066	5,873	5,462	5,427	5,415	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
NOLES:	Demand Reduction (Conservation) strategies assu	mod lorgoly rof	octod in proj	ootod water	domondo				
ן ר	Water supply for City of Lockhart and/or other user		ected in proj	ected water	uemands.				
2 3			but depende		huring draw		nthunnaur	otified	
ა	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

#### Recharge and Recirculation Regional Water Management Alternative Plan

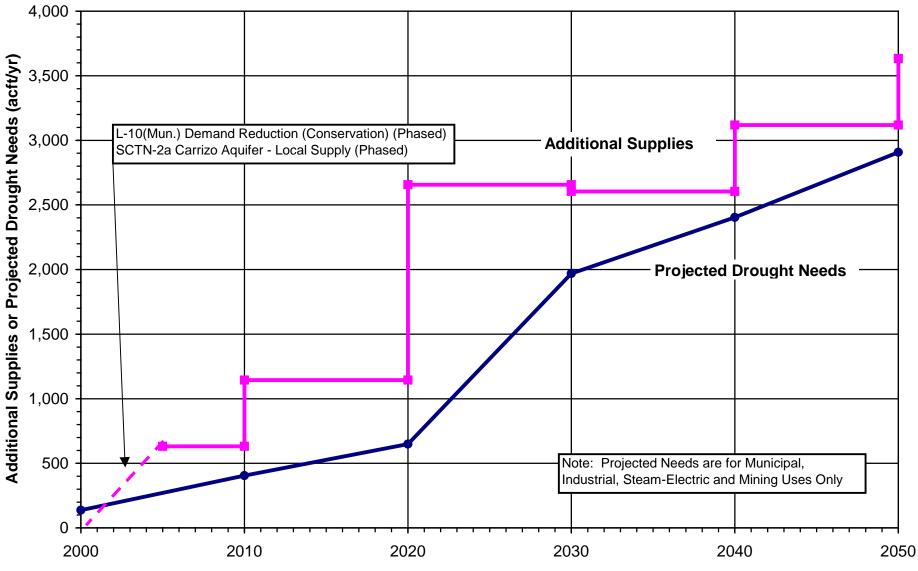


Recharge and Recirculation Alternative Regional Water Plan Comal County

South Ce	entral Texas Region					С	ounty =	Comal	
County S	summary of Projected Water Needs and	Water Supply	/ Options			User Gro	oup(s) =	all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,289	5,049	10,487	18,282	25,205		
	Industrial		1,388	1,425	1,486	,	2,009		
	Steam-Electric		0	0	0	-		-	
	Mining		5,570	5,464	5,628	5,796	,	,	
	Irrigation		30	14	0	•	-	0	
	Total Needs		9,277	11,952	17,601	25,815	30,804	37,575	
	Mun, Ind, S-E, & Min Needs		9,247	11,938	17,601	25,815	30,804	37,575	
	Irrigation Needs		30	14	0	0	0	0	
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
		New Oupply	616	718	848				1
G-15C	Canyon Reservoir - River Diversion	15,000	15,000	15,000	15,000				ו ס
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	90,000	13,000	13,000	3,500				3, 4, 5
1 10 (leg )	Small Aquifer Recharge Dams								6
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		15,616	15,718	19,348	27,718	32,324	38,942	
Mu	Total System Mgmt. Supply / Deficit n, Ind, S-E, & Min System Mgmt. Supply / Deficit		6,339 6,369	3,766 3,780	1,747 1,747	1,903 1,903	1,520 1,520		
	Irrigation System Mgmt. Supply / Deficit		-30	-14	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for prio	rity impleme	entation, bu	t will not be	available ir	nmediatelv		
1	Demand Reduction (Conservation) strategies assu								
2	Portion of Canyon firm yield (with amendment) diverted below Seguin.								
3	Candidate New Supply to be shared among Comal, Guadalupe, and Hays Counties. Effects on regional aquifer levels to be quantified.								
4	Portion of 90,000 acft/yr available from northern Gonzales and southern Bastrop Counties under CZ-10D.								
5	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.								
6	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

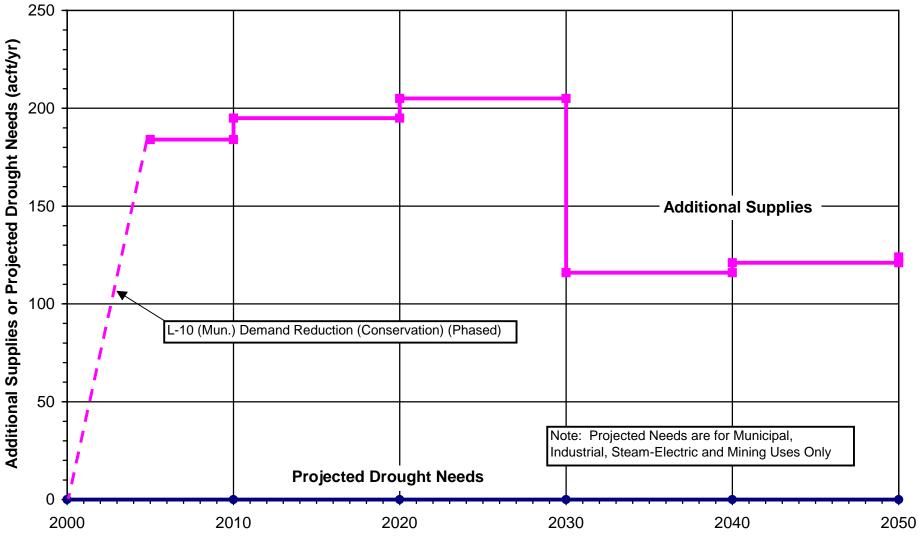
#### Recharge and Recirculation Regional Water Management Alternative Plan

# Recharge and Recirculation Alternative Regional Water Plan Dimmit County



South Ce	entral Texas Region					C	ounty =	Dimmit	
	Summary of Projected Water Needs and V	Nater Supply	/ Options			User Gro		all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		138	405	649	1,054	1,479	1,959	
	Industrial		0	0	0	0	0	-	
	Steam-Electric		0	0	0	0	0		
	Mining		0	0	0	915	925	949	
	Irrigation		0	0	0	2,133	1,737	1,331	
	Total Needs		138	405	649	4,102	4,141		
	Mun, Ind, S-E, & Min Needs		138	405	649	1,969	2,404		
	Irrigation Needs		0	0	0	2,133	1,737	1,331	
Wator Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	•	New Supply	131	144	156	104	118		Notes
SCTN-2a	Carrizo Aquifer - Local Supply		500	1,000	1,000	2,500	3,000		2, 3
SCTN-4	Brush Management								
SCTN-5	Weather Modification								4
SCTN-9	Rainwater Harvesting								4
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		631	1,144	1,156	2,604	3,118	3,633	
	Total System Mgmt. Supply / Deficit		493	739	507	-1,498	-1,023	-606	
Mu	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		493	739	507	635	714	725	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	-2,133	-1,737	-1,331	
Notes:									
*	Candidate New Supplies shown for year 2000 are i	dentified for pric	rity impleme	entation, but	will not be	available in	nmediately		
1	Demand Reduction (Conservation) strategies assu						modutory		
2	Additional well(s) for Carrizo Springs and Mining su				domando.				
3	Early implementation of facilities assumed in cost e		sure sufficier	nt supply du	ring droug	nt			
<u> </u>	Option expected to provide additional water supply						ntly unqua	atified	

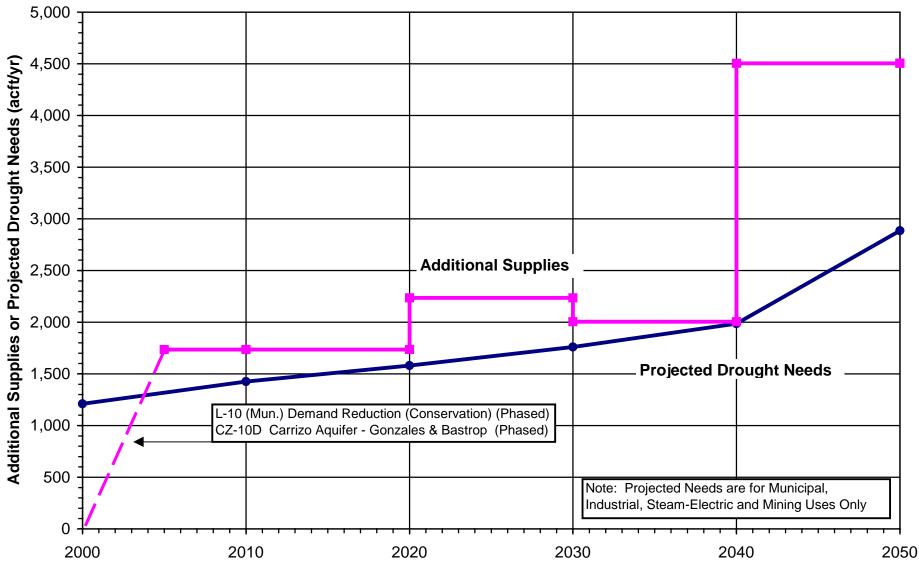
Recharge and Recirculation Alternative Regional Water Plan Frio County



Year

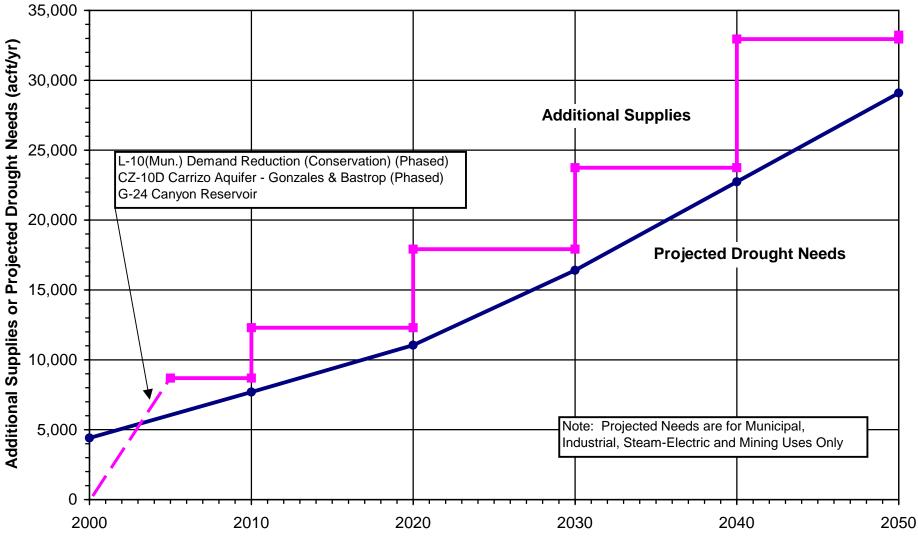
South Ce	entral Texas Region					C	ounty =	Frio	
	Summary of Projected Water Needs and V	Nater Supply	v Options			User Gro		all	
eeung e			, epuene				-p(0)		
Projected	Water Needs (acft/yr)								
,	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	0	0	
	Industrial		0	0	0	0	0		
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		71,126	67,646	64,365	76,505	73,519	70,662	
	Total Needs		71,126	67,646	64,365	76,505	73,519	70,662	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		71,126	67,646	64,365	76,505	73,519	70,662	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		184	195	205	116	121	124	1
, ,									
SCTN-4	Brush Management								2
SCTN-5	Weather Modification								2 2 2 2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)		5,947	5,947	5,947	5,947	5,947	5,947	3
	Total New Supplies		6,131	6,142	6,152	6,063	6,068	6,071	
	Total System Mgmt. Supply / Deficit		-64,995	-61,504	-58,213		-67,451		
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		184	195	205	116	121	124	
	Irrigation System Mgmt. Supply / Deficit		-65,179	-61,699	-58,418	-70,558	-67,572	-64,715	
Notes:									
1	Demand Reduction (Conservation) strategies assu								
2	Option expected to provide additional water supply								
3	Estimates based upon use of LEPA systems on 50	percent of acre	ages irrigate	ed in 1997, v	with conser	vation at 20	percent of	irrigation	
	application rate.								

### Recharge and Recirculation Alternative Regional Water Plan Guadalupe County



South Co	entral Texas Region					C	ounty =	Guadalu	ре
County S	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	up(s) =	all	-
Projected	d Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		29	23	30	71	87	773	
	Industrial		985	1,204	1,350	1,487	1,692		
	Steam-Electric		0	0	0	0	0	0	
	Mining		196	198	200	202	207	213	
	Irrigation		985	879	779	684	594	508	
	Total Needs		2,195	2,304	2,359	2,444	2,580	3,393	
	Mun, Ind, S-E, & Min Needs		1,210	1,425	1,580	1,760	1,986	2,885	
	Irrigation Needs		985	879	779	684	594	508	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.	.) Demand Reduction (Conservation)		235	236	236	5	5	6	1
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	90,000	1,500	1,500	2,000	2,000	2,500	4,500	2, 3, 4
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		1,735	1,736	2,236	2,005	2,505	4,506	
	Total System Mgmt. Supply / Deficit		400	500	-123	-439	76	4 4 4 2	
Μ.	un, Ind, S-E, & Min System Mgmt. Supply / Deficit		-460 525	-568 311	656	-439 245	-75 519	, -	
IVI	Irrigation System Mgmt. Supply / Deficit		-985	-879	-779	-684	-594		
	Irrigation System Mgmt. Supply / Deficit		-985	-8/9	-779	-684	-594	-508	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Candidate New Supply to be shared among Comal, Guadalupe, and Hays Counties. Effects on regional aquifer levels to be quantified.								
3	Portion of 90,000 acft/yr available from northern Go							1	
4	Early implementation of facilities assumed in cost estimation to ensure sufficient supply during drought.								
5	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

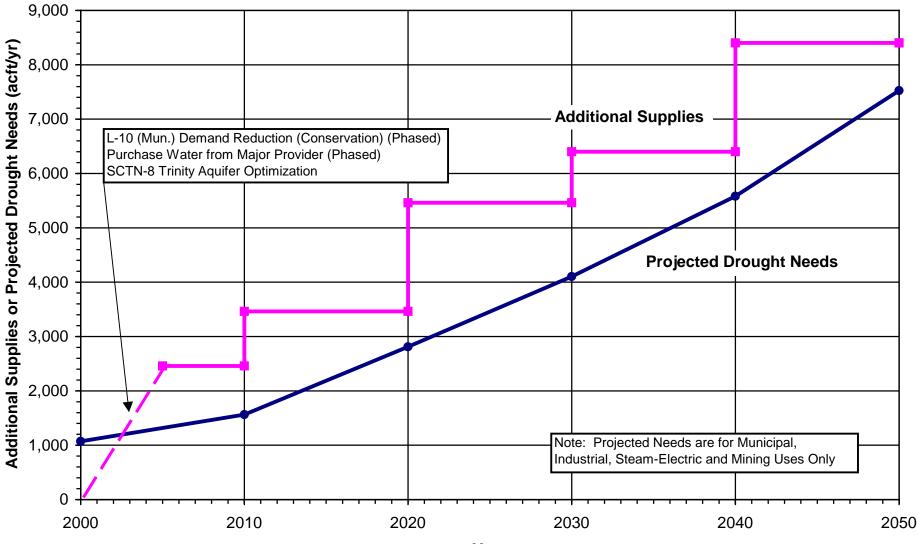
Recharge and Recirculation Alternative Regional Water Plan Hays County



Year

South Ce	entral Texas Region					C	ounty =	Hays	
County S	ummary of Projected Water Needs and V	Vater Supply	<b>Options</b>			User Gro	up(s) =	all	
Droingtod	Meter Neede (eeft/m)								
Projected	Water Needs (acft/yr) User Group(s)		2000	2010	2020	2030	2040	2050	Notes
									Notes
	Municipal		4,325	7,609	10,980		22,696		
	Industrial		0	0	0	-	0	-	
	Steam-Electric		0	0	0		0		
	Mining		84	82	68		37		
	Irrigation		0	0	0	•	0	-	
	Total Needs		4,409	7,691	11,048	,	22,733	,	
	Mun, Ind, S-E, & Min Needs		4,409	7,691	11,048	,	22,733		
	Irrigation Needs		0	0	0	0	0	0	
Water Sur	oply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	Demand Reduction (Conservation)		647	747	873	699	906	1,174	1
CZ-10D	Carrizo Aquifer - Gonzales & Bastrop	90,000	4,000	7,000	10,500		22,000		2, 3, 4
G-24	Canyon Reservoir	1,048	1,048	1,048	1,048		1,048		5
	Small Aquifer Recharge Dams								6
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		5,695	8,795	12,421	17,747	23,954	33,222	
	Total System Mgmt. Supply / Deficit		1,286	1,104	1,373		1,221		
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,286	1,104	1,373		1,221		
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0	0	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Candidate New Supply to be shared among Comal, Guadalupe, and Hays Counties. Effects on regional aquifer levels to be quantified.								
3	Portion of 90,000 acft/yr available from northern Gonzales and southern Bastrop Counties under CZ-10D.								
4	Early implementation of facilities assumed in cost e								
5	Candidate New Supply for Wimberley and Woodcreek.								
6	Option expected to provide additional water supply in many years, but dependable supply during drought is presently unquantified.								

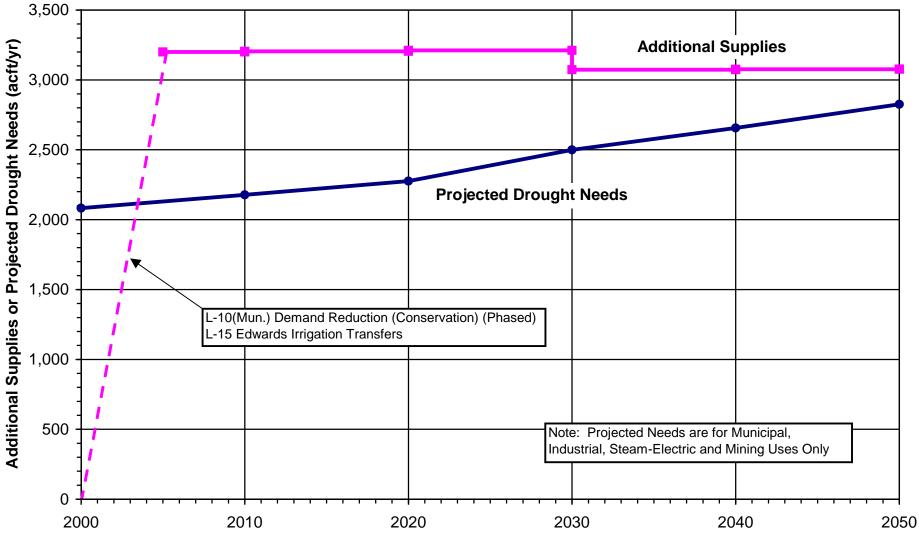
Recharge and Recirculation Alternative Regional Water Plan Kendall County



Year

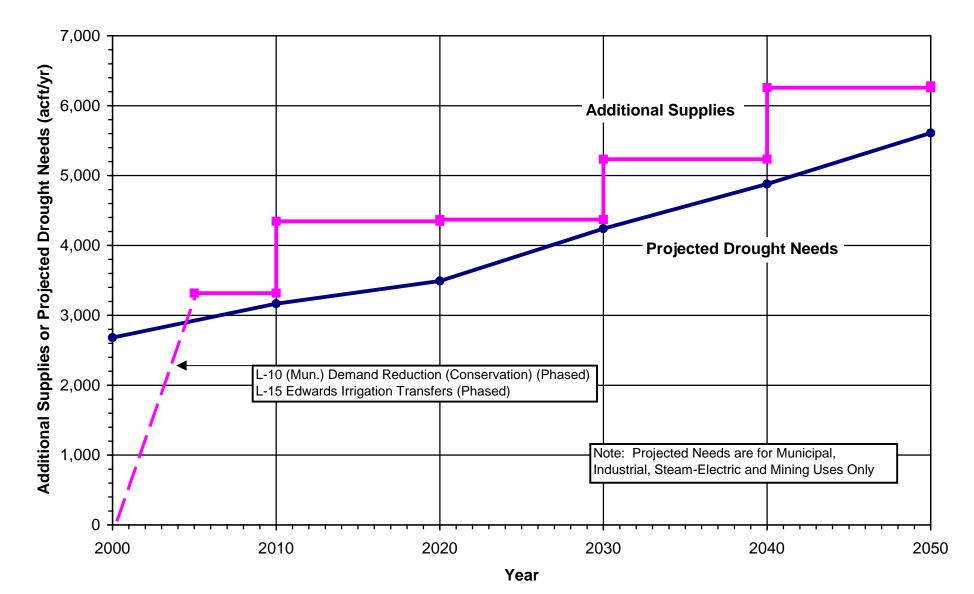
South Ce	entral Texas Region					C	ounty =	Kendall	
	Summary of Projected Water Needs and V	Vater Supply	<b>Options</b>			User Gro		all	
Projected	Water Needs (acft/yr)			0040				0050	
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		1,070	1,560	2,808	4,099	5,578	,	
	Industrial		2	3	4	4	5		
	Steam-Electric		0	0	0	0	0	Ŭ	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	-	
	Total Needs		1,072	1,563	2,812		5,583		
	Mun, Ind, S-E, & Min Needs		1,072	1,563	2,812	,	5,583		
	Irrigation Needs		0	0	0	0	0	0	
						1			
	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)	) Demand Reduction (Conservation)		67	71	71	11	11	11	1
	Purchase Water from Major Provider		2,000	2,000	3,000		6,000		2, 3
SCTN-8	Trinity Aquifer Optimization	390	390	390	390	390	390	390	
SCTN-4	Brush Management								4
SCTN-5	Weather Modification								2
SCTN-9	Rainwater Harvesting								2
	Small Aquifer Recharge Dams								4
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		2,457	2,461	3,461	5,401	6,401	8,401	
	Total System Mgmt. Supply / Deficit		1,385	898	649	1,298	818	877	
Mu	In, Ind, S-E, & Min System Mgmt. Supply / Deficit		1,385	898	649		818	-	
	Irrigation System Mgmt. Supply / Deficit		0	0	0	0	0		
Notes:				I					
Notes:	Candidate New Supplies shown for your 2000 are i	dentified for price	rity implom	antation but	t will not be	available in	nmediatoly		
Notes:	Candidate New Supplies shown for year 2000 are i						nmediately		
Notes: * 12	Demand Reduction (Conservation) strategies assu	med largely refle	ected in pro	ected water	demands.				
Notes: * 1 2 3		med largely refle der. Kendall Co	ected in pro unty water	ected water needs are n	demands. ot reflected	l in Bexar C			

Recharge and Recirculation Alternative Regional Water Plan Medina County



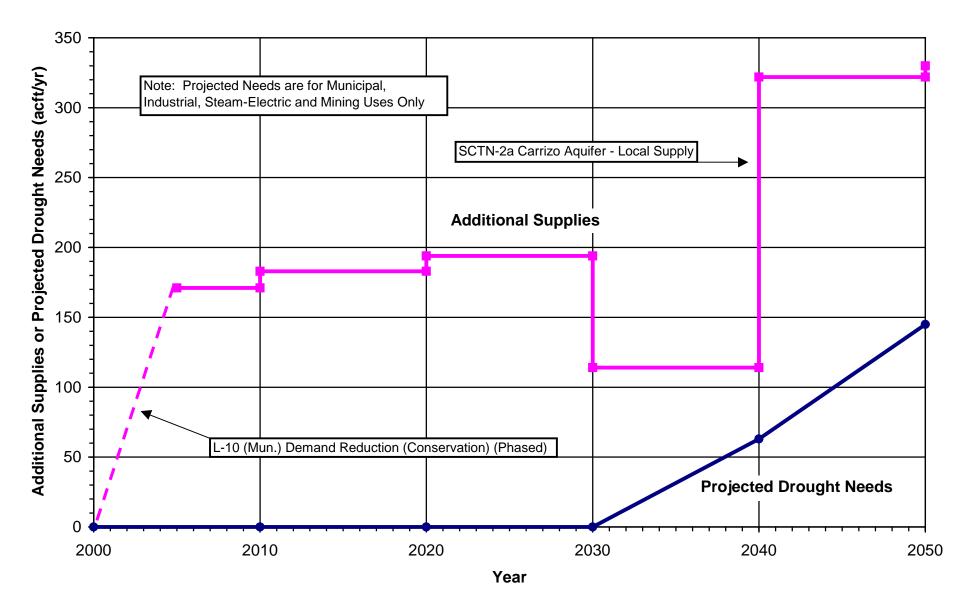
South Ce	entral Texas Region					C	ounty =	Medina	
County S	Summary of Projected Water Needs and V	Vater Supply	Options			User Gro	oup(s) =	all	
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,015	2,110	2,206	2,427	2,582	2,750	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		68	68	70		74		
	Irrigation		98,916	95,268	91,320	92,320	88,925	84,692	
	Total Needs		100,999	97,446	93,596	94,819	91,581	87,518	
	Mun, Ind, S-E, & Min Needs		2,083	2,178	2,276	2,499	2,656	2,826	
	Irrigation Needs		98,916	95,268	91,320	92,320	88,925	84,692	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
L-10 (Mun.)			200	205	211		76	78	
L-15	Edwards Irrigation Transfers	81,000	3,000	3,000	3,000		3,000		2, 3
SCTN-4 SCTN-5	Brush Management Weather Modification								
SCTN-5 SCTN-9	Rainwater Harvesting								2
30111-9	0								
L-10 (Irr.)	Small Aquifer Recharge Dams Demand Reduction (Conservation)		11,867	11,867	11,867	11,867	11,867	11.867	2
L-10 (III.)	Total New Supplies		15,067	15,072	15,078	,	1	,	;
			,	,	,	,		,	
	Total System Mgmt. Supply / Deficit		-85,932	-82,374	-78,518	,	-76,638		
Mu	In, Ind, S-E, & Min System Mgmt. Supply / Deficit Irrigation System Mgmt. Supply / Deficit		1,117 -87,049	1,027 -83,401	935 -79,453		420 -77,058		
Notes:									
*	Candidate New Supplies shown for year 2000 are						nmediately		
1	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Candidate New Supply to be shared among Uvalde, Medina, Atascosa, and Bexar Counties. Supply may not be reliable in drought.								
3	Pursuant to draft EAA Critical Period Management								
	the estimated maximum potential annual transfer (	95,430 acft) bas	ed on Propo	osed Permit	s prorated	to 400,000 a	acft/yr.		
4	Option expected to provide additional water supply								
5	Estimates based upon use of LEPA systems on 80 percent of acreages irrigated in 1997, with conservation at 40 percent of irrigation								
	application rate, but applicable to only 50 percent c	of Edwards Aquif	er irrigation	permitted q	uantities.				

# Recharge and Recirculation Alternative Regional Water Plan Uvalde County



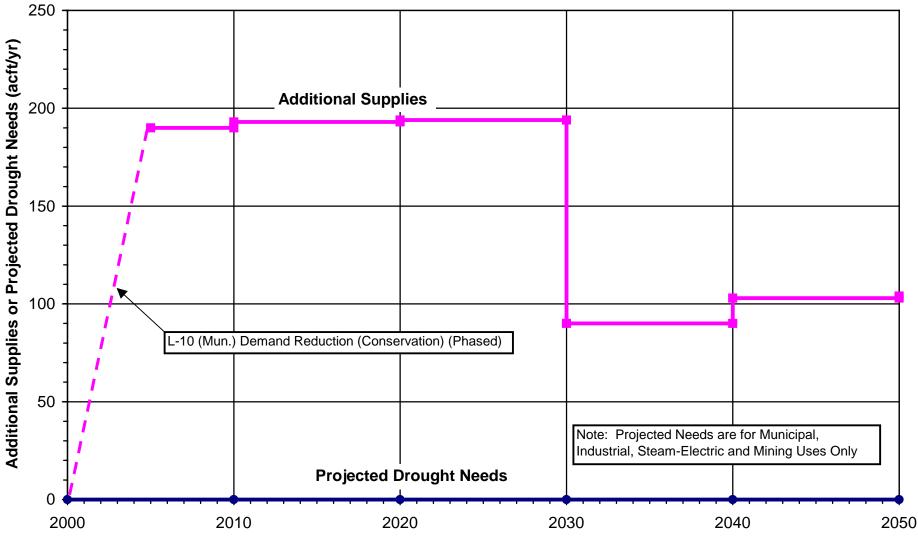
South Ce	entral Texas Region					C	ounty =	Uvalde	
	Summary of Projected Water Needs and V	Vater Supply	/ Options			User Gro		all	
, , , , , , , , , , , , , , , , , , ,		,	•				1 ( )		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		2,682	3,166	3,493	4,241	4,880	5,609	
	Industrial		0	0	0	0	0	-	
	Steam-Electric		0	0	0	0	0	-	
	Mining		0	0	0	0	0	-	
	Irrigation		75,263	72,798	70,154	71,022	68,880	,	
	Total Needs		77,945	75,964	73,647	75,263	73,760	,	
	Mun, Ind, S-E, & Min Needs		2,682	3,166	3,493	4,241	4,880		
	Irrigation Needs		75,263	72,798	70,154	71,022	68,880	65,676	
Water Su	pply Options (acft/yr)	Candidate							
ID#	Description	New Supply	2000*	2010	2020	2030	2040	2050	Notes
	Demand Reduction (Conservation)		318	346	371	235	258		1
L-15	Edwards Irrigation Transfers	81,000	3,000	4,000	4,000	5,000	5,000		2, 3, 4
2.10		01,000	0,000	.,	.,000	0,000	0,000	0,000	, 0,
SCTN-4	Brush Management								5
SCTN-5	Weather Modification								5
SCTN-9	Rainwater Harvesting								5
	Small Aquifer Recharge Dams								5
L-10 (Irr.)	Demand Reduction (Conservation)		14,143	14,143	14,143	14,143	14,143	14,143	6
	Total New Supplies		17,461	18,489	18,514	19,378	19,401	20,426	
	Total System Mgmt. Supply / Deficit		-60,484	-57,475	-55,133	-55,885	-54,359		-
Mu	n, Ind, S-E, & Min System Mgmt. Supply / Deficit		636	1,180	878		378		
	Irrigation System Mgmt. Supply / Deficit		-61,120	-58,655	-56,011	-56,879	-54,737	-51,533	
Notes:									
*	Candidate New Supplies shown for year 2000 are identified for priority implementation, but will not be available immediately.								
1	Demand Reduction (Conservation) strategies assumed largely reflected in projected water demands.								
2	Candidate New Supply to be shared among Uvalde					may not be	reliable in o	drought.	
3	Pursuant to draft EAA Critical Period Management								
	the estimated maximum potential annual transfer (								
4	Early implementation of facilities assumed in cost e						,		
5	Option expected to provide additional water supply						ently unqua	ntified.	
6	Estimates based upon use of LEPA systems on 80								
	application rate, but applicable to only 50 percent o							Ŭ	

# Recharge and Recirculation Alternative Regional Water Plan Wilson County



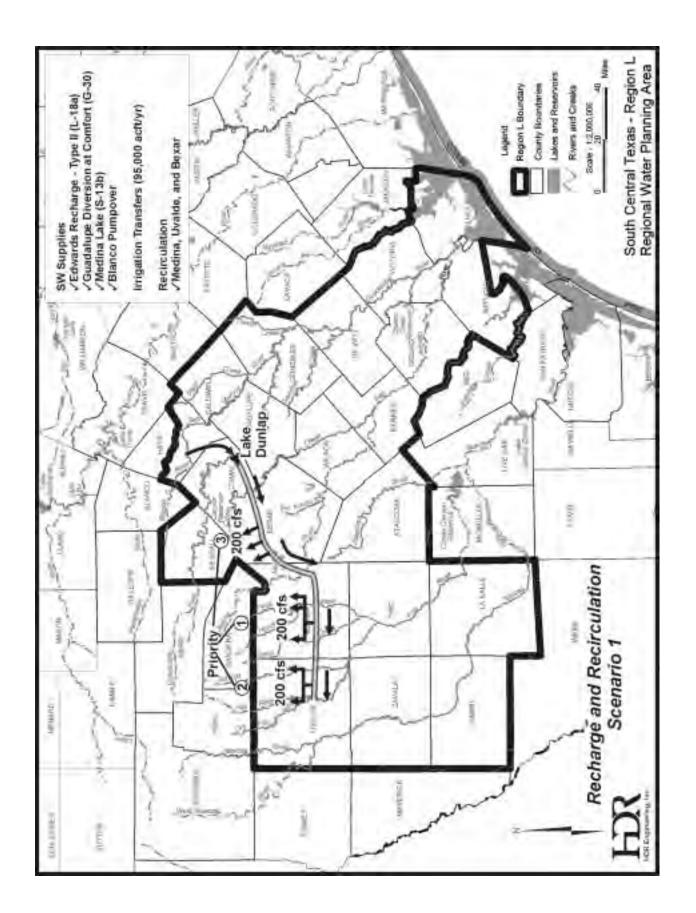
South Ce	entral Texas Region					Co	ounty =	Wilson	
	Summary of Projected Water Needs and W	ater Supply	Options			User Gro	up(s) =	all	
			•				,		
Projected	Water Needs (acft/yr)								
	User Group(s)		2000	2010	2020	2030	2040	2050	Notes
	Municipal		0	0	0	0	63	145	
	Industrial		0	0	0	0	0	0	
	Steam-Electric		0	0	0	0	0	0	
	Mining		0	0	0	0	0	0	
	Irrigation		0	0	0	0	0	0	
	Total Needs		0	0	0	0	63		
	Mun, Ind, S-E, & Min Needs		0	0	0	0	63	145	
	Irrigation Needs		0	0	0	0	0	0	
Water Cur	anti-Ontiona (active)	Condidate							
iD#	pply Options (acft/yr) Description	Candidate	2000	2010	2020	2030	2040	2050	Notes
		New Supply							Notes
L-10 (Mun.)			171	183	194	114	122	130 200	
SCTN-2a	Carrizo Aquifer - Local Supply						200	200	
SCTN-4	Brush Management								:
SCTN-5	Weather Modification								
SCTN-9	Rainwater Harvesting								
	Small Aquifer Recharge Dams								
L-10 (Irr.)	Demand Reduction (Conservation)								
	Total New Supplies		171	183	194	114	322	330	
	Total System Mgmt. Supply / Deficit		171	183	194	114	259	185	
Mı	Ind, S-E, & Min System Mgmt. Supply / Deficit		171	183	194	114	259		
IVIC	Irrigation System Mgmt. Supply / Deficit		0	0	0		239		
	inigation cystom ingint supply / Denot		5	5		5	0	U	
Notes:									
1	Demand Reduction (Conservation) strategies assu	med largely refle	ected in proj	ected water	demands.	•			
2	Additional well(s) for Floresville.	,	Í						
3	Option expected to provide additional water supply	in many years.	but dependa	ble supply a	lurina drou	ight is prese	ntlv unguai	ntified.	

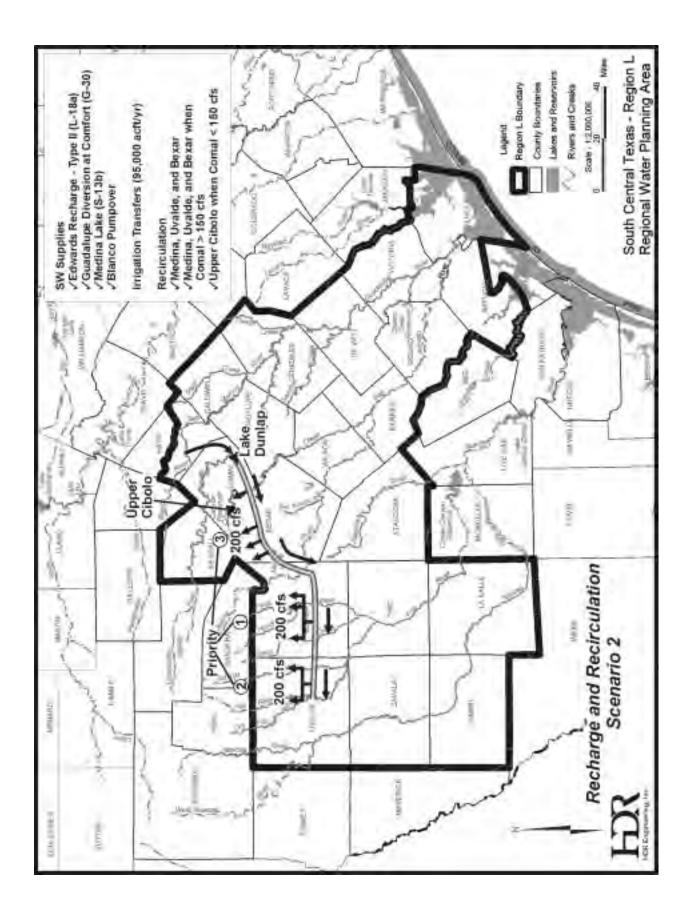
Recharge and Recirculation Alternative Regional Water Plan Zavala County

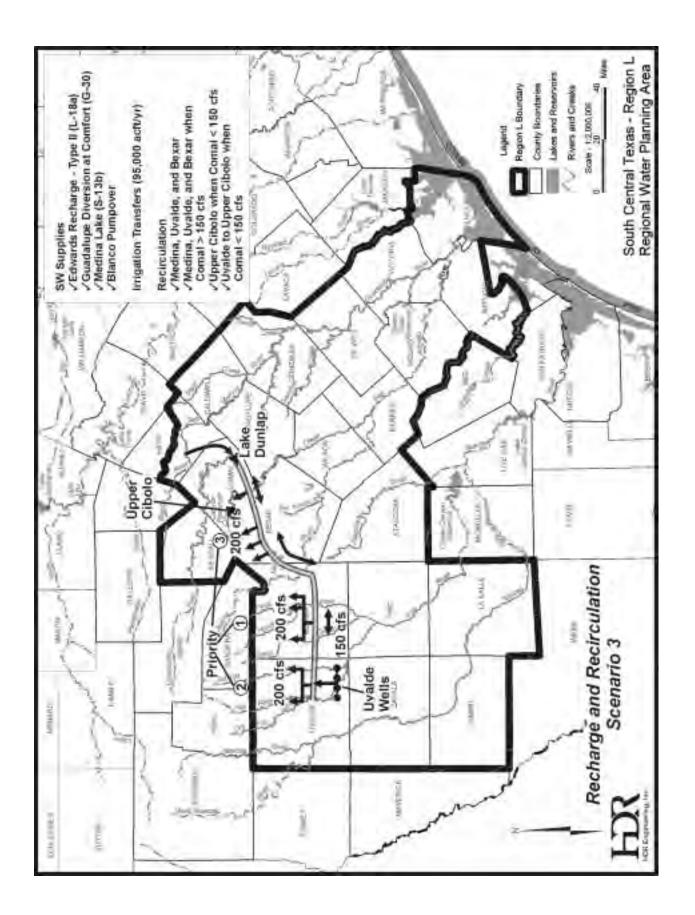


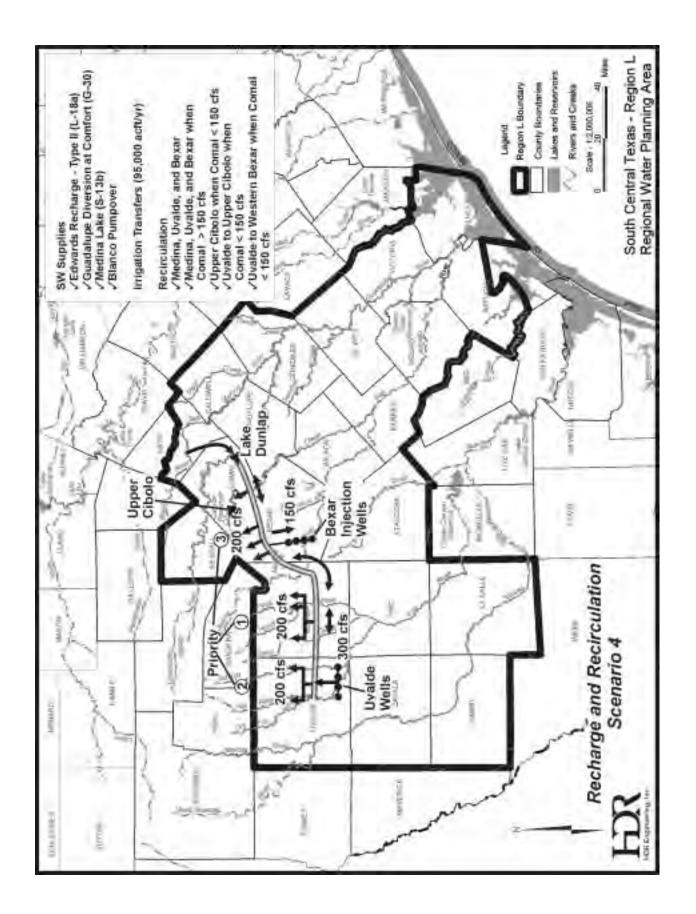
Year

County Sum Projected Wa Us Mu Inc Stu Mi	ral Texas Region mary of Projected Water Needs and V ater Needs (acft/yr) ser Group(s) unicipal dustrial eam-Electric ining igation	Vater Supply	<b>2000</b> 0 0	<b>2010</b>	2020	User Gro 2030	ounty = up(s) = 2040	all 2050	
Projected Wa	ater Needs (acft/yr) ser Group(s) unicipal dustrial eam-Electric ining		<b>2000</b> 0 0	0	2020			2050	
Us Mu Inc Str Mi	ser Group(s) unicipal dustrial eam-Electric ining		0	0		2030	2040	2050	
Mu Inc Sta Mi	unicipal dustrial eam-Electric ining		0	0		2030	2040	2050	- NI (
Inc Stu Mi	dustrial eam-Electric ining		0	-	0				Notes
Sto Mi	eam-Electric ning		-		0	0	0	0	
Mi	ining			0	0	0	0	0	
			0	0	0	0	0	0	
Irr	igation		0	0	0	0	0	0	
			80,722	76,589	72,655	88,293	84,673	81,200	
	Total Needs		80,722	76,589	72,655	88,293	84,673	81,200	
	Mun, Ind, S-E, & Min Needs		0	0	0	0	0	0	
	Irrigation Needs		80,722	76,589	72,655	88,293	84,673	81,200	
Water Supply	/ Options (acft/yr)	Candidate							
	escription	New Supply	2000	2010	2020	2030	2040	2050	Notes
L-10 (Mun.) De	emand Reduction (Conservation)		190	193	194	90	103	104	1
							·		·
SCTN-4 Br	ush Management								2
	eather Modification								2
	ainwater Harvesting								2
	nall Aquifer Recharge Dams								2
	emand Reduction (Conservation)		6,401	6,401	6,401	6,401	6,401	6,401	3
, , , , , , , , , , , , , , , , , , ,	Total New Supplies		6,591	6,594	6,595	6,491	6,504	6.505	
			- ,	- ,	- , - , - , -	-,		-,	
	Total System Mgmt. Supply / Deficit		-74,131	-69,995	-66,060	-81,802	-78,169	-74,695	
Mun, Ir	nd, S-E, & Min System Mgmt. Supply / Deficit		190	193	194	90	103	104	
	Irrigation System Mgmt. Supply / Deficit		-74,321	-70,188	-66,254	-81,892	-78,272	-74,799	
	5		, -	-,	,	- ,		,	
Notes:									
1 De	emand Reduction (Conservation) strategies assur	med largely refl	ected in proi	ected water	demands.				
	otion expected to provide additional water supply					ght is preser	ntly unquar	ntified.	
	stimates based upon use of LEPA systems on 50								
	pplication rate.			)-					









### Summary of Features and Costs

June 13, 2000

- Surface Water Rights
  - Honored
  - Enhanced flow from Comal Springs is unavailable for meeting water rights or meeting Environmental Criteria. However, enhanced flow from the other springs is available for water rights and environmental criteria.
  - The baseline flow from Comal Springs is based on a simulation of 412,312 pumpage without irrigation transfers to Bexar County.
- Surface Water Supplies
  - Edwards Recharge-Type 2 Projects (L-18a: Frio, Sabinal, Verde, Hondo, Cibolo, Blanco, and Indian Creek Pumpover)
  - Guadalupe River Diversion to Recharge Zone (G-30) with recharge in NW Bexar County
  - Medina Lake Recharge Enhancements (S-13b)
  - Blanco River Pump Over to Lake Dunlap (Maximum of 75 cfs)
  - Unappropriated Surface Water at Lake Dunlap. Availability for recirculation is subject to
    making up a deficit between base springflow and scenario springflow. In other words,
    when flow from Comal Springs is lower with the Alternative Regional Water Plan than
    during the baseline conditions, the unappropriated flow is first allocated to surface water
    rights to cover this deficit.
- Water Transfers
  - Edwards Irrigation (L-15: 95,000 acft/yr)
- Other Management
  - Not included
    - ASR
    - Critical Period Management
    - Term Permits
- Increase in Water Supply produced by the alternative. The increase includes the contributions by all the surface water supplies listed above.
  - Sustained Yield Test: The difference between the total pumpage in the scenario and the total pumpage in the baseline simulation with the 95,000 ac-ft/yr irrigation transfers turned ON.
  - 400K Base: The difference between the total pumpage in the scenario and 400K Base with 95,000 acft/yr of irrigation transfers.

- Costs Estimates:
  - Capital: Include recharge and transfer facilities as well as the recirculation facilities.
  - O&M: Based on average flow of water through the facility
- > Tests
  - Sustained Yield: All pumpages were set at a 69.5 percent of the 400K base pumpage and represents the reduction needed to maintain flow from Comal Springs at 60 cfs with a uniform reduction of all pumpage and all the other management factors turned OFF.
  - 400K Base: All pumpage except municipal was set to a multiplier of 1.00. Municipal pumpage multiplier was adjusted until the number of months of flow from Comal Springs was the same as during the 400K Base conditions with all of the management options turned OFF. The total was 91 months.
- Scenarios
  - Scenarios 1, 2, 3, and 4
    - Recirculate from Lake Dunlap at a maximum capacity of 600 cfs to
      - Medina County (maximum = 200 cfs and first priority)
      - Uvalde County (maximum = 200 cfs and second priority)
      - Bexar County (maximum = 200 cfs and third priority)
  - Scenarios 2, 3, and 4
    - Add feature of transferring all recirculation to Upper Cibolo Creek when flow in Comal Springs is less than 150 cfs. The transfer to Upper Cibolo Creek is turned OFF when the flow in Comal Springs exceeds 200 cfs.
  - Scenarios 3 and 4
    - Add feature of turning ON a transfer groundwater, at a rate of 150 cfs, from Uvalde County to Upper Cibolo Creek when the flow from Comal Springs is less than 150 cfs. The transfer it turned OFF when the flow from Comal Springs is greater than 200 cfs.
  - Scenario 4
    - Add feature of turning ON a transfer groundwater, at a rate of 150 cfs, from Uvalde County to Edwards Aquifer in western Bexar County when the flow from Comal Springs is less than 150 cfs. The transfer it turned OFF when the flow from Comal Springs is greater than 200 cfs

#### Flux for Sustained Yield Simulations (Minimum Flow from Comal Springs is 60 cfs) (acft/year)

	Baseline with 95,000 irrigation transfers	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Pumpage					
Total	272,538	389,642	405,139	450,411	482,454
Change		117,104	132,601	177,873	209,916
Recirculation					
Lake Dunlap to Medina County	0	131,617	127,452	115,371	102,588
Lake Dunlap to Uvalde County		53,269	49,031	38,680	31,263
Lake Dunlap to Bexar County		45,406	43,280	35,877	28,964
Lake Dunlap to Cibolo Creek		0	2,176	12,947	21,655
Uvalde County Transfer to Cibolo Creek		0	0	8,732	14,069
Uvalde County Transfer to W. Bexar County		0	0	0	14,069
Springflow					
Comal Springs	216,168	262,464	253,896	224,376	200,837
All Springs except Leona	337,021	461,286	445,504	397,121	360,574
Leona Springs	20,854	28,419	27,917	25,871	23,477

### Flux for 400K Base Simulations (Number of Months of Flow Below 60 cfs at Comal Springs is Unchanged) (acft/year)

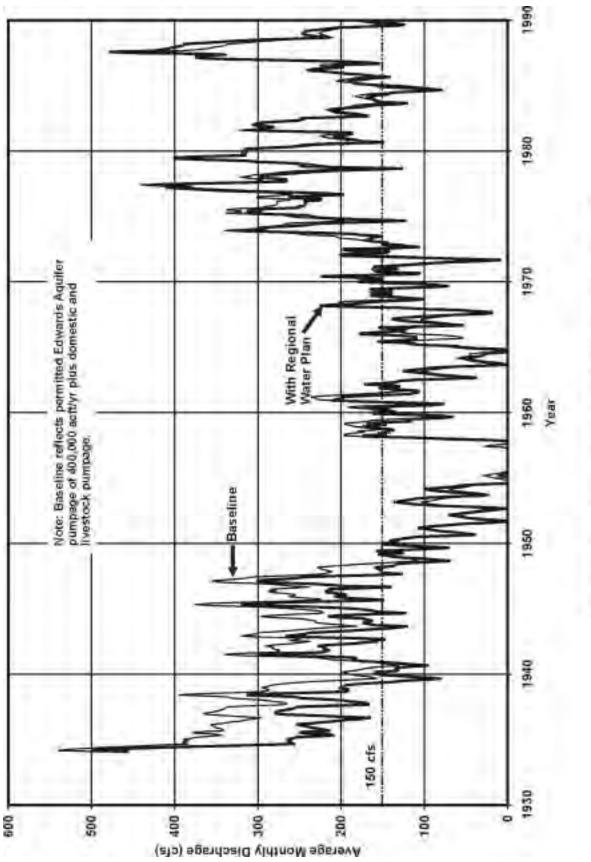
	Baseline with 95,000 irrigation transfers	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Pumpage					
Total	412,312	512,323	524,703	567,667	599,226
Change		100,011	112,391	155,355	186,912
Recirculation					
Lake Dunlap to Medina County	0	92,239	79,936	67,882	59,062
Lake Dunlap to Uvalde County	0	27,920	26,668	20,710	17,694
Lake Dunlap to Bexar County	0	25,272	23,583	17,111	12,704
Lake Dunlap to Cibolo Creek	0	0	11,902	54,331	64,389
Uvalde County Transfer to Cibolo Creek	0	0	0	39,458	45,118
Uvalde County Transfer to W. Bexar County	0	0	0	0	45,118
Springflow					
Comal Springs	126,540	169,800	165,600	140,424	122,124
All Springs except Leona	224,963	321,655	314,180	278,876	254,186
Leona Springs	16,194	22,879	22,089	18,212	14,523

Costs for Sustained Y	Yield Simulations
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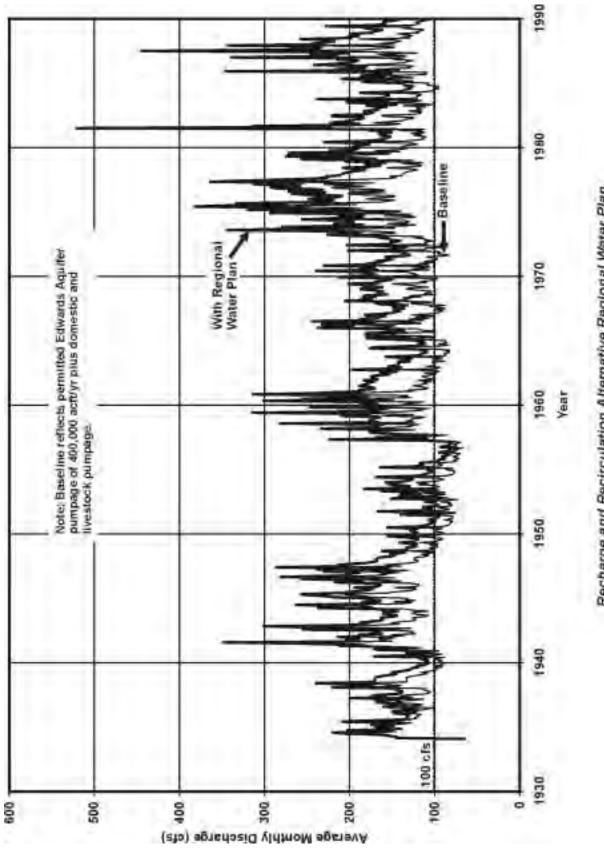
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Capital	\$750,293,000	\$752,091,000	\$801,932,000	\$871,442,000
Project	\$1,134,732,000	\$1,137,538,000	\$1,211,485,000	\$1,307,330,000
Annual	\$121,316,000	\$121,079,000	\$125,886,000	\$132,767,000
Annual Cost of Water (\$ per acft)	\$1,036	\$913	\$708	\$632

### Costs for 400,000 Base Simulations

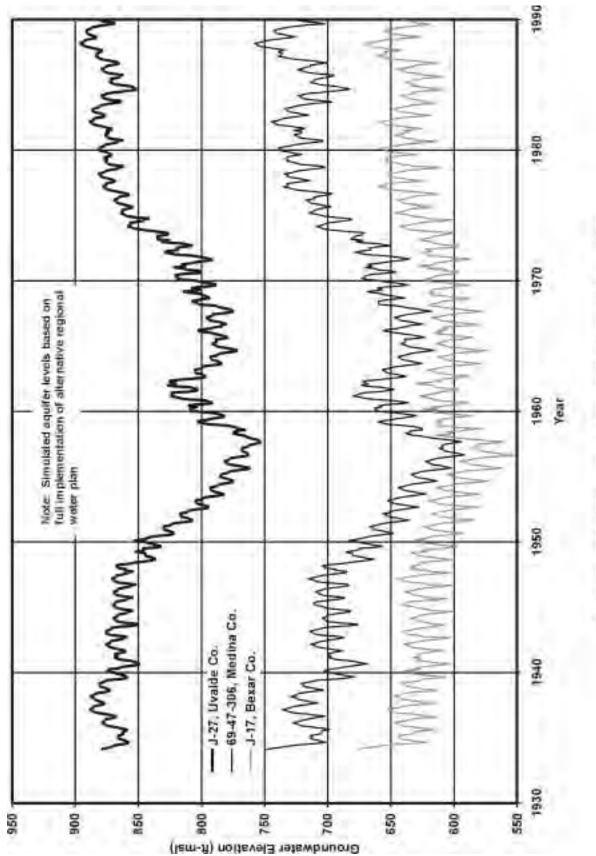
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Capital	\$750,293,000	\$752,091,000	\$801,932,000	\$871,442,000
Project	\$1,134,723,000	\$1,137,538,000	\$1,211,485,000	\$1,307,330,000
Annual	\$114,123,000	\$114,292,000	\$123,976,000	\$132,947,000
Annual Cost of Water (\$ per acft)	\$1,141	\$1,017	\$798	\$711



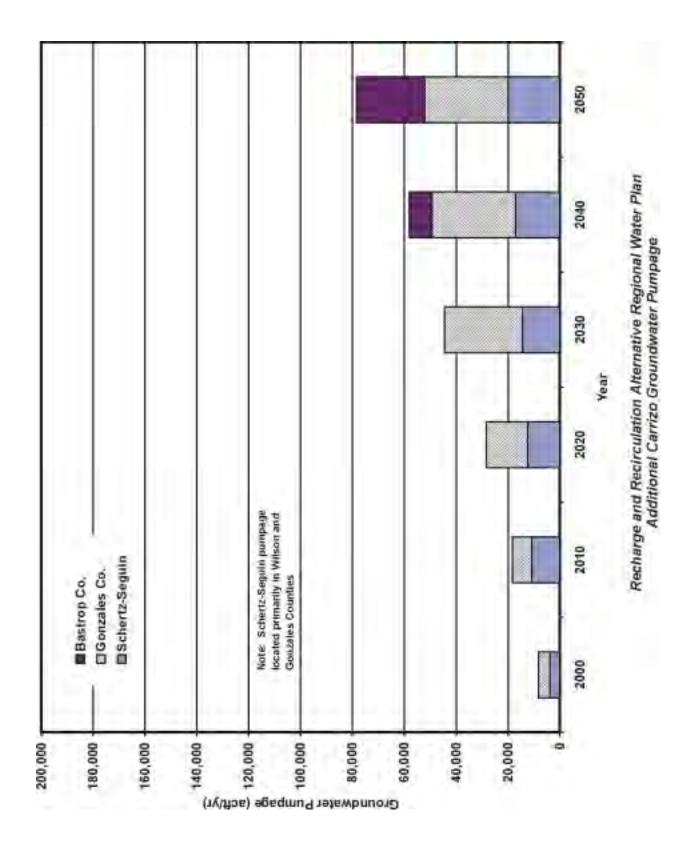




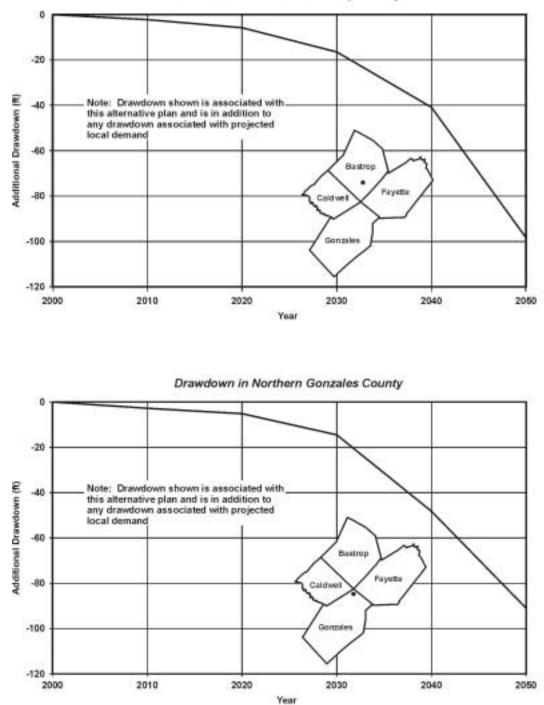
Recharge and Recirculation Alternative Regional Water Plan Simulated San Marcos Springs Discharge



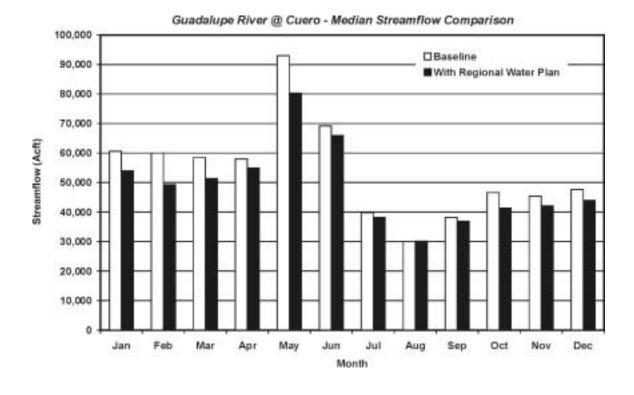
Recharge and Recirculation Alternative Regional Water Plan Simulated Edwards Aquifer Levels

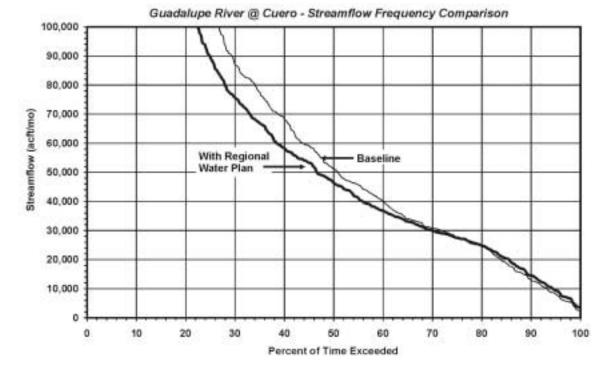


Drawdown in Southern Bastrop County

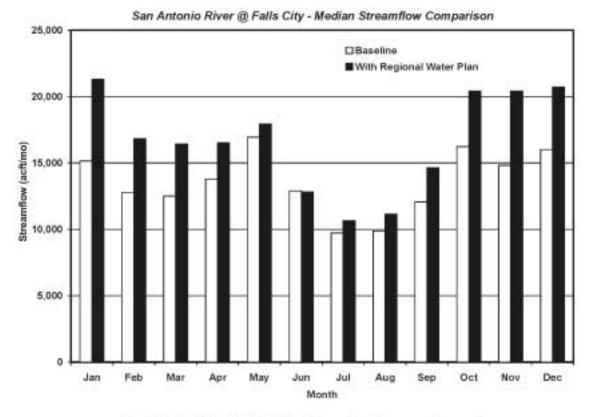


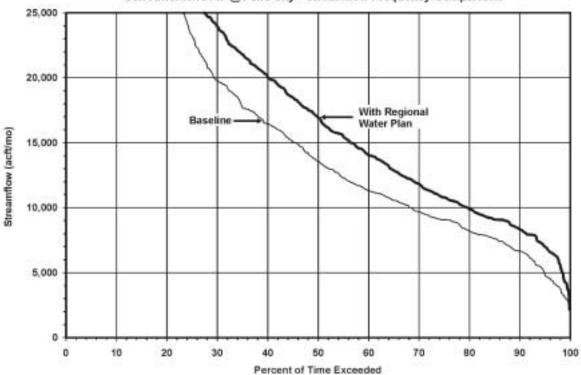
Recharge and Recirculation Alternative Regional Water Plan - Carrizo Aquifer





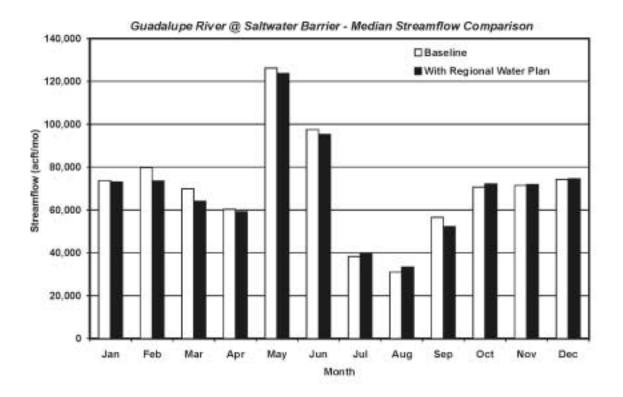
Recharge and Recirculation Alternative Regional Water Plan Streamflow Comparisons

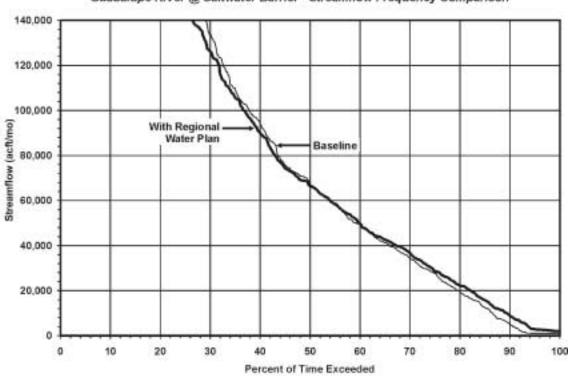




San Antonio River @ Falls City - Streamflow Frequency Comparison

Recharge and Recirculation Alternative Regional Water Plan Streamflow Comparisons

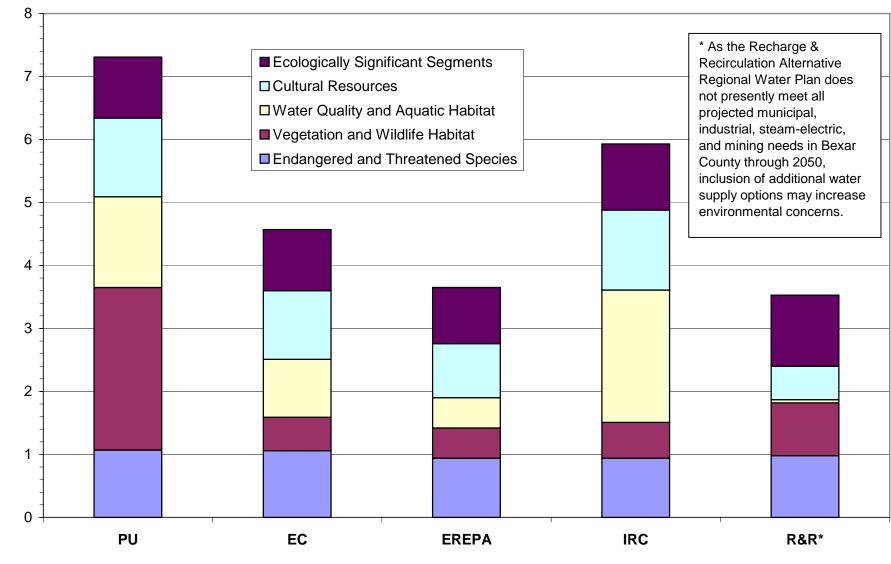




Guadalupe River @ Saltwater Barrier - Streamflow Frequency Comparison

Recharge and Recirculation Alternative Regional Water Plan Streamflow Frequency Comparisons

Figure 1 Composite Environmental and Cultural Resources Impacts Summary for Five Alternative Regional Water Plans



**Composite Score** 

**Alternative Plan** 

# Figure 2 Endangered & Threatened Species

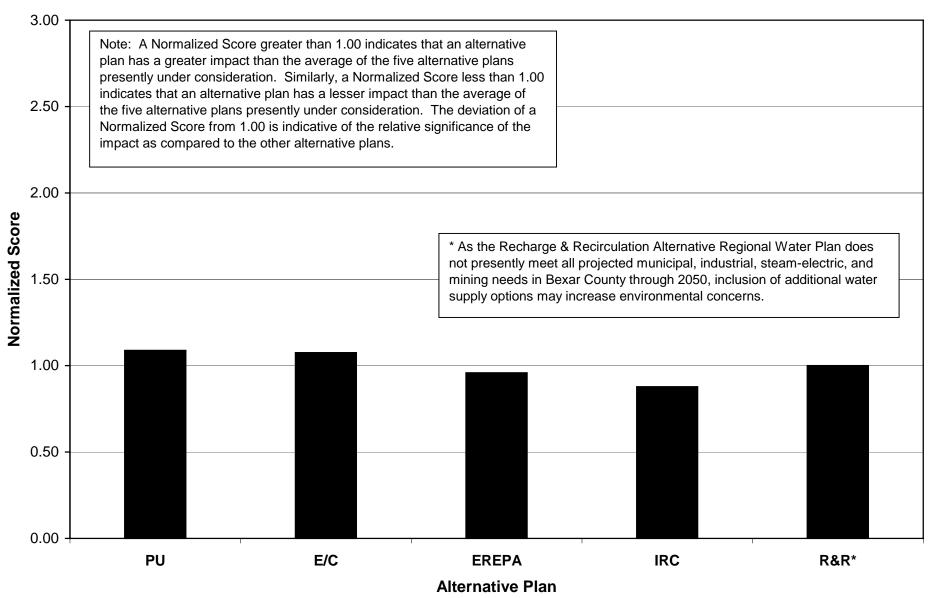


Figure 3 Vegetation & Wildlife Habitat

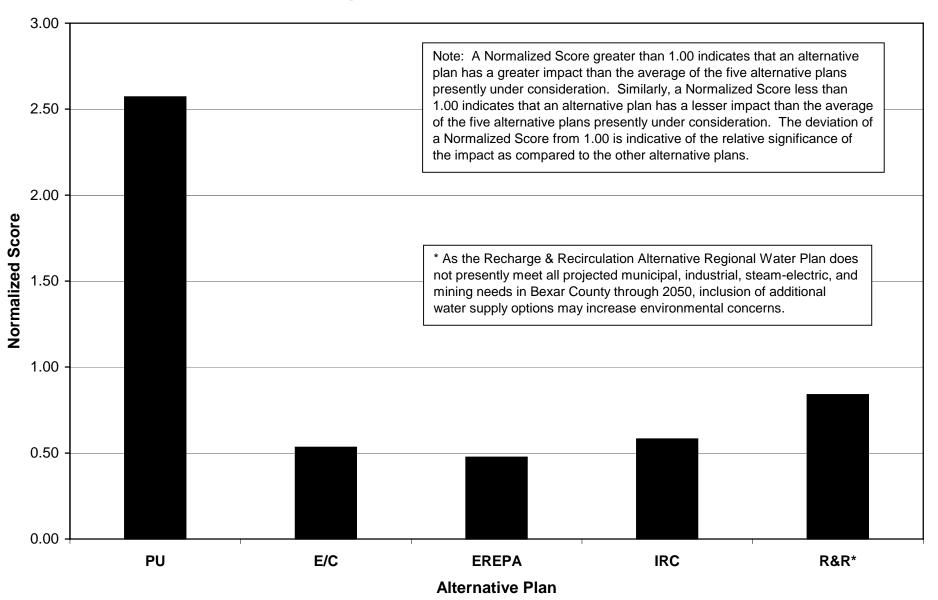
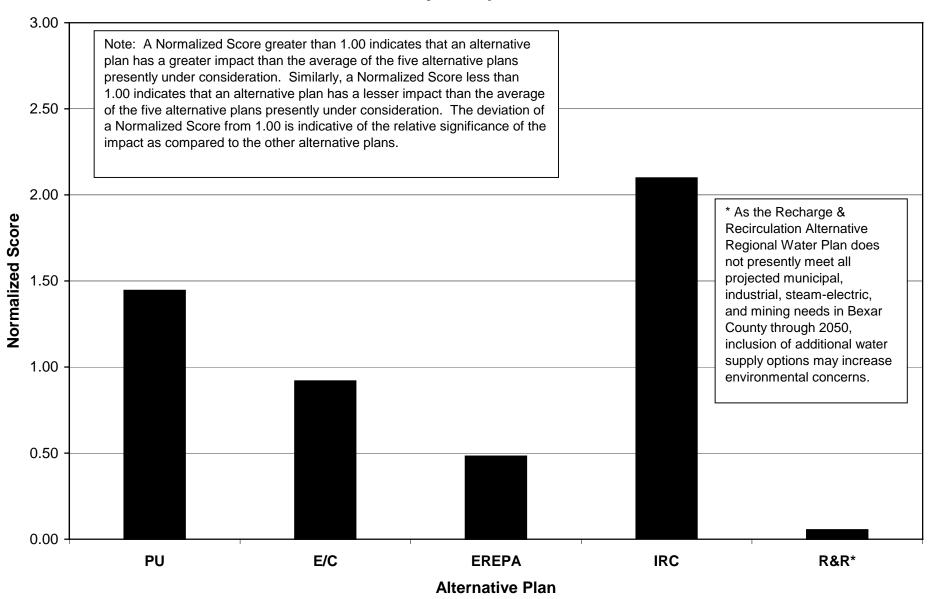
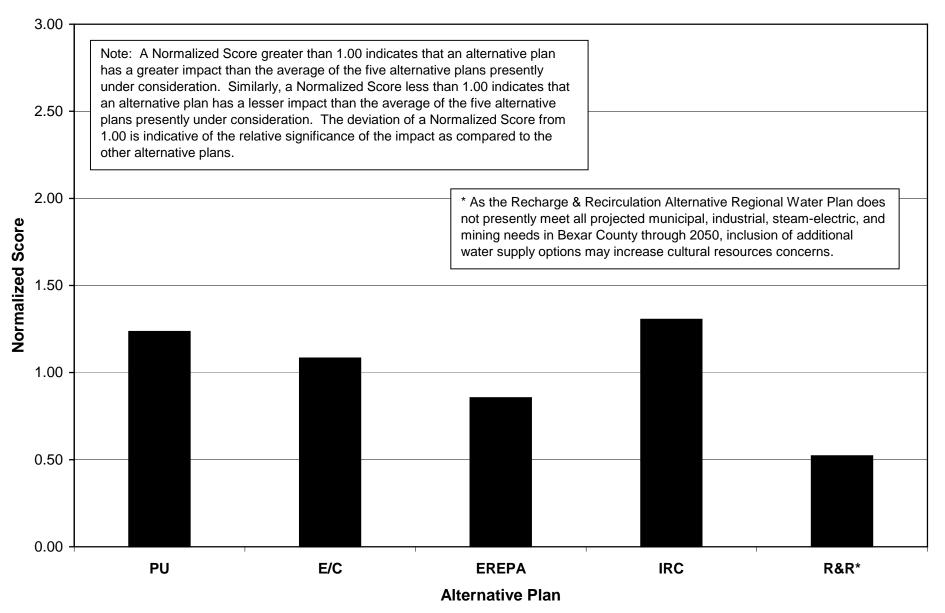


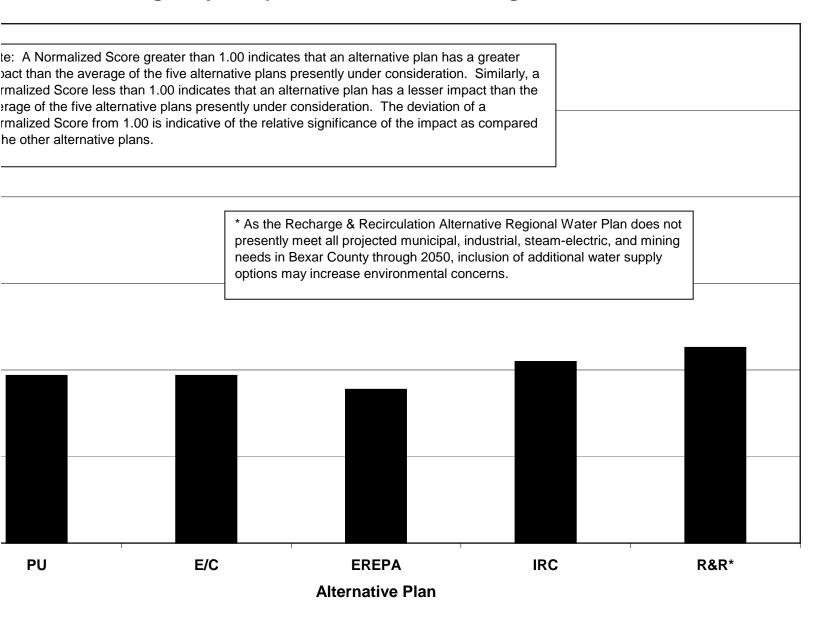
Figure 4 Water Quality & Aquatic Habitat



# Figure 5 Cultural Resources



# Figure 6 Ecologically Unique River and Stream Segments



## Assessment of Potential Environmental Impacts of Five South Central Texas Region Regional Water Management Alternative Plans

# **1.0 Introduction**

This document is a preliminary assessment of the potential environmental impacts of the five Alternative Water Management Plans now under consideration in Region L. The assessment is based on engineering descriptions provided by HDR Engineering, Inc. of the individual water supply options used to construct the Alternative Plans and on environmental data compiled during previous studies of the water supply options and updated for this phase of the Senate Bill 1 work in region L.

This assessment is preliminary in the sense that neither environmental nor engineering site-specific studies have been performed to verify the published data employed, identify environmental resources at risk that can be avoided, finalize facility locations and operational routines, and propose compensation for unavoidable impacts. This assessment provides relative rankings of potential environmental impacts of the Alternative Plans (and individual water supply options) as they are presently described. However, most of the facilities evaluated here have been designed and located only in a conceptual sense, the actual locations of intakes, pipeline rights-of-way, and other project features will not be finally determined until site-specific field studies and land acquisition programs have been completed. For that reason many, if not most of the potential impacts tabulated in the following evaluations, can be avoided or significantly mitigated by relocation of project elements. This is particularly the case with respect to facilities such as pipelines and individual well pads and less so for reservoirs, for which there may be a limited set of suitable sites.

# 2.0 Methods

For each Water Supply Option, potential impacts to five resource categories were evaluated:

- 1) Endangered and Threatened Species,
- 2) Vegetation and Wildlife Habitats,
- 3) Water Quality and Aquatic Habitats,
- 4) Cultural Resources
- 5) Ecologically Unique Segments

The composite impact values from each resource evaluation were tabulated for all water supply options included in each of the Water Management Alternatives. Raw impact scores in each of the five resource evaluations were divided by the average score for the five alternatives to produce normalized scores that can be summed over the resource categories to arrive at an overall relative impact assessment for the five Alternative Plans. The normalized scores are summarized in Table 1. For comparison, linear rankings of the potential impacts of the five Alternative Plans are also included in Table 1.

## 2.1 Endangered and Threatened Species

To assess the relative impact potential of the five water management plans on endangered and threatened species, and watchlist species, the potential impacts of each individual water supply option were first evaluated with respect to those species using a two-part index system. First, each listed species was assigned a multiplier that reflected its status: 1-species of concern, 2-threatened, 3-endangered. In cases where status varied among state and federal agencies, the higher status was used. As a practical matter, we note that federally listed endangered and threatened species enjoy a higher level of legal and regulatory protection than do state listed species. While Texas Organization for Endangered Species (TOES) watchlist species have no special protections, their presence often serves as a useful marker for areas of particularly high biodiversity or unique habitats.

The most current county lists and mapped occurrences of endangered and threatened species within Region L were obtained from the Texas Parks and Wildlife Department Natural Heritage Program. Supplementary information on federally listed species in Region L was obtained from the U.S. Fish and Wildlife Service, and Texas Organization for Endangered Species was contacted to update information on their watchlist species. Reported occurrences of protected and watchlist species, areas of existing, suitable habitats for those species, and their historic ranges were compared to pipeline routes prepared by HDR Engineering to determine where potential impacts might occur.

Each water supply option was then evaluated with respect to its potential impact on endangered and threatened species by assigning a numerical value from zero (0) to three (3) to each instance in which construction or operational disturbances could result in an impact to one of these species according to the following criteria:

- 0 -- No adverse impact expected, project in historic range only
- 1 -- Species known to occur within county, but not likely to impact

2 -- Species or potential habitat known to occur within the project area, may impact habitats or individuals of widespread species

3 – Species or habitat present within the corridor, significant reductions in critical habitat or population of endemic species possible.

Each potential impact score was then multiplied by the status score and the product of the two values entered in the results table for that option. All species impact values were then summed for each water supply option. The summed impact values for the suite of water supply options employed in each of the five Alternative Water Management Plans are tabulated and summed over each Alternative to generate an overall endangered and threatened species impact value. This information is summarized in Table 2

## 2.2 Vegetation and Wildlife Habitat

The South Central Texas Region water supply options impact a variety of habitats in a variety of manners. Any comparison of the alternative plans based on the total impact to wildlife habitat must take into consideration the relative value of each of the habitats

being disturbed and to the extent of the disturbance. In this comparison, each of the water supply options was given a "total adjusted impact value" based on a matrix of the total area of each of the habitat types disturbed and the level of impact to each. The sum of these impact values for each of the options within an alternative plan was used to compare the five alternative plans.

For each option, the total land area potentially disturbed was divided into categories based on types of disturbance. For example, inundation of land due to the construction of a reservoir is a different type of disturbance than the temporary construction corridor of a pipeline easement. Using information about each option given in the October 1999 Technical Evaluations of South Central Texas Region Water Supply Options, the May 2000 South Central Texas Region Water Management Alternative Plans and from updates from HDR Engineering, Inc., the number of acres of each type of disturbance was estimated. Pipeline routes were provided digitally by HDR and overlaid on to DRG (Digital Raster Graphic) maps of 7.5 minute USGS Quads using ArcView. From this, pipeline lengths and areas were calculated. A 30foot permanent easement corridor was given to pipelines with pipe diameters less than 36 inches and 40 foot corridors for those with diameters greater than 36 inches. A 100 foot temporary construction corridor was given to all pipelines. Area inundated by reservoirs was provided in the 1999 Technical Evaluations, as well as other estimations of land area disturbed. The total area for facilities such as water treatment plants, pump stations, storage units, and wells was calculated by subtracting any reservoir areas and permanent pipeline easement areas from the total impact area stated in the 1999 Technical

Habitat categories were based on a clustering of the eight Physiognomic Regions of vegetation by the Texas Parks and Wildlife Department.

- 1) 0-30% canopy cover grasslands, shrubland and cropland.
- 2) 31-70% canopy cover brushland and parkland.
- 3) 70-100% canopy cover woodland and forest.
- 4) All wetland and wooded riparian areas

Area to be disturbed in each habitat type were multiplied by a factor reflecting the projected severity of disturbance:

Low (x1) - temporary disturbance only

Medium (x2) - permanent disturbance, managed at reduced habitat/wildlife value High (x3) – permanent disturbance, habitat/wildlife value nil or permanently removed through inundation or construction.

The product of the level of impact multiplier and the adjusted value for the type of habitat yielded the "Adjusted Impact Value." The sum of these values is the "Total Adjusted Impact Value" for the option. These values, together with linear rank and normalized scores are presented in Table 3

## 2.3 Water Quality and Aquatic habitats

Potential impacts to water quality and aquatic habitats were evaluated in a two stage process. First, an impact matrix tabulating the water quality/aquatic habitat effects of the individual Water Supply Options was developed and scores were summed over the sets of Options comprising the Alternative Plans. Second, net changes in streamflows in the Guadalupe, San Antonio, and Nueces Rivers, and estuarine inflows, resulting from development of each of the five Alternative Plans were evaluated and tabulated (Table 9). Normalized scores from the two evaluations were summed to produce a composite score (Table 4).

Each water supply option was evaluated with respect to a list of seven potential impact classes and assigned a score if the impact was likely to result from project implementation. Impact classes employed and the associated scoring was as follows:

1) Inundation/Conversion of lotic to lentic habitat: 1

2) Streamflow reductions:1, or 0.25 if compliant with consensus planning criteria

3) Alteration of flood frequency (below storage reservoirs): 1

4) Alteration of physico-chemical characteristics of streamflow:1, or 0.25 if compliant with consensus planning criteria

5) Blocks aquatic migration (any dam on a perennial stream): 1

6) Alteration of annual hydrograph: 1, or 0.25 if compliant with consensus planning criteria

7) Construction disturbance: 1 for <u>each</u> outfall, intake, pipeline stream crossing, and dam

## 2.4 Cultural Resources

The following references were used to obtain identify and obtain other information on historic sites:

B. Dooley Awbrey, C. Dooley and the Texas Historical Commission. <u>Why Stop?</u> <u>A guide to Texas Historical Roadside Markers</u>, 3<sup>rd</sup> Edition. Gulf Publishing Company. 1992. p 540.

Texas Historical Commission. Texas Historic Sites Atlas. Online. Texas Historical Commission Homepage. Internet. atlas.thc.state.tx.us/Atlas/atlas\_search\_frame.html

All historic sites mapped within a mile of the pipeline corridor using ArcView and the DRG files mentioned above were entered into the impact matrix along with their distances from the pipeline and other details relevant to determining probable impact. The probable impact on each historic site was determined according to the criteria listed below. These values were then summed to obtain a "total historical site impact value" for each water supply option.

1. Historic sites that were mapped at a distance greater than 0.50 mile from the pipeline were assigned a value of "0".

2. Sites between 0.25 and 0.50 mile were assigned a value of "1".

3. Sites less than 0.25 mile were assigned a value of "2".

4. Sites that would be permanently inundated by reservoir waters were assigned a value of "3".

5. An additional impact point was assigned if the historical site was a cemetery. (For example: If a historical site was less than 0.25 mile from the pipeline and it was a cemetery; it was assigned a value of "3".)

6. Other reasons for adding and subtracting impact points are listed in the spreadsheet mentioned above.

Potential impacts to archaeological resources were estimated by compiling the number of proposed disturbances to landforms considered to be of relatively high potential for containing buried archaeological deposits. The high-potential areas were defined to be stream terraces bordering both perennial and intermittent streams. A probable impact index was devised which included factors reflecting site potential and type of disturbance for each instance of the activity:

- 1) perennial stream crossings 1.5
- 2) intermittent stream crossings -1
- 3) construction parallel to perennial stream channels 2.5,
- 4) construction parallel to intermittent stream parallels 2.

For each water supply option, impact values for historical sites were added to the potential archaeological site impact estimate to arrive at a total impact value. Cultural resources impacts are summarized in Table 5.

## **2.5 Ecologically Unique Segments**

Instances of individual Water Supply Option activities projected to occur in stream segments nominated as Ecologically Unique River and Stream Segments by Texas Parks and Wildlife Department are tabulated in Table 6, and the results summed for each Alternative in table 6a. Table 7 summarizes the characteristics on which nomination as an ecolocically unique segment was based, while Table 8 provides more detail on the activities and environmental effects expected in each segment.

#### Results

Table 1 presents a comparison of the environmental impact potentials of the five Alternative Water Management Plans being considered. The distribution of impacts among the water supply options making up the five Alternative Water Management Plans is shown in Figure 1 and in Tables 2 through 6a and the relative potential impacts of the five Alternative Plans are shown graphically in Figures 1 through 6. Impact matrices developed for individual water supply options are available as electronic files.

 Table 1

 Comparison of Alternative Water Management Plans

			Rank				
	Endangered and Threatened Species	Vegetation and Wildlife Habitat	Water Quality and Aquatic Habitat	Cultural Resources	Ecologically Significant Segments	Total	Rank
PU	5	5	4	4	2.5	20.5	5
EC	4	2	3	3	2.5	14.5	3
EREPA	2	1	2	2	1	8	1
IRC	1	3	5	5	4	18	4
RR	3	4	1	1	5	14	2

# Normalized Interval

	Endangere d and Threatened Species	Vegetation and Wildlife Habitat	Water Quality and Aquatic Habitat	Cultural Resources	Ecologically Significant Segments	Total	Rank
PU	1.07	2.58	1.44	1.25	.97	7.31	5
EC	1.06	.53	.92	1.09	.97	4.57	3
EREPA	.94	.48	.48	.86	.89	3.65	2
IRC	.94	.57	2.10	1.27	1.05	5.93	4
RR	.98	.84	.050	.53	1.13	3.53	1

 Table 2

 Composite Endangered and Threatened Species Impact Values for all Water Supply Options

SCTN-1a           SCTN-2a           SCTN-2b           SCTN-3c           SCTN-4           SCTN-5           SCTN-6a           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16b           S-13b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10d           C-17a           C-17b           SAWS recycle.		38       0       62       High*       0       28       0	38 0 76 High* 0 78 0 0	38 0 High* 0 78 0	38 0 0 76 High* 0	0 High* 0 78 28
SCTN-2b           SCTN-3c           SCTN-4           SCTN-5           SCTN-6a           SCTN-8           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10d           C-17a           C-17b		62 High* 0 28	76 High* 0 78	High* 0 78	0 76 High* 0	High* 0 78
SCTN-3c           SCTN-4           SCTN-5           SCTN-6a           SCTN-8           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16b           S-13b           S-13b           S-13c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10d           C-17a           C-17b		High* 0 28	High* 0 78	0 78	76 High* 0	0 78
SCTN-4           SCTN-5           SCTN-6a           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16a           SCTN-16b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10d           C-17a           C-17b		High* 0 28	High* 0 78	0 78	High* 0	0 78
SCTN-5           SCTN-6a           SCTN-8           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16a           SCTN-16b           S-13b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10c           CZ-10d           C-17a           C-17b		0	0 78	0 78	0	0 78
SCTN-6a           SCTN-8           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16a           SCTN-16b           S-13b           S-13b           S-13c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10d           C-17a           C-17b		28	78	78		78
SCTN-8           SCTN-9           SCTN-14a           SCTN-14b           SCTN-16a           SCTN-16b           S-13b           S-13c           G-30           L-10           L-15           L-18a           L-18c           CZ-10c           CZ-10d           C-17a           C-17b						
SCTN-9           SCTN-14a           SCTN-16b           SCTN-16b           S-13b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10c           CZ-10d           C-17a           C-17b			0	0	0	20
SCTN-14a         SCTN-14b         SCTN-16a         SCTN-16b         S-13b         S-15c         G-15c         G-21         G-24         G-30         L-10         L-15         L-18a         L-18c         CZ-10c         CZ-10d         C-17a         C-17b		0	0	0	0	۷Z
SCTN-14b         SCTN-16a         SCTN-16b         S-13b         S-15c         G-15c         G-21         G-24         G-30         L-10         L-15         L-18a         L-18c         CZ-10c         CZ-10d         C-13c         C-17a         C-17b					0	0
SCTN-16a           SCTN-16b           S-13b           S-15c           G-15c           G-21           G-24           G-30           L-10           L-15           L-18a           L-18c           CZ-10c           CZ-10d           C-13c           C-17a           C-17b					56	
SCTN-16b         S-13b         S-15c         G-15c         G-21         G-24         G-30         L-10         L-15         L-18a         L-18c         CZ-10c         CZ-10d         C-13c         C-17a         C-17b					50	
S-13b         S-15c         G-15c         G-21         G-24         G-30         L-10         L-15         L-18a         L-18c         CZ-10c         CZ-10d         C-13c         C-17a         C-17b	_		71			
S-15c         G-15c         G-21         G-24         G-30         L-10         L-15         L-18a         L-18c         CZ-10c         CZ-10d         C-13c         C-17a         C-17b		71				
G-15c         G-21         G-24         G-30         L-10         L-15         L-18c         CZ-10c         CZ-10d         C-13c         C-17a         C-17b			25	25		25
G-21 G-24 G-30 L-10 L-15 L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b		39				
G-24 G-30 L-10 L-15 L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b		30	30	30	30	30
G-30 L-10 L-15 L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b		9				9
L-10 L-15 L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b		60	60	60	60	60
L-15 L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b						100
L-18a L-18c CZ-10c CZ-10d C-13c C-17a C-17b		0	0	0	0	0
L-18c CZ-10c CZ-10d C-13c C-17a C-17b		0	0	0	0	0
CZ-10c CZ-10d C-13c C-17a C-17b		125				125
CZ-10d C-13c C-17a C-17b			80	80	80	
C-13c C-17a C-17b		40	40	40	39	
C-17a C-17b		76		76		76
C-17b			73			
				82		
SAWS recycle.					75	
		0	0	0	0	
Trin. Aqu. Bex.		0				
Edwards Aqu.						0
Raw		578	571	509	466	531
		1.07	1.06	0.94	0.94	0.98
Rank	alized	5	4	2	1	3

\* Brush Control Management has the potential of affecting over a million acres of brushland. Depending upon the areas to be controlled a variety of important species could be adversely affected. Species that are likely to reside in brushland habitat include the endangered ocelot and jaguarundi, the Texas horned lizard, Texas tortoise and plains spotted skunk to name a few.

Option		PU	EC	EREPA	IRC	RR
SCTN-1a	a	657	657	657	657	
SCTN-2a	a	Low*	Low*	Low*	Low*	Low*
SCTN-2	b				Low*	
SCTN-30	c	5,179	4,422		4,422	
SCTN-4		High**	High**	High**	High**	High**
SCTN-5		0	0	0	0	0
SCTN-6a	a		2,777	2,777		6942
SCTN-8		750				750
SCTN-9		0	0	0	0	0
SCTN-14	4a				3,297	
SCTN-14	4b				4,028	
SCTN-16	ба		10,654			
SCTN-16	6b	10,654				
S-13b			0	0		0
S-15c		84,604				
G-15c		505	505	505	505	505
G-21		13,639				13,639
G-24		1,052	1,052	1,052	1,052	1,052
G-30						907
L-10		0	0	0	0	0
L-15		0	0	0	0	0
L-18a		13,769				13,769
L-18c			4,230	4,230	4,230	
CZ-10c		3,088	3,088	3,088	2,810	
CZ-10d		9,086		9,086		9,086
C-13c			2,266			
C-17a				5,033		
C-17b					11,341	
SAWS re	ecycle.	0	0	0	0	
Trin. Aqu	u. Bex.	0				
Edwards						0
	Raw	142,983	29,651	26,428	32,342	46,650
Totals	Normalize	,	0.53	0.48	0.57	0.84
l	Rank	5	2	1	3	4

 Table 3

 Composite Vegetation and Wildlife Habitat Impact Values for all Water

 Supply Options

\*SCTN-2a and 2b explore the potential of existing wells and new well fields for use by nearby municipalities. The number of wells and lengths of pipelines are undetermined, but the habitat impact value is thought to be small, compared to that of other options.

\*\* Brush Control could potentially affect over a million acres of brushland by conversion to grassland. The level of impact is comparable to that of a pipeline permanent maintenance easement. This yields an impact value of over 4,000,000 which is 20 times larger than the cumulative impact of all options.

 Table 4

 Composite Water Quality and Aquatic Habitat Impact Values for all Water Supply Options

Option			PU	EC	EREPA	IRC	RR
SCTN-1a			1.5	1.5	1.5	1.5	
SCTN-2a			0	0	0	0	0
SCTN-2b						0	
SCTN-3c			3	3		3	
SCTN-4			1	1	1	1	1
SCTN-5			1	1	1	1	1
SCTN-6a				1.25	1.25		1.25
SCTN-8			2.5				2.5
SCTN-9			0	0	0	0	0
SCTN-14a	l					2.25	
SCTN-14b	)					2.25	
SCTN-16a	l			3.25			
SCTN-16b	)		3.25				
S-13b				0	0		0
S-15c			5.75				
G-15c			1	1	1	1	1
G-21			4.25				4.25
G-24			1	1	1	1	1
G-30							1.25
L-10			0	0	0	0	0
L-15			0	0	0	0	0
L-18a			3.25				3.25
L-18c				2.25	2.25	2.25	
CZ-10c			2.25	2.25	2.25	2.25	
CZ-10d			1.25		1.25		1.25
C-13c				4.25			
C-17a					5.25		
C-17b						6.25	
SAWS rec	ycle.		0	0	0	0	
Trin. Aqu.			0				
Edwards A							0.5
	Options		31	21.75	17.75	23.75	18.25
Totals	Nori	nalized	5	1.51	0	2.26	0.19
	Net strea	amflow	1	2	2	4	1
	Normalized		0	1.67	1.67	5	0
	Composite		5	3.18	1.67	7.26	0.19
	Score						
	Normali	zed	1.44	0.92	0.48	2.10	0.05
	Rank		4	3	2	5	1

 Table 5

 Composite Cultural Resources Impact Values for all Water Supply Options

Option		PU	EC	EREPA	IRC	RR
SCTN-1a	a	26.5	26.5	26.5	26.5	
SCTN-2a	a	0	0	0	0	0
SCTN-2	b				0	
SCTN-30	c	105	89		89	
SCTN-4		High*	High*	High*	High*	High*
SCTN-5		0	0	0	0	0
SCTN-6a	a		35	35		35
SCTN-8		12				12
SCTN-9		0	0	0	0	0
SCTN-14	4a				81	
SCTN-14	4b				103	
SCTN-10	ба		82.5			
SCTN-10	6b	82.5				
S-13b			2	2		2
S-15c		44				
G-15c		0	0	0	0	0
G-21		22				22
G-24		22.5	22.5	22.5	22.5	22.5
G-30						8.5
L-10		0	0	0	0	0
L-15		0	0	0	0	0
L-18a		26				26
L-18c			16	16	16	
CZ-10c		79	79	79	48	
CZ-10d		85		85		85
C-13c			89.5			
C-17a				83		
C-17b					147	
SAWS re	ecycle.	0	0	0	0	
Trin. Aq		0				
Edwards						
	Raw	504.5	442	349	533	213
Totals	Normalized	1.25	1.09	0.86	1.27	0.53
	Rank	4	3	2	5	1

\* Brush Control could be potentially very high. All Stream terraces to be impacted by brush clearing must be surveyed for cultural resources.

 Table 6

 Ecologically Significant River and Stream Segments Nominated by Texas Parks and

 Wildlife Department Potentially Affected by Water Supply Options in and Adjacent

 to the Region L Planning Area

1			1		101	лс кс	giun	J Planr	iing A	ICa						
	Blanco River	Comal River	Frio River	Garcitas Creek	Geronimo Creek	Guadalupe River- Upper	Guadalupe River- Middle	Guadalupe River Lower	Nueces River- Upper	Sabinal River	San Marcos River- Gonzales	West Nueces River	West Carancahua Creek	Colorado River- Bastrop	Colorado River- Matagorda	Onion Creek
SCTN-																
1a																
SCTN-2a																
SCTN-2b																
SCTN-3c (PU)					xng*									xng		
SCTN-3c		xng												xng		
(EC, IRC) SCTN-4																
SCTN-5																
SCTN-6a							ldu <sup>1</sup>	rdu <sup>2</sup>								
SCTN-8						(rci)										
SCTN-9																
SCTN-14a								rdx								
SCTN-14b								rdx								
SCTN-16a								rdsx								
SCTN-16b								rdsxu								
S-13b																
S-15c																
G-15c					xng		lds									
G-21											(rcp)					
G-24	xng					lds										xng
G-30						rdsu										
L-10																
L-15																
L-18a	rcp		rci						rcp	rci		rcp				
L-18c			rci							rci		-				
CZ-10c (PU, EC, EREPA)							gw									
CZ-10c							gw									
(IRC) CZ-10d					xng		gw									
C-13c														cd rds		

	Table 6 Continued															
	Blanco River	Comal River	Frio River	Garcitas Creek	Geronimo Creek	Guadalupe River- Upper	Guadalupe River- Middle	Guadalupe River Lower	Nueces River- Upper	Sabinal River	San Marcos River- Gonzales	West Nueces River	West Carancahua Creek	Colorado River- Bastrop	Colorado River- Matagorda	Onion Creek
C-17a															cd rdsx	
C-17b				xng				xng					xng		rdx	
SAWS recycle.																
Trin. Aqu. Bex.																
Edwards Aqu. Recir.			xng							xng						

# \* Key to Table Entries

rci - recharge dam; median daily flow <0, intermittent impoundment

rcp - recharge dam; median daily flow >0, perennial impoundment

- cd channel dam; diversion pool only
- ld reservoir diversion

rd - river diversion

s=stored water, x=existing run of river rights, u=unappropriated flow, ()=tributary impoundments

xng-Pipeline crossing

gw - groundwater withdrawals with a significant effect on streamflow

rfp – reduced flood peaks from upstream dam operation

<sup>1</sup> Diversion at Lake Dunlap

2 Diversion at Gonzales

Table 6a Summary of Potential Effects on Ecologically Significant River and Stream Segments

	Stream Crossings	Diversions	Diversions of Unappropriated Water	Dam in Segment	Total Score	Normalized Score
PU	6	3	1	2	12	0.97
EC	5	5	1	1	12	0.97
EREPA	4	4	2	1	11	0.89
IRC	7	5	1	0	13	1.05
RR	6	4	2	2	14	1.13

# Table 7 Criteria Used by TPWD to Nominate Ecologically Unique River and Stream Segments in and Adjacent to the Region L Planning Area

	Biological	Hydrologic Function	Riparian	Water Quality	Threatened &
	Function		Conservation	Aquatic Life/Uses	Endangered spp.
Arenosa Cr.				ecoregion stream	
Blanco R.		Edwards Aquifer Recharge		overall use	
Carpers Cr.				ecoregion stream	
Comal R.		Edwards Aquifer Recharge	Landa Park		multiple spring- dependent spp.
Cypress Cr.		Edwards Aquifer Recharge		overall use	
Frio R.	Texas Natural River Systems Nominee	Edwards Aquifer Recharge	Garner State Park	overall use, aesthetic	
Garcitas Cr.	Estuarine wetlands			ecoregion stream	diamondback terrapin*
Geronimo Cr.				ecoregion stream	
Guadalupe R., Upper		Edwards Aquifer Recharge	Guadalupe River Park	overall use #2 scenic river in Texas	
Guadalupe R., Middle					golden orb*
Guadalupe R., Lower	Freshwater and marine wetlands		Victoria Municipal Park Guadalupe Delta WMA	overall use	whooping crane

	Table 7 Continued										
	Biological Function	Hydrologic Function	Riparian Conservation	Water Quality Aquatic Life/Uses	Threatened & Endangered spp.						
Honey Cr.			Honey Creek Natural Area								
Mission R.	Freshwater and marine wetlands										
Upper Nueces R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic							
Sabinal R.	T. Nat R Systems	Edwards Aquifer Recharge		Aesthetic							
Upper San Marcos R.			multiple University and City parks	overall use	multiple spring- dependent spp.						
Lower San Marcos R.			Palmetto State Park								
San Miguel Cr.				ecoregion stream							
West Nueces R.		Edwards Aquifer Recharge									
West Verde Cr.			Hill Country Natural Area								
West Carancahua Cr.				ecoregion stream							
Colorado R Bastrop				overall use	blue sucker						
Tidal Ĉolorado R.	Freshwater and marine wetlands										
Onion Creek				ecoregion stream							

**Table 7 Continued** 

	Biological Function	Hydrologic Function	Riparian Conservation	Water Quality Aquatic Life/Uses	Threatened & Endangered spp.
Middle Nueces R.	Resident and migratory bird habitat; Freshwater wetlands		City of Corpus Christi Wildlife Sanctuary; Hazel Bazemore County Park	overall use	Wood stork, interior least tern, indigo snake, black spotted newt, South Texas siren, white-faced ibis, golden orb*
Tidal Nueces R.	Marine wetlands; Migratory bird habitat		Nueces River Park	overall use	Brown pelican, piping plover, reddish egret, snowy plover*, white- faced ibis, wood stork, migrating whooping cranes, opossum pipefish, Gulf saltmarsh snake*, indigo snake, diamondback terrapin*

**Table 7 Continued** 

\* Not listed as Threatened or Endangered by the State of Texas or U.S. Fish and Wildlife Service

#### Table 8

## Summary of Water Supply Option Features Potentially affecting Ecologically Unique River and Stream Segments Nominated by Texas Parks and Wildlife Department in and Adjacent to Region L

#### **Blanco River**

L-18a recharge dam: Enhance Edwards Aquifer recharge, flow from San Marcos
Springs
Impounds a permanant pool
Dam may affect recreational use

#### **Frio River**

L-18a, L-18c	recharge dams: Enhance Edwards Aquifer recharge
	Downstream of perennial reach, no effect on aquitic biota or water- oriented uses
	Far downstream of Garner State Park
<b>Upper Guada</b>	lupe River
SCTN-8	tributary dams: Supplement Trinity Aquifer recharge
	Reduced channel scour in tributaries below dams
	No effect on low flows in Guadalupe River, effects on
	flood flows minor
	Impoundments not likely to maintain fish communities
	capable of nuisance insect suppression without
	management
G-30	river diversion: Supplement Edwards Aquifer recharge
	Flow reductions $>10\%$ at flows above median
	No effect on flood peaks
	No effect on low flow regime
	No effect on overall use of Guadalupe River
G-24	Canyon Lake diversions: divert small amount of appropriated, stored
	water

## Middle Guadalupe River

SCTN-6a	reservoir diversion: Enhance Edwards Aquifer recharge and flow from
	Comal Springs
	No effects on flood flows
	Downstream flow reductions limited at lowest flow range
G-15c	reservoir diversion: Diversion of stored water released from Canyon Lake
	increases flow between Canyon and diversion point
CZ-10c	groundwater withdrawal: Streamflow reduction over Carrizo recharge
	zone
	Largest proportional reduction at lowest flows

# Lower Guadalupe River

SCTN-14a,b river diversions: Divert appropriated water at salt water barrier No effects on freshwater wetlands, public properties or use

regime	Small reduction in annual estuary inflow, no effect on low flow				
regime	No effect on flood peaks and volumes				
SCTN-16a,b river diversions: Divert stored, appropriated and unappropriate water at salt water barrier					
	No effects on freshwater wetlands, public properties or use				
	Changes in annual hydrograph from stored water delivery				
	Small reduction in annual estuary inflow, no effect on low flow				
regime					
	No effect on flood peaks and volumes				

#### **Sabinal River**

L-18a, L-18c recharge dams: Enhance Edwards Aquifer recharge Downstream of perennial reach, no effect on aquitc biota or water- oriented uses

#### Lower San Marcos River

G-21 tributary dam: Reduction of Plum Creek flood flows may reduce some flood peaks at Palmetto State Park Impounds perennial pool

#### **Upper Nueces River**

L-18a recharge dam: enhance Edwards Aquifer recharge, located at extreme lower portion of perennial reach, may affect recreational use

#### **Colorado River-Bastrop**

C-13c channel dam: Stored water released from Highland Lakes increases flow between Mansfield Dam and diversion point near Bastrop

#### Colorado River-Matagorda

C-17a,b channel dam: Stored water released from Highland Lakes increases flow between Mansfield Dam and diversion point (Colorado County), while diversion of run of river irrigation rights decreases flow downstream Groundwater withdrawal not expected to affect streamflow

All river and reservoir diversions and surface impoundment options listed here comply with the Consensus Planning Criteria for instream flows and for bay and estuary inflows. Pipeline crossings were not considered to be a credible threat to the resources of any of the nominated river and stream segments, and are not listed here.

#### Table 9

	PU	EC	EREPA	IRC	RR
Guadalupe R. @ Cuero	0	1	1	0	0
San Antonio R. @ Falls City	0	0	0	4	0
Salt Water Barrier	0	0	0	0	0
Nueces R. @ Calallen	1	1	1	0	1
Total	1	2	2	4	1
Normalized Score	0.5	1	1	2	0.5

## Net Streamflow Change From Implementation of the Five Alternative Water **Management Plans**

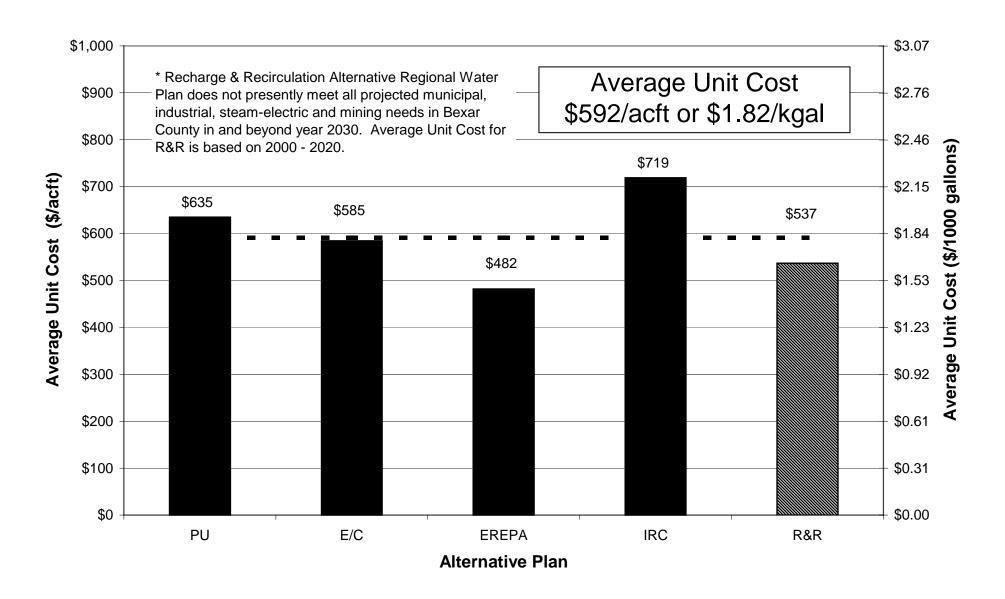
0 – flow increase or no change at low (<50<sup>th</sup> percentile) flows, no change or only minor decrease in high flows

 $1 - \text{moderate flow decrease at at low flows (<10% between 50<sup>th</sup> and 75<sup>th</sup> percentiles)$ 

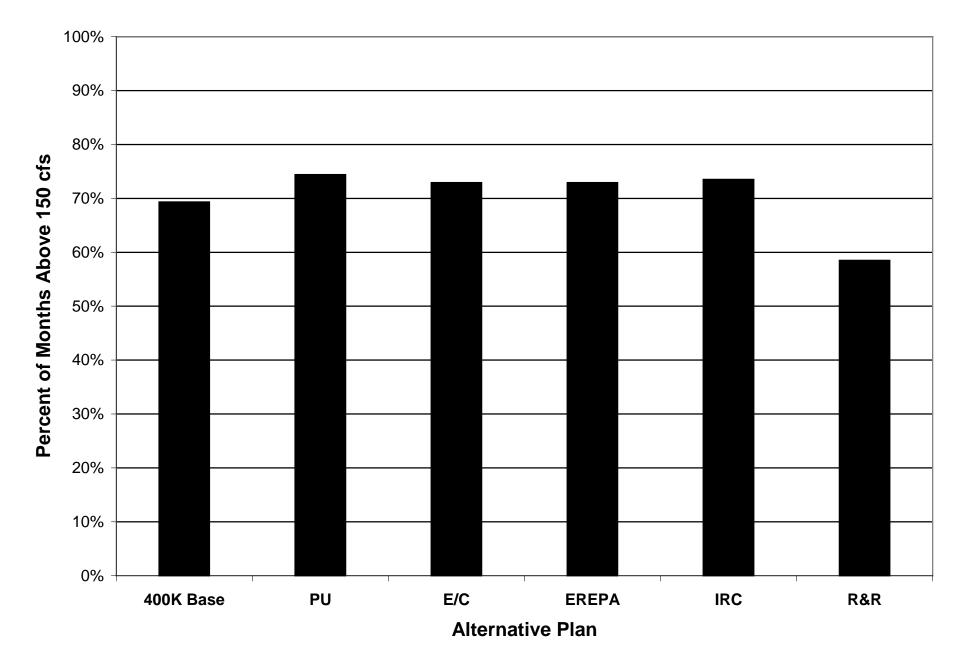
2 - moderate flow decrease at at low flows, moderate decrease in high flows (>20% between 50<sup>th</sup> and 75<sup>th</sup> percentiles)

3 -flow decrease >10% between 50<sup>th</sup> and 75<sup>th</sup> percentiles 4 - flow decrease >10% between 50<sup>th</sup> and 75<sup>th</sup> percentiles, and decrease >20% between 50<sup>th</sup> and 75<sup>th</sup> percentile

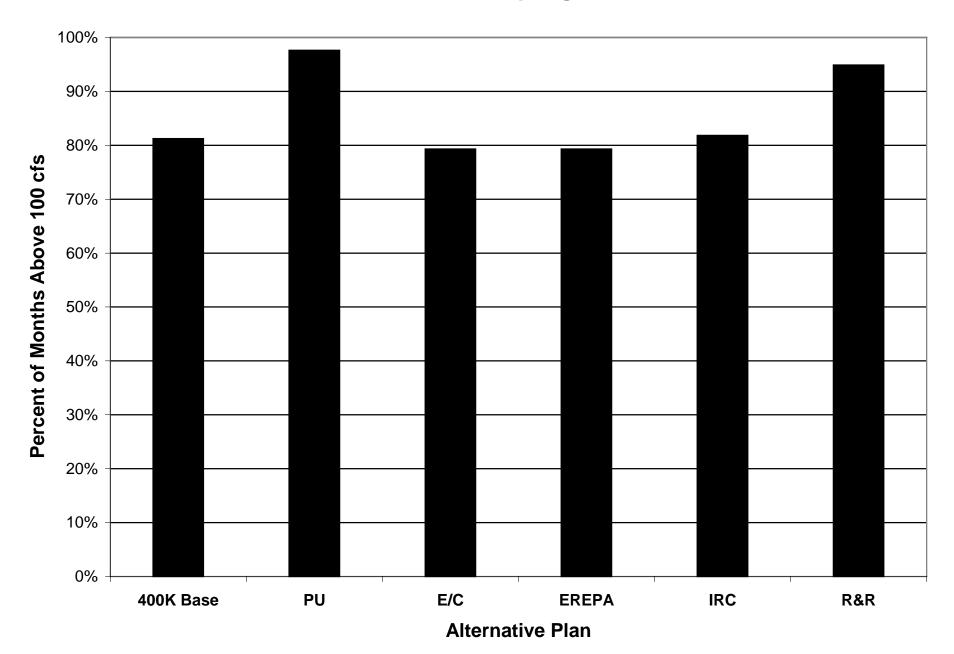
# Average Unit Cost Comparison of Alternative Regional Water Plans

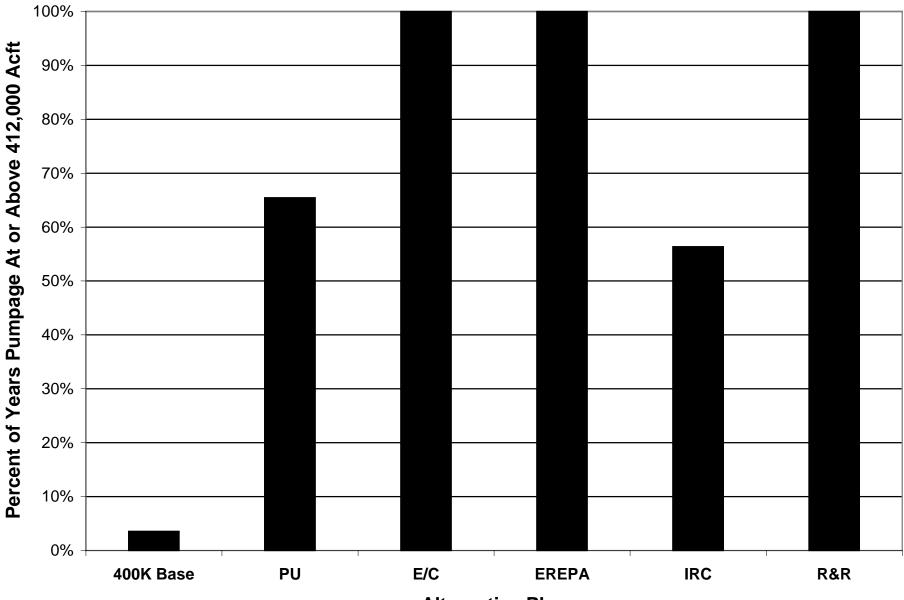


# **Comal Springs**



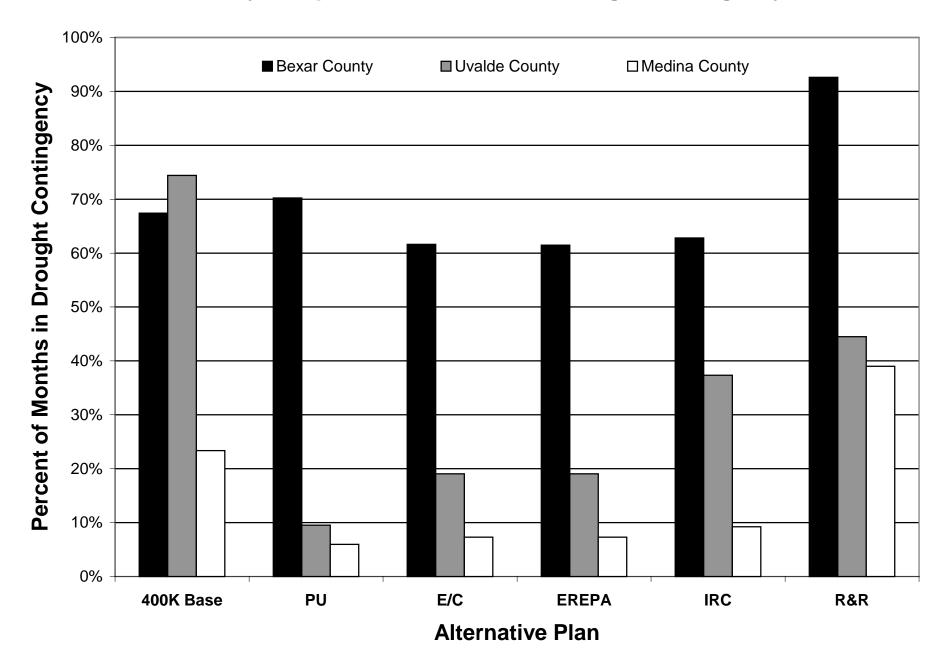
# San Marcos Springs



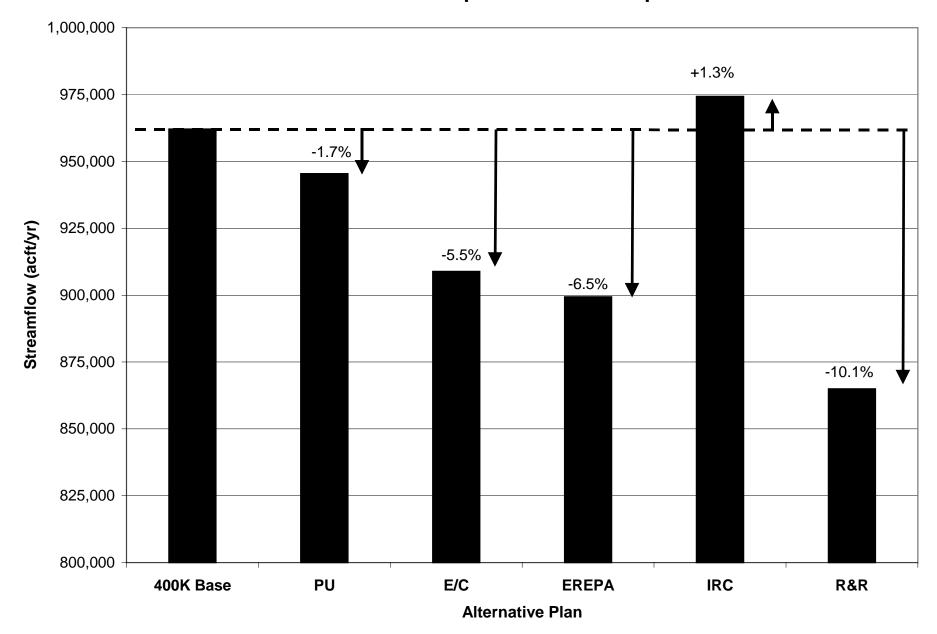


# Pumpage At or Above 412,000 Acft/yr

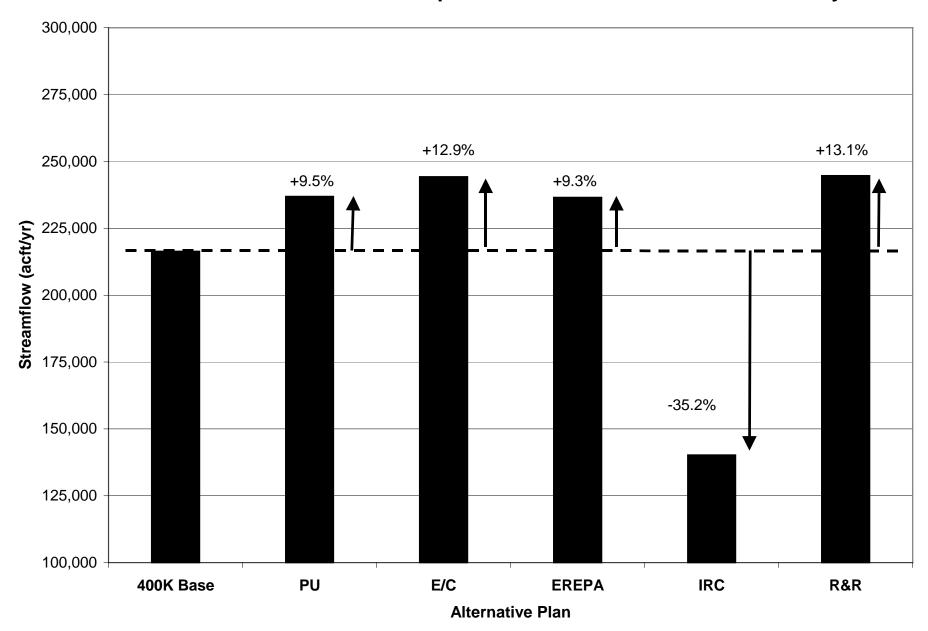
**Alternative Plan** 



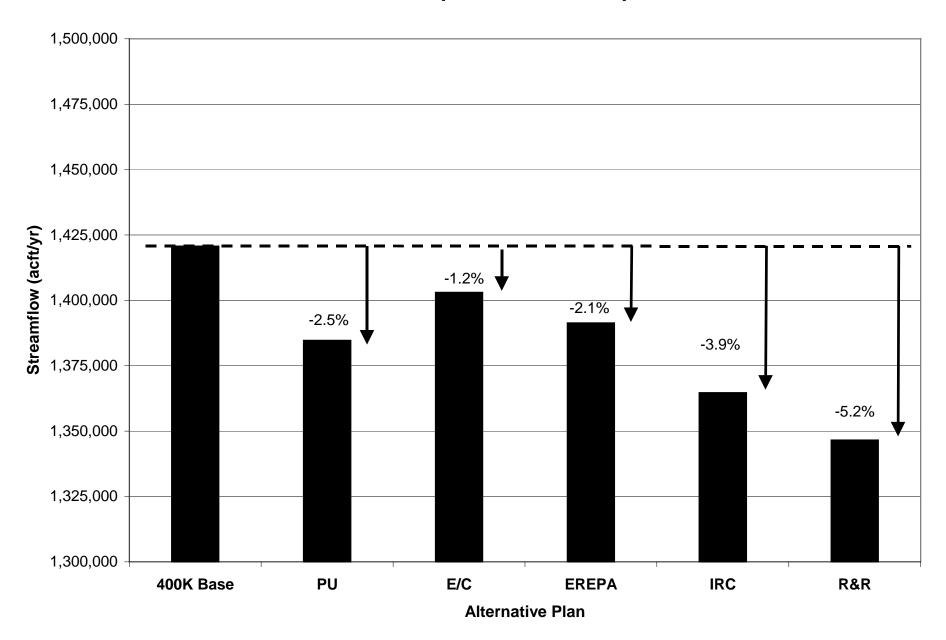
# **County Comparisons of Months in Drought Contingency**



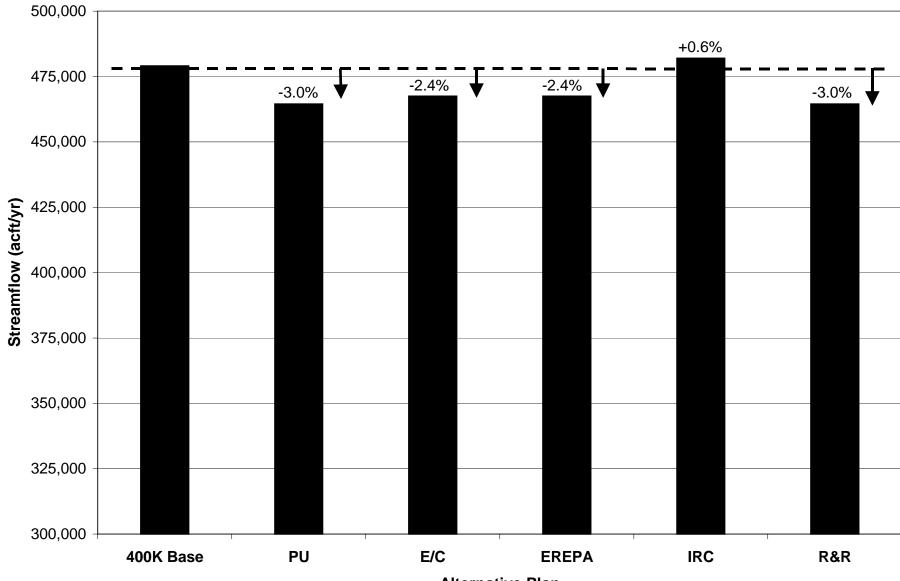
# Median Annual Streamflow Comparison - Guadalupe River @ Cuero



# Median Annual Streamflow Comparison - San Antonio River @ Falls City



# Median Annual Streamflow Comparison - Guadalupe R. Saltwater Barrier



# Mean Annual Streamflow Comparison - Nueces River @ Estuary

**Alternative Plan** 

# General Procedures & Assumptions for Formulation and Technical Evaluation of Regional Water Management Alternative Plans

## **Procedures for Formulation of Regional Water Management Alternative Plans**

- Identification of water supply options for inclusion in an alternative plan is based on the applicable, plan-specific criteria established by the South Central Texas Regional Water Planning Group (SCTRWPG). These criteria are: (1) Planning Unit Approach, (2) Environmental/Conservation Approach, (3) Economic, Reliable, Environmental, Publicly Acceptable Approach (EREPA), (4) Interregional Cooperation Approach, and (5) Recharge and Recirculation Approach.
- 2) Order of implementation of water supply options within each alternative plan is primarily based on the estimated time to implement in relation to the occurrence of projected water needs, with due consideration of engineering economies and other factors.
- 3) Alternative plans include system management supplies to account for:
  - a) Implementation of water supply options in advance of projected need to allow for system operations with the Edwards Aquifer, project development at optimal size, time for reservoir filling, time for accumulation of storage in aquifer(s), interim seasonal peaking capacity, and/or unknown problems in permitting/construction.
  - b) Uncertainty as to dependable supply from the Edwards Aquifer during drought to the extent that such supply may be dependent upon as yet unspecified minimum springflows at Comal and San Marcos Springs.
  - c) Uncertainty as to the ultimate ability to implement specific water supply options.
  - d) The possible occurrence of drought more severe than that which has occurred historically.
- 4) Consistency in system management quantities of supplies included in the alternative plans is desirable (to facilitate cost comparisons), but may not always be possible.

## **Procedures for Technical Evaluation of Regional Water Management Alternative Plans**

- 1) Establish baseline (year 2000) hydrologic simulation for the Edwards Aquifer.
  - a) Breakdown of use type and geographical distribution based on EAA originally proposed permits (without any voluntary transfers from irrigation to municipal use); and
  - b) Starting heads and seasonal distribution of pumpage based on factors developed by the TWDB and currently used in the GWSIM4 model.
- 2) Establish baseline (year 2000) hydrologic simulation for the Carrizo (including Simsboro) Aquifer.
  - a) Use available simulated starting heads representative of 1994 levels (available additional measured well levels obtained since 1994 will be plotted for reference); and
  - b) Breakdown of use type and geographical distribution, and specified local pumpage quantities and use types, as projected by the TWDB.

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- 3) Establish baseline (year 2000) hydrologic simulations for the Gulf Coast and Trinity Aquifers using best available models and technical data, and specified local pumpage quantities and use types, as projected by the TWDB.
- 4) Establish baseline hydrologic simulations for Nueces, Guadalupe San Antonio, Lavaca, and Lower Colorado River Basins based on assumptions noted below and available information.
- 5) Perform hydrologic simulations that reflect the projected implementation of water supply options comprising each alternative plan for each decade from 2000 through 2050.
- 6) Quantify the Available Yield, Total Annual Costs, Annual Unit Costs of Water, Environmental Effects, Impacts on Water Resources of the State, Impacts of Water Management Strategies on Threats to Agricultural and Natural Resources of the Region, Equitable Comparison and Consistent Consideration with Other Water Management Strategies, Interbasin Transfer Provisions in Texas Water Code Sect. 11.085(k)(1), Third Party Social and Economic Impacts from Voluntary Redistribution of Water, Efficient Use of Existing Supplies and Opportunities for Development and Operation of Regional Water Facilities, and Effects on Navigation [Sect. 357.7(a)(7)] associated with the implementation and operation of each alternative plan. Costs will be presented on a Second Quarter 1999 basis and computed in accordance with Cost Estimating Procedures set forth in Appendix A of the "Technical Evaluation of South Central Texas Region Water Supply Options."
- 7) Assess cumulative effects of alternative plan implementation based on differences between the baseline (year 2000) and full implementation (year 2050) hydrologic simulations.

## Assumptions

- 1) Full exercise of surface water rights.
- 2) Edwards Aquifer pumpage of 400,000 acft/yr (plus domestic & livestock) subject to Critical Period Management Rules currently (March 29, 2000) under review by an assessment team for the Edwards Aquifer Authority. This is consistent with provisions in the EAA statute (SB1477) regarding permitted pumpage of 400,000 acft/yr after 2007 and with potential critical period management actions reducing pumpage by 15 percent to 340,000 acft/yr. Note that by agreement with the TWDB, an Edwards Aquifer supply of 340,000 acft/yr has been assumed for assessment of regional water needs. However, springflows resulting from the 400,000 acft/yr Edwards Aquifer pumpage scenario will be used in the baseline hydrologic simulations of the Guadalupe – San Antonio and Nueces River Basins.
- 3) Options and alternative plans involving Edwards Aquifer recharge enhancement will generally be evaluated on the basis of potential recharge recovery permits derived from increased sustained yield as described in Appendix C of the "Technical Evaluation of South Central Texas Region Water Supply Options." Some variation of this assumption may be required for full evaluation of the Recharge & Recirculation Alternative Plan.

- 4) In the evaluation of options and alternative plans involving river diversions for Edwards Aquifer recharge enhancement (recirculation), the diversion of "enhanced springflow" will not be assumed subject to downstream water rights. River diversions for Edwards Aquifer recharge enhancement may not result in simulated water rights shortages greater than those which would occur subject to the 400,000 acft/yr Edwards Aquifer pumpage scenario.
- 5) Water treatment will not be necessary for Edwards Aquifer recharge enhancement options if water originates upstream of the outcrop of the Edwards Aquifer or from the Edwards Aquifer.
- 6) Subordination of all senior Guadalupe River hydropower permits to Canyon Reservoir. This assumption is based on past actions of the GBRA to subordinate its own Guadalupe River hydropower rights and on an existing GBRA contractual agreement with the City of Seguin.
- 7) Delivery of GBRA's full contractual obligations from Canyon Reservoir to point of diversion in all years. Uncommitted balance of Canyon Reservoir currently (March 29, 2000) authorized annual diversions, and additional diversions proposed under an amendment presently before TNRCC, to be diverted near Nolte Dam unless otherwise assigned in the assessment of needs. It is expected that this amendment will be granted prior to submittal of the Regional Water Plan.
- 8) Baseline (year 2000) effluent discharge / return flow in the Guadalupe San Antonio and Nueces River Basins will be that reported for 1988 and adjusted for SAWS direct reclaimed water use of 35,000 acft/yr. Estimated effluent discharge / return flow representative of each decade from 2010 through 2050 is included for Bexar County. Estimates are computed as a fixed percentage of projected municipal demand based on best available information for recent years.
- 9) Operation of power plant reservoirs (Braunig, Calaveras, and Coleto Creek) subject to authorized consumptive uses at the reservoir, with makeup diversions as needed to maintain full conservation storage subject to senior water rights, instream flow constraints, and/or applicable contractual provisions.
- 10) Desired San Antonio River flows at Falls City gage of 55,000 acft/yr, with seasonally varying minimums under current SAWS/SARA/CPS agreement.
- 11) Application of Environmental Water Needs Criteria of the Consensus Planning Process (Appendix B, Technical Evaluation of South Central Texas Region Water Supply Options) in consideration of water potentially available as unappropriated streamflow for diversion and/or impoundment as a part of a new water supply option.
- 12) Relative priority of surface water supply options within an alternative plan will be based on order of implementation.
- 13) Operation of Choke Canyon Reservoir/Lake Corpus Christi (CCR/LCC) System subject to the Corpus Christi Phase 4 (maximum yield) policy and TNRCC Agreed Order regarding freshwater inflows to the Nueces Estuary.
- 14) Historical Edwards Aquifer recharge estimates developed by HDR.
- 15) Applicable rules of groundwater management districts included.

- 16) A single point of delivery identical to that in the technical evaluation of water supply options will be assumed for the major municipal demand center of the South Central Texas Region.
- 17) Regional water treatment facilities are sized to meet peak-day demands (assumed to be approximately 2.0 times average-day demands).
- 18) Terminal storage facilities are included near regional water treatment facilities as necessary to ensure reliability subject to peak-day demands during drought.
- 19) Period of record for simulations: Guadalupe-San Antonio River Basin (1934-89, Critical Drought = 1950s), Nueces River Basin (1934-96, Critical Drought = 1990s), Colorado River Basin (1941-65, Critical Drought = 1950s).

# Hydrologic Models

Guadalupe-San Antonio River Basin Water Availability Model (WRAP) (TNRCC/HDR) Nueces River Basin Water Availability Model (WRAP) (TNRCC/HDR) Colorado River Daily Allocation Program (RESPONSE) (LCRA) Edwards Aquifer (Balcones Fault Zone) Model GWSIM4 (TWDB) Carrizo-Wilcox Aquifer Model (TWDB/LBG-G/HDR) Carrizo-Wilcox (Simsboro) Aquifer Model (BEG/TWDB/HDR) Gulf Coast Aquifer Model (TAMU-CC) Trinity Aquifer Model (TWDB) Guadalupe-San Antonio River Basin Model (HDR) Nueces River Basin Model (HDR) Lower Nueces River Basin & Estuary Model (HDR) SIMYLD, RESOP, & SIMDLY (TWDB/TDWR)