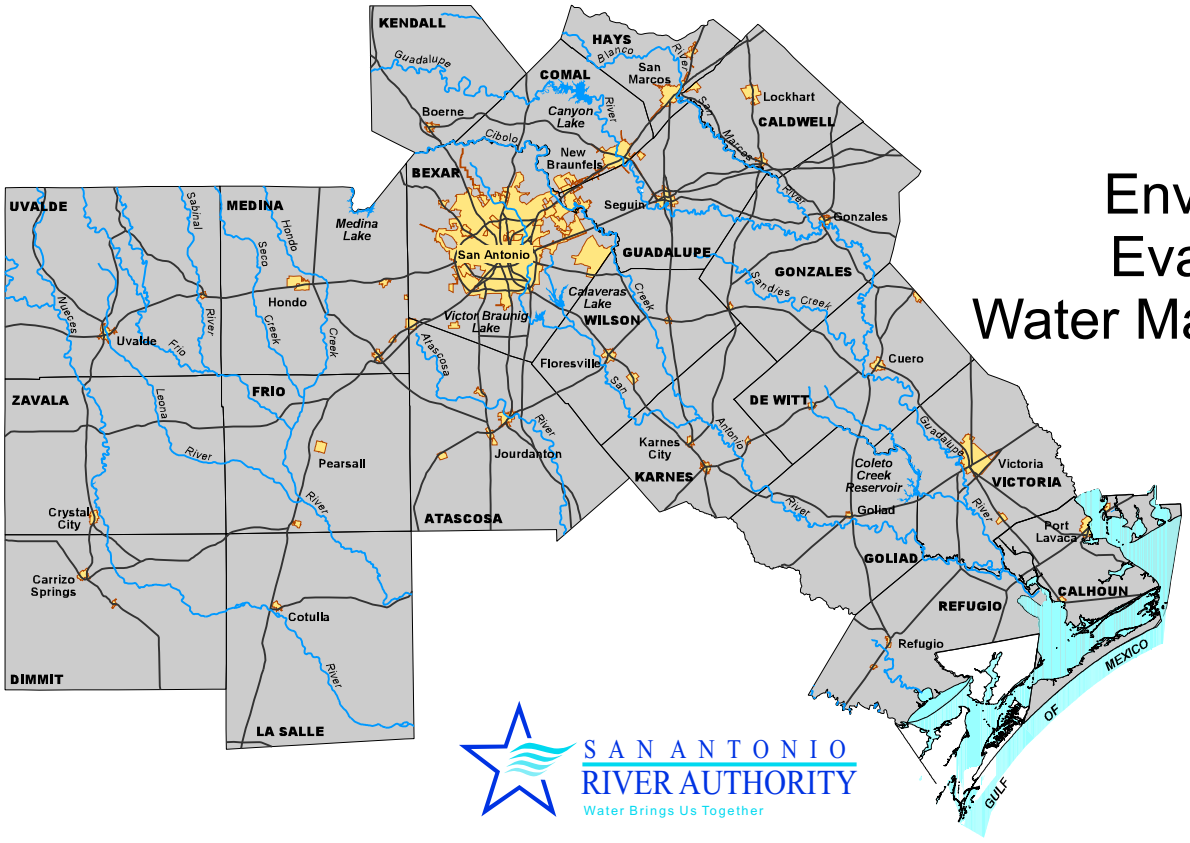
Region L
South Central Texas Regional Water Planning Group

TEXAS WATER DEVELOPMENT BOARD

2011 Regional Water Plan



SAN ANTONIO RIVER AUTHORITY
Water Brings Us Together

Study 5 Environmental Evaluations of Water Management Strategies

April 2009

Prepared by:

South Central Texas Regional Water Planning Group

With administration by:

San Antonio River Authority

With technical assistance by:

HDR Engineering, Inc.
Laura Raun Public Relations
Ximenes & Associates

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South Central Texas Regional Water Planning Area

2011 Regional Water Plan

Study 5 — Environmental Evaluations of Water Management Strategies

Prepared by:

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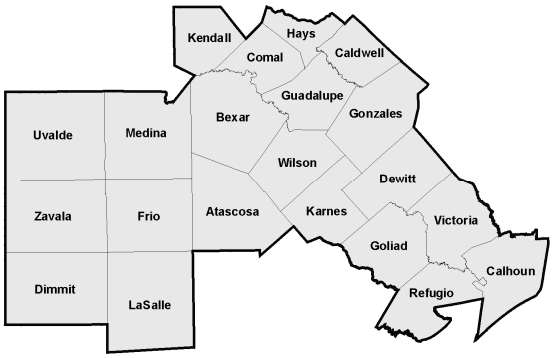

With technical assistance by:

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April 2009

Table of Contents

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1.0 Introduction

The South Central Texas Regional Water Planning Area (Region L) has been a leader among planning regions in the scope of environmental assessments completed as part of the regional water planning process. Pursuant to Texas Water Development Board (TWDB) Regional Water Planning Guidelines in Chapter 357.7 of the Texas Administrative Code, "regional water plan development shall include evaluations of all water management strategies the regional water planning group determines to be potentially feasible by including a quantitative reporting of environmental factors including effects on environmental water needs, wildlife habitat, cultural resources, and effect of upstream development on bays, estuaries, and arms of the Gulf of Mexico." Region L has prepared two regional water plans[1,2] with unique focus on quantitative reporting of potential effects of plan implementation on surface water flows, groundwater levels, surface water / groundwater interactions, water quality and aquatic habitat, vegetation and terrestrial habitat, endangered and threatened species, and cultural resources. Despite its past efforts, Region L intends to improve its environmental assessments in the 2011 South Central Texas Regional Water Plan (SCTRWP).

Seeking the best environmental assessments economically feasible for regional planning purposes as a long-term goal and recognizing the more immediate need to prepare and submit a scope of work for development of the 2011 SCTRWP, the South Central Texas Regional Water Planning Group (SCTRWPG) formed an Environmental Assessment Committee in November 2007. This committee is comprised of SCTRWPG members and representatives of resource agencies and environmental organizations supported by the Technical (HDR Engineering, Inc.) and Facilitation (Ximenes & Associates) Consultants for Region L. Funding for the consultants to support the activities of the committee was provided by the TWDB under Study 5 – Environmental Evaluations of Water Management Strategies, one of five region-specific studies conducted by Region L during the first biennium for the 2011 SCTRWP. The following two sections respectively document the environmental assessment refinement process followed by Region L and the resulting recommendations and actions in terms of scope of work development for the 2011 SCTRWP.

[1] South Central Texas Regional Water Planning Group, "2001 South Central Texas Regional Water Plan," Vols. I, II, & III, Texas Water Development Board, San Antonio River Authority, HDR Engineering, Inc., et al., January 2001.
[2] South Central Texas Regional Water Planning Group, "2006 South Central Texas Regional Water Plan," Vols. I & II, Texas Water Development Board, San Antonio River Authority, HDR Engineering, Inc., et al., January 2006.

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2.0 Process

The Chair of the SCTRWPG formed the Environmental Assessment Committee (EAC) from volunteers and recommended resource scientists during the November 1, 2007 meeting of the SCTRWPG at the headquarters of the San Antonio River Authority. Charges of the EAC included comparisons of environmental assessments by the 16 planning regions in Texas, detailed review of the environmental assessments performed for the 2006 SCTRWP, consideration of comments received regarding the assessments, and development of recommendations for improvement to be considered by the SCTRWPG in formulating the scope of work for the 2011 SCTRWP.

Meetings of the EAC were held on December 19, 2007 and January 18, 2008 at the offices of HDR Engineering, Inc. (HDR) in Austin and were facilitated by Ms. Susan Hughes of Ximenes and Associates. Key documents forming the basis for discussions during the first meeting include summaries of cumulative effects analyses and environmental assessments (Appendix A) and comments received regarding environmental issues (Appendix B) for the 2006 SCTRWP. Table 2-1 summarizes general comparisons of environmental assessments among the 16 planning regions in Texas. Upon review of Table 2-1, it is apparent that the SCTRWPG places significant emphasis on the importance of environmental considerations in the regional water planning process. Both meetings involved free-flowing and constructive technical discussions with the result being a set of consensus recommendations documented by Ms. Hughes in the January 28, 2008 Report of the Environmental Assessment Committee of the South Central Texas Regional Water Planning Group (Region L) included as Appendix C. This report was presented during the February 7, 2008 meeting of the SCTRWPG and referenced in scope of work development discussions during and subsequent to the meeting. Recommendations of the EAC and actions of the SCTRWPG, as reflected in the scope of work for the 2011 SCTRWP, are summarized in Section 3.

Table 2-1.
Comparison of Environmental Assessments in 2006 Regional Water Plans

Analyses / Measure	***Planning Region***															
	A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***K***	***L***	***M***	***N***	***O***	***P***
Number of Pages in Section 7[1]	17	5	8	12	4	7	18	11	6	4	8	72	21	4	2	3
Number of Streamflow and Freshwater Inflow Comparison Locations	6	5	11	18	6	5	9	26	10	4	13	11	9	9	7	7
Endangered and Threatened Species Tabulated	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cumulative Effects Analyses (GW, SW, GW/SW Interactions, etc)	✓*	✓*	✓*	✓		✓*	✓	✓	✓*		✓	✓	✓	✓		
Ecologically-based Assessment of Estuarine Inflow Changes								✓				✓				
Overall Quantitative Environmental Assessment of Plan				✓								✓				
Environmental Comparisons to Past State Water Plans												✓				

[1] Section 7 - Consistency with Long-Term Protection of the State's Water, Agricultural, and Natural Resources.

* Qualitative assessment only.

3.0 Recommendations and Actions

Key recommendations of the Environmental Assessment Committee are broadly categorized and briefly summarized in the following pages. Resulting actions affecting the 2011 SCTRWP and, if appropriate, specific references to the scope of work are included along with each key recommendation. Essentially all technical elements of the environmental assessments in the 2006 SCTRWP are expected to be updated and included in the 2011 SCTRWP subject to and supplemented by the following recommendations and actions.

3.1 Water Management Strategy Evaluations and Cumulative Effects Assessments

a. Recommendation(s): Continue to perform *cumulative effects assessments* of the regional plan, including mapping of maximum transient or cumulative aquifer drawdown, in addition to evaluations of individual water management strategies.
Action(s): Include cumulative effects assessments with mapping of maximum transient or cumulative aquifer drawdown in the 2011 SCTRWP.
Scope of Work Reference(s): Tasks 4c.1-5, 5.1, and 7.1

b. Recommendation(s): Provide *updates on selected projects* in the 2006 SCTRWP that are moving toward implementation and/or are of significant environmental or public interest (i.e., LCRA-SAWS Project, Regional Carrizo for Bexar County, Brackish Wilcox Groundwater for SAWS Needs, Hays/Caldwell Carrizo Project, and Seawater Desalination).
Action(s): Include updated documentation of selected projects in the 2011 SCTRWP.
Scope of Work Reference(s): Tasks 4b.8.1-5

c. Recommendation(s): Include a *discussion of land stewardship* in the 2011 SCTRWP.
Action(s): Include supplemental technical evaluations of Brush Management for Regional Water Supply in the 2011 SCTRWP.
Scope of Work Reference(s): Task 4b.7.1

d. Recommendation(s): Consider *biologically significant flow statistics* in the assessment of changes in instream flows and freshwater inflows to the Guadalupe Estuary.
Action(s): Assess results of current Study 4 – Environmental Studies, monitor progress of environmental flows process established by Senate Bill 3 (SB3) of the 80th Texas Legislature, and include ecologically-based assessments of changes in instream flows and freshwater inflows to the Guadalupe Estuary in the 2011 SCTRWP.
Scope of Work Reference(s): Tasks 4c.3-4, 5.1, and 7.1

e. Recommendation(s): Increase *unit costs for power* in calculation of short- and long-term annual unit costs for water in the technical evaluation of water management strategies.

Action(s): TWDB General Guidelines for Regional Water Plan Development (2007-2011) include a unit cost for power of $0.09/kwh which may be adjusted based on local and regional conditions.
Scope of Work Reference(s): Task 4b

3.2 Surface Water and Groundwater Modeling

a. Recommendation(s): Account for *treated effluent* in calculating surface water supplies, technical evaluation of water management strategies, and assessing potential environmental effects of strategy and/or plan implementation.
Action(s): Include accounting for treated effluent as a fundamental hydrologic modeling assumption for development of the 2011 SCTRWP and obtain TWDB approvals as necessary and appropriate.
Scope of Work Reference(s): Tasks 3a, 4b, 4c, 5.1, and 7.1

b. Recommendation(s): Consider recommendations to Texas Commission on Environmental Quality (TCEQ) focused on *improvement of the Guadalupe – San Antonio River Basin Water Availability Model (GSA WAM)*[3] by development of natural streamflow sets accounting for natural Edwards Aquifer springflow and flow adjustment files accounting for regulated Edwards Aquifer pumpage pursuant to critical period reductions specified in SB3 of the 80th Texas Legislature.
Action(s): The SCTRWPG may choose to discuss these items in the development of recommendations for legislative, administrative, and/or regulatory rule changes to be included in the 2011 SCTRWP.
Scope of Work Reference(s): Task 8.1

c. Recommendation(s): Consider technical information regarding *selection of an Edwards Aquifer simulation model* (e.g., USGS MODFLOW[4], TWDB GWSIM-IV[5,6]) for application in development of the 2011 SCTRWP.
Action(s): Consider Edwards Aquifer model selection for planning purposes based on available technical information.
Scope of Work Reference(s): Task 3.b.1

[3] HDR Engineering, Inc., "Water Availability in the Guadalupe – San Antonio River Basin," Texas Natural Resource Conservation Commission, December 1999.
[4] U.S. Geological Survey, et al., "Conceptualization and Simulation of the Edwards Aquifer, San Antonio Region, Texas," Scientific Investigations Report 2006-5319, 2006.
[5] Texas Department of Water Resources, "Ground-Water Resources and Model Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Report 239, 1979.
[6] Texas Water Development Board, "Model Refinement and Applications for the Edwards (Balcones Fault Zone) Aquifer in the San Antonio Region, Texas," Report 340, 1992.

3.3 Legislative Issues and Relevant Environmental Matters

a. Recommendation(s): Discuss potential recommendation of legislative designation of selected river or *stream segments* in Region L as being *of unique ecological value*.
Action(s): Explore potential recommendation of legislative designation of stream segments on the Nueces, Frio, Sabinal, and Comal Rivers as being of unique ecological value.
Scope of Work Reference(s): Tasks 8.1-3

b. Recommendation(s): Discuss potential recommendation to the legislature regarding appropriate regulation of proposed groundwater production from *wells in the alluvium of rivers* and streams.
Action(s): The SCTRWPG may choose to discuss this item in the development of recommendations for legislative, administrative, and/or regulatory rule changes to be included in the 2011 SCTRWP.
Scope of Work Reference(s): Task 8.1

c. Recommendation(s): Be mindful that some seek to consider the *environment as a Water User Group* (WUG) in the regional water planning process.
Action(s): The SCTRWPG may choose to discuss this subject in the development of recommendations for legislative, administrative, and/or regulatory rule changes to be included in the 2011 SCTRWP.
Scope of Work Reference(s): Task 8.1

d. Recommendation(s): Consider a sensitivity analysis of the potential effects of *climate change* on supplies for one or more water user groups in Region L.
Action(s): Consider studies to be done by others.
Scope of Work Reference(s): N/A

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Appendix A
Cumulative Effects & Environmental Assessments of Regional Water Plan Implementation

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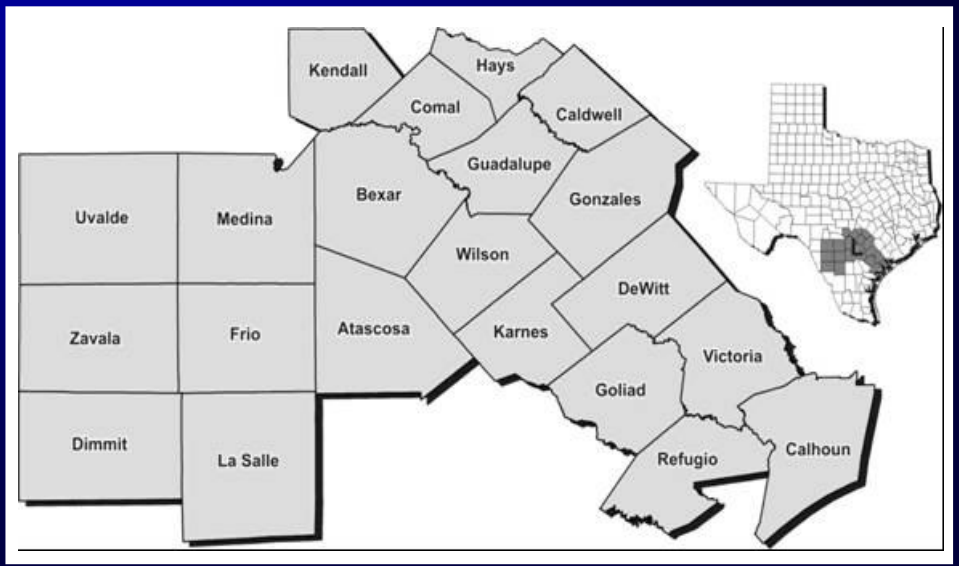
2006 South Central Texas Regional Water Plan

Cumulative Effects & Environmental Assessments of Regional Water Plan Implementation

December 19, 2007

HDR

South Central Texas Planning Region (Region L)



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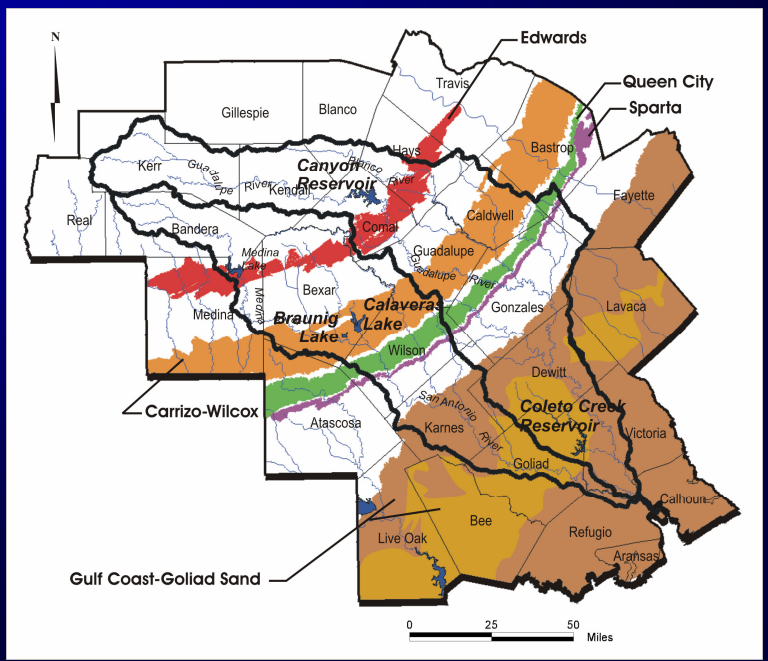
Cumulative Effects Assessment

- Hydrologic Assessments
  - Surface Water
  - Groundwater
- Ecologically-Based Assessment
  - Freshwater Inflow to the Guadalupe Estuary

Aquifers, Streams, & Reservoirs



Hydrologic Assessment
General Procedure for Surface Water (Flow) Assessments

- Use Authorized Use & Current Effluent (Run1), which is essentially the WAM simulation used for calculation of Surface Water Supply, as Baseline for assessment of cumulative effects of Regional Water Plan implementation on flows.
- Use Authorized Use & Future Effluent (Run1) Plus Water Management Strategies for assessment of cumulative effects of Regional Water Plan implementation on flows.

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Hydrologic Assessment
General Procedure for Groundwater Assessments

- Use projected Local Pumpage (excluding exports) as Baseline for assessment of water management strategies and the Regional Water Plan on aquifer levels using available GAMs or alternative models.
- Use projected Local Pumpage Plus Water Management Strategies (exports) for assessment of cumulative effects of water management strategies and the Regional Water Plan on aquifer levels. Assessment of water management strategies may provide information for refinement prior to recommendation for the Regional Water Plan.
- Consider changes in surface water / groundwater interactions and integrate with Surface Water (Flow) Assessments.

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Hydrologic Assessment Modeling Methodologies

- GWSIM4 model of the Edwards Aquifer – 56-year continuous simulation with year 2060 projects (water management strategies recommended to meet needs) in place, using historical recharge data (1934-1989). Effects of projects shown for each year of the 56-year simulation.
- Guadalupe-San Antonio River Basin Water Availability Model (GSAWAM) – 56-year continuous simulation with year 2060 projects in place, using historical streamflow data (1934-1989). Effects of projects shown for each year of the 56-year simulation.
- Nueces River Basin Water Availability Model (NWAM) – 56-year continuous simulation with year 2060 projects in place, using historical streamflow data (1934-1989). Effects of projects shown for each year of the 56-year simulation.
- South Central Carrizo System model (SCCS) – 58-year predictive simulation with projects and local demands increasing through time (2002-2060). Maximum (year 2060) effect on groundwater – surface water flux shown for each year of the 56-year surface water simulation.
- Gulf Coast Groundwater Availability Model (Gulf Coast GAM) – 60-year predictive simulation with projects and local demands fluctuating through time (2000-2060). Maximum (drought year 2022) effect on groundwater – surface water flux shown for each year of the 56-year surface water simulation.

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Guadalupe – San Antonio River Basin
1) Guadalupe River above Comal River @ New Braunfels (USGS# 08168500)
2) San Marcos River @ Luling (USGS# 08172000)
3) Guadalupe River @ Victoria (USGS# 08176500)
4) San Antonio River near Falls City (USGS# 08183500)
5) San Antonio River @ Goliad (USGS# 08188500)
6) Guadalupe River @ Diversion Dam & Saltwater Barrier near Tivoli (USGS# 08188800)
7) Guadalupe Estuary

Nueces River Basin
8) Nueces River below Uvalde (USGS# 08192000)
9) Nueces River @ Cotulla (USGS# 08194000)
10) Frio River near Derby (USGS# 08205500)
11) Nueces Estuary

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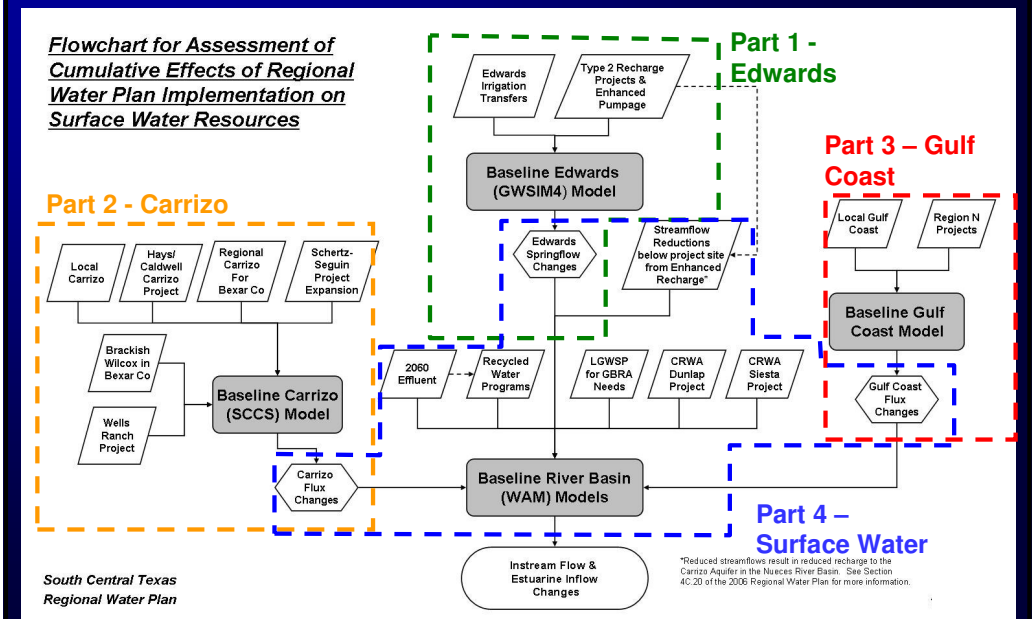
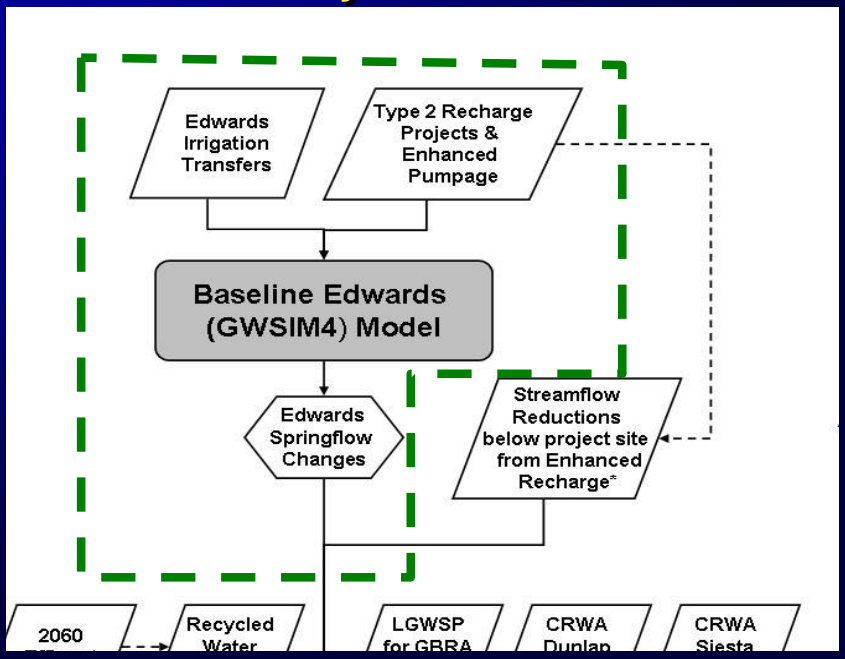
Connectivity of Groundwater, Surface Water, & Recommended Water Management Strategies



Connectivity – Part 1 - Edwards



Edwards Aquifer Pumpage Amounts and Distribution for Assessment of Cumulative Effects of Regional Water Plan Implementation

Pumpage Type	Annual Pumpage Amount (acft/yr)[1]	2060 Transfer Amount (acft/yr) FROM[2]	2060 Transfer Amount (acft/yr) TO[3]	Enhanced Recharge Pumpage	REVISED 2060 Annual Pumpage Amount (acft/yr)
Bexar County Industrial	16,830				16,830
Bexar County Irrigation	23,307	-8,392			14,915
Bexar County Municipal	36,950		13,831	21,577	72,358
Comal County Municipal	14,199		513		14,712
Domestic and Livestock	12,312				12,312
Hays County Municipal	7,710		1,176		8,886
Medina County Industrial	876				876
Medina County Irrigation	61,146	-29,374			31,772
Medina County Municipal	4,013		7,221		11,234
SAWS Industrial	37,137				37,137
SAWS Municipal	100,409		56,471		156,880
Uvalde County Industrial	1,365				1,365
Uvalde County Irrigation	92,886	-46,158			46,728
Uvalde County Municipal	3,171		4,712		7,883
Total	**412,312**	**-83,924**	**83,924**	**21,577**	**433,889**

Notes:

1 Pumpage distribution based on EAA Initial Regular Permits (including SAWS permanent acquisitions) pro-rated to a 400 kacft/yr cap. Basis for springflows used in surface water supply assessment and technical evaluation of WMS. Also baseline for assessment of cumulative effects of regional water plan implementation.

2 Assignment of Edwards Transfer WMS amounts to source counties (10% Bexar, 35% Medina, & 55% Uvalde) based on estimated supplies within unrestricted transfer potential. Includes renewal of existing leases. Voluntary transfers may result in reduced projected irrigation demands in source counties.

3 Assignment of Edwards Transfer WMS amounts to approximate pumpage locations. Includes renewal of existing leases.

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Type 2 Recharge Projects

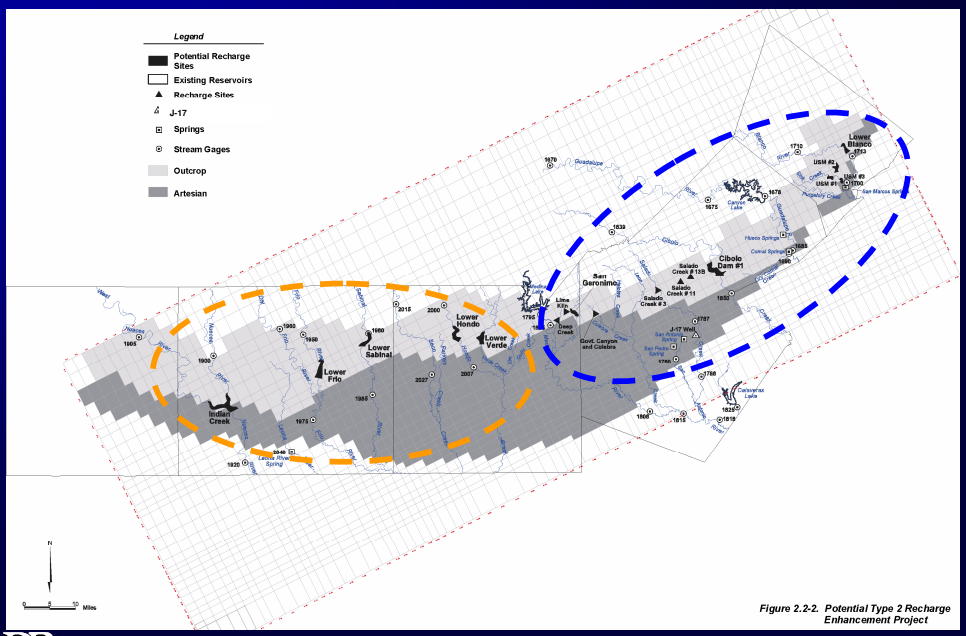

Figure 2.2-2. Potential Type 2 Recharge Enhancement Project

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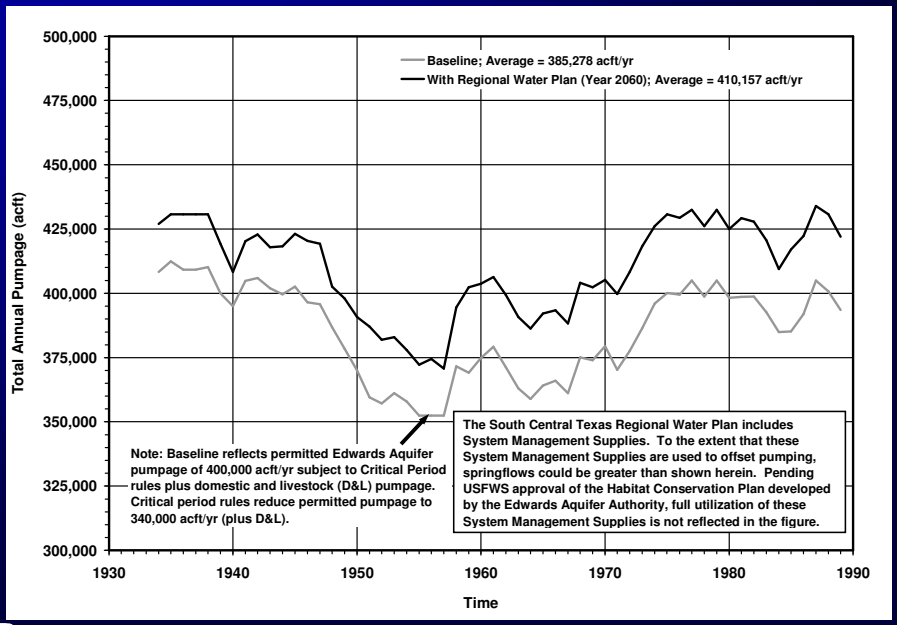
Simulated Edwards Aquifer Pumpage



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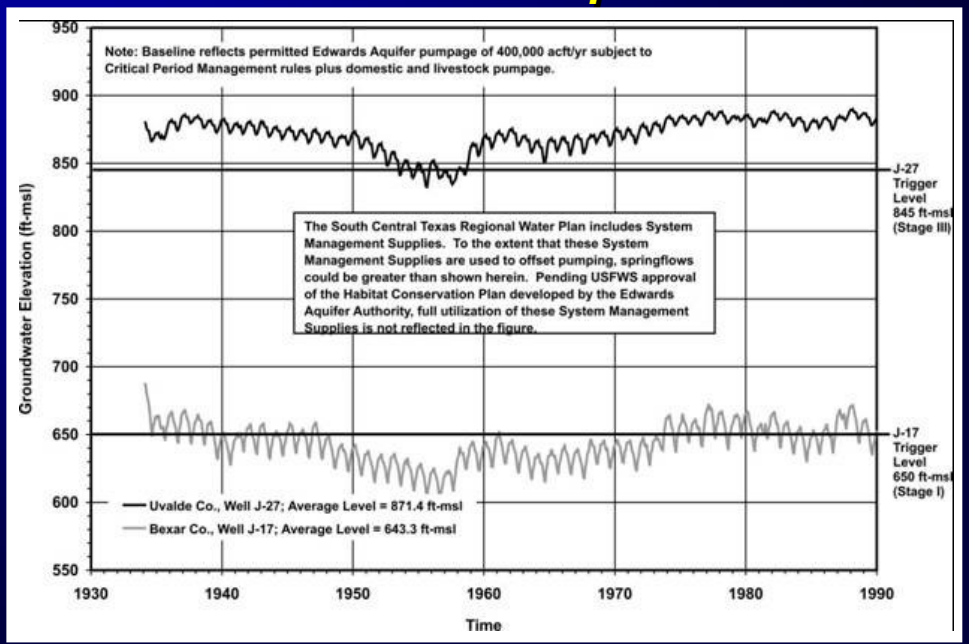
Simulated Edwards Aquifer Levels



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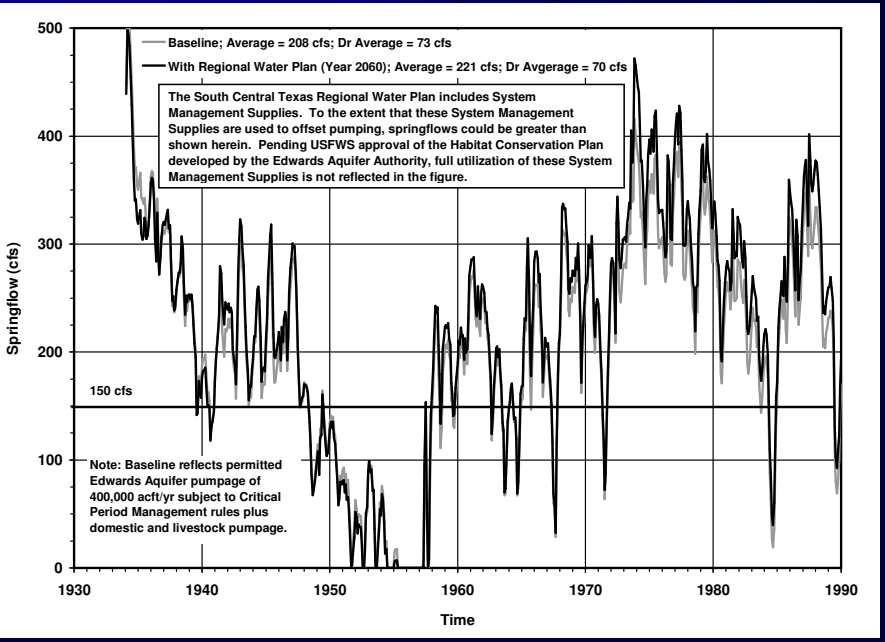
Comal Springs



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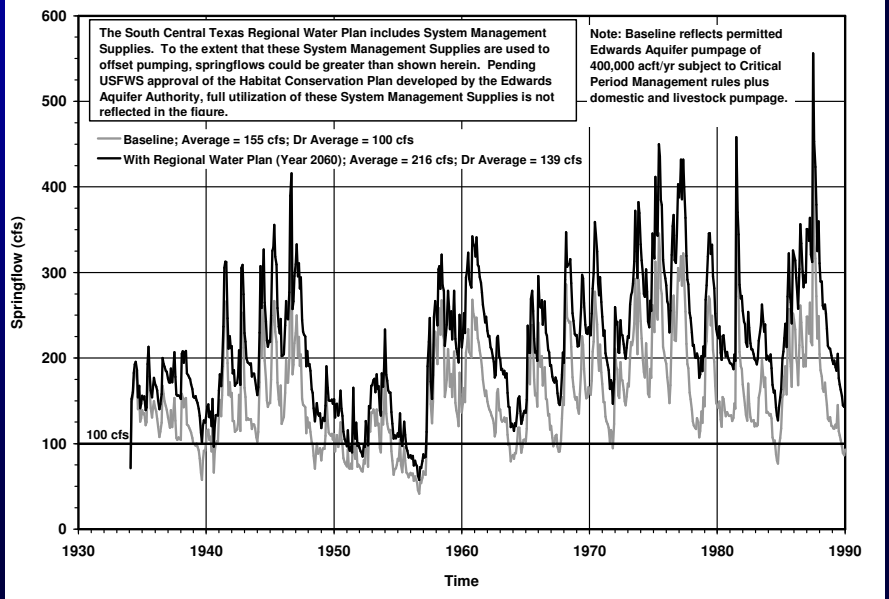
San Marcos Springs



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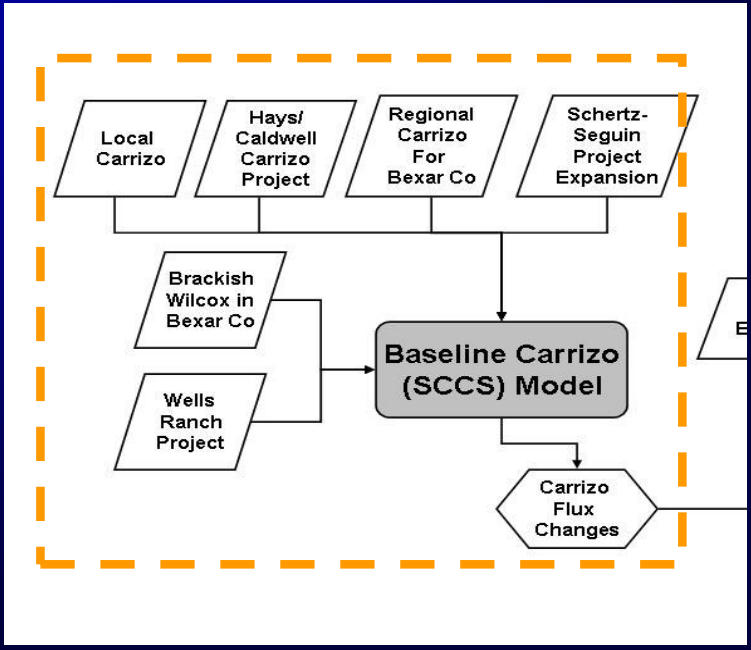
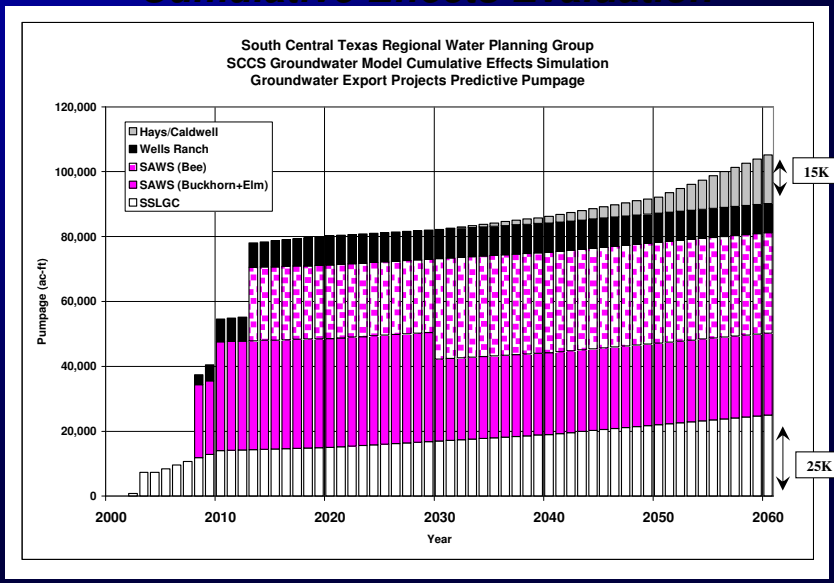
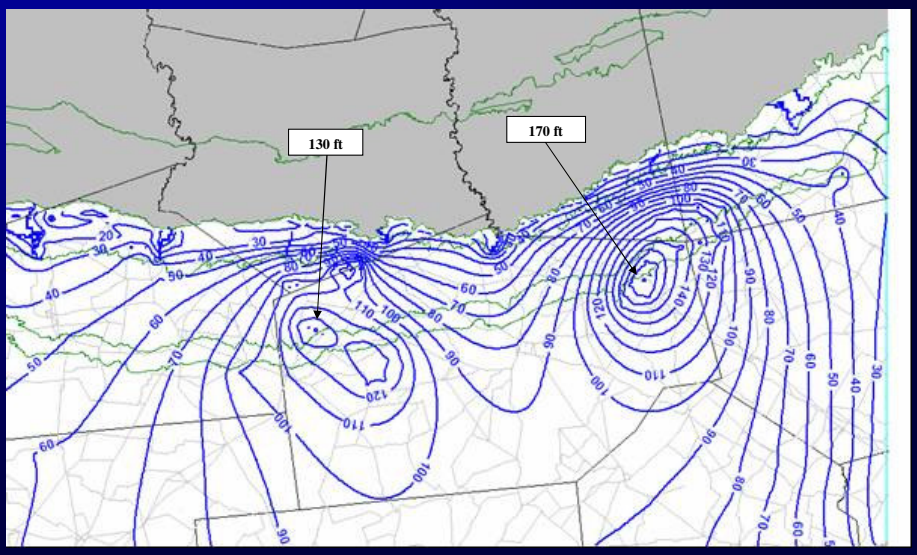
Connectivity – Part 2 - Carrizo



Carrizo Aquifer Export Pumpage Simulated for Cumulative Effects Evaluation



SCCS Cumulative Effects Simulation: 2002-2060 Drawdown



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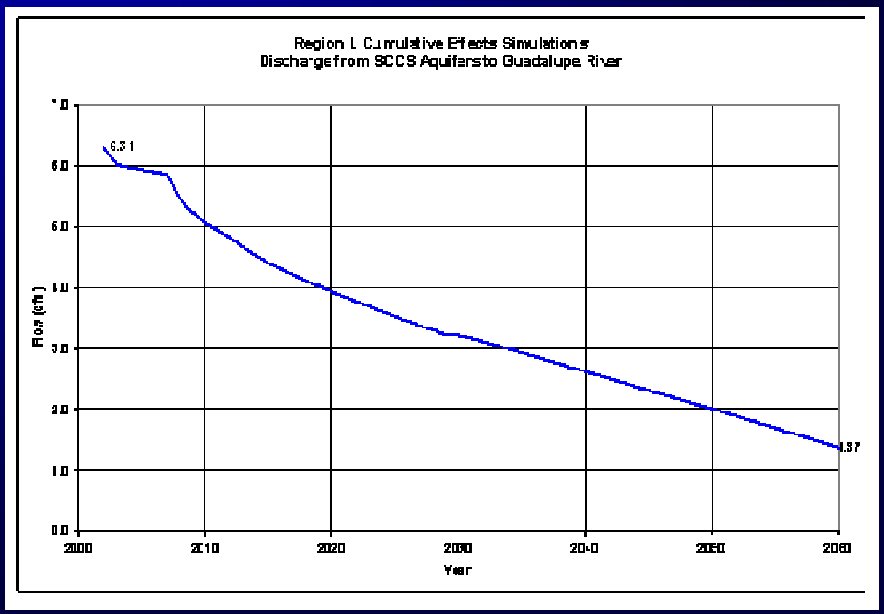
Discharge from SCCS Aquifers - Example



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Flux from the Carrizo Aquifer

	Flux From SCCS Aquifers to Streams (cfs) [1]			
	San Antonio River (+Tributaries)	Cibolo Creek	Guadalupe River	San Marcos River (+ Tributaries)
2002	12.6	7.0	6.3	17.0
2060	0.9	0.7	1.4	8.5
Net Change	-11.7	-6.3	-4.9	-8.5

Notes: Numbers represent flux from aquifers to stream channels. No initial upstream flow is included, nor adjustments for increased upstream municipal effluent.

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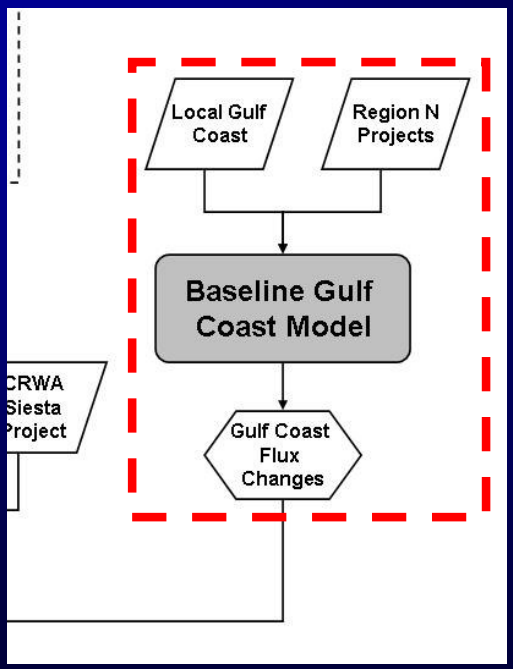
Connectivity – Part 3 – Gulf Coast



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Flux from the Gulf Coast Aquifer

	Year	San Antonio River @ Goliad		Guadalupe River @ Victoria		Guadalupe River near Tivoli	
		Flux*	Δ from 2000*	Flux*	Δ from 2000*	Flux*	Δ from 2000*
Without Brackish Well Field	2000 (Start)	+27.1	-	+20.6	-	-14.4	-
	2022 (Drought)	+24.5	-2.6	+33.7	+13.1	-18.7	-4.3
	2060 (End)	+28.7	+1.7	+41.5	+20.9	+2.3	+16.8
With Brackish Well Field	2000 (Start)	+27.1	-	+20.6	-	-14.4	-
	2022 (Drought)	+24.4	*-2.7*	+33.4	*+12.9*	-25.6	*-11.2*
	2060 (End)	+28.7	+1.6	+41.9	+20.8	-0.3	+14.1

** Positive values indicate the stream is gaining water from the aquifer, while negative values indicate that the stream is losing water to the aquifer*

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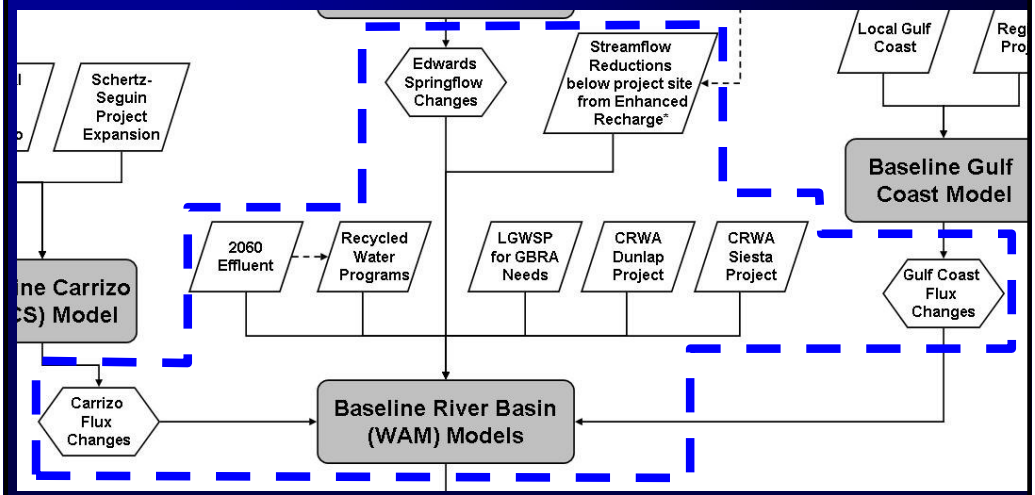
Connectivity – Part 4 – Surface Water



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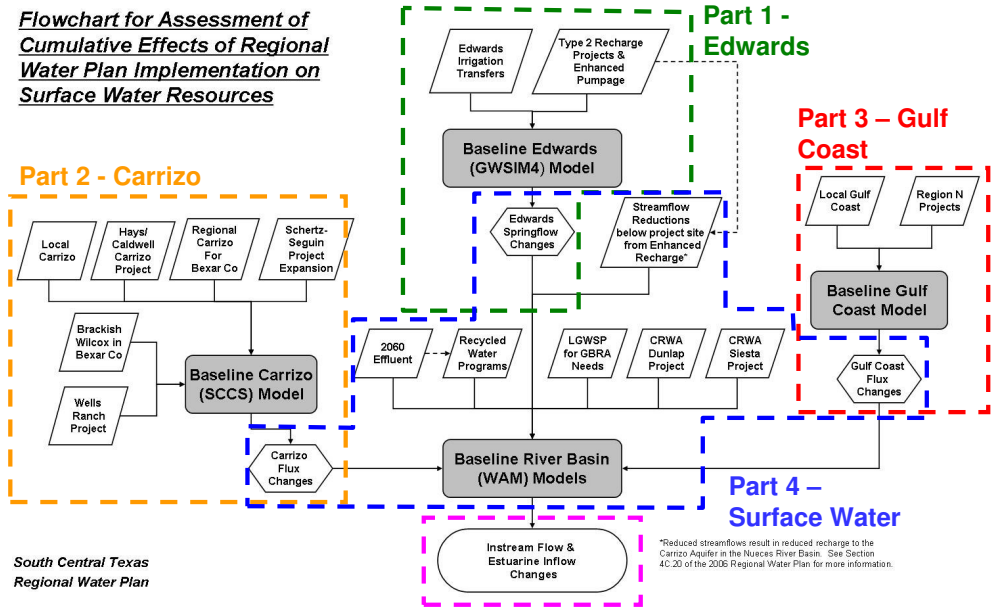
SAWS Recycle Program

Estimate of Future SAWS Recycle Program
***** Based on Recycle to Meet 20% of SAWS M&I Demand *****
Units = acft/yr

Description	2000	2010	2020	2030	2040	2050	2060
Municipal Demand, San Antonio (SAWS) [+]	172,815	198,065	220,078	241,043	256,842	272,214	287,593
Additional Municipal Conservation (SA Only) [-]		5,752	7,318	8,795	10,490	15,698	23,711
Industrial Demand, Bexar County [+]	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Total M&I Demand [=]	194,067	218,264	242,257	265,023	282,420	295,481	305,994
20 % Total M&I Demand	38,813	43,653	48,451	53,005	56,484	59,096	61,199
Current Recycle Program (Consumptive; Capacity = 35,000 Acft/yr)	24,941	24,941	24,941	24,941	24,941	24,941	24,941
Additional Future Recycle Program		18,712	23,510	28,064	31,543	34,155	36,258
SAWS Effluent (60% of Total M&I Demand)	116,440	130,958	145,354	159,014	169,452	177,289	183,596
SAWS Effluent After Consumptive Recycle Program (40% of Total M&I Demand)	77,627	87,306	96,903	106,009	112,968	118,192	122,398
Other Bexar Co Municipal [+]	56,879	64,039	69,994	75,381	79,191	83,032	86,943
Additional Municipal Conservation [-]	0	1,471	3,066	4,585	5,863	7,186	9,089
Other Bexar Co Industrial [+]	0	0	0	0	0	0	0
Other Bexar Co M & I Demand [=]	56,879	62,568	66,928	70,796	73,328	75,846	77,854
Other Bexar Co Effluent	34,127	37,541	40,157	42,478	43,997	45,508	46,713
Total Bexar Co Municipal Demand [+]	229,694	262,104	290,072	316,424	336,033	355,246	374,536
Additional Municipal Conservation [-]		7,223	10,384	13,379	16,353	22,884	32,800
Total Bexar Co Industrial Demand [+]	21,252	25,951	29,497	32,775	36,068	38,965	42,112
Total Bexar Co M & I Demand [=]	250,946	280,832	309,185	335,820	355,748	371,327	383,848
Total Bexar Co Effluent	150,568	168,499	185,511	201,492	213,449	222,796	230,309
Bexar Co Effluent After Consumptive Recycle Program	125,627	124,846	137,060	148,487	156,965	163,700	169,110

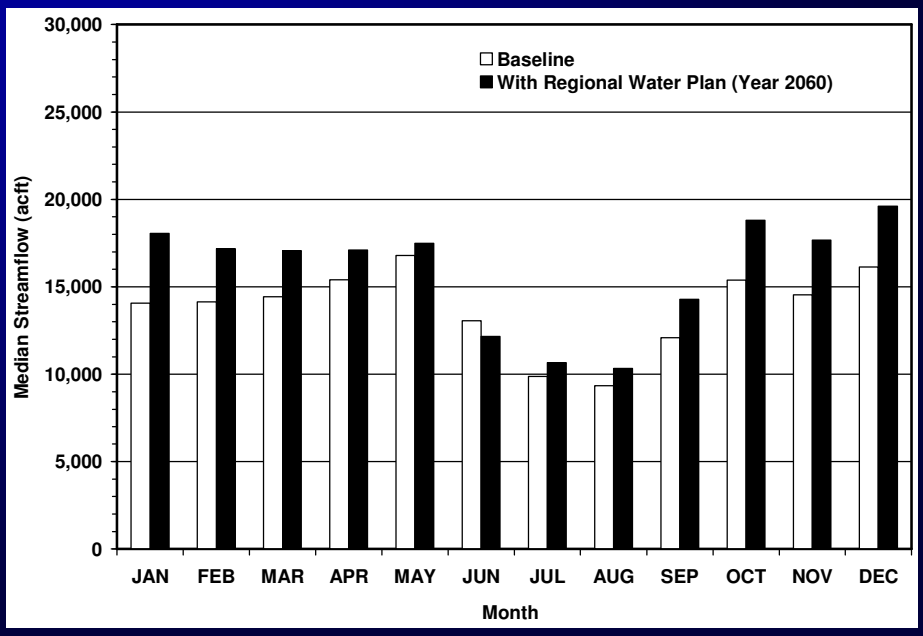
Connectivity - Results

Flowchart for Assessment of Cumulative Effects of Regional Water Plan Implementation on Surface Water Resources



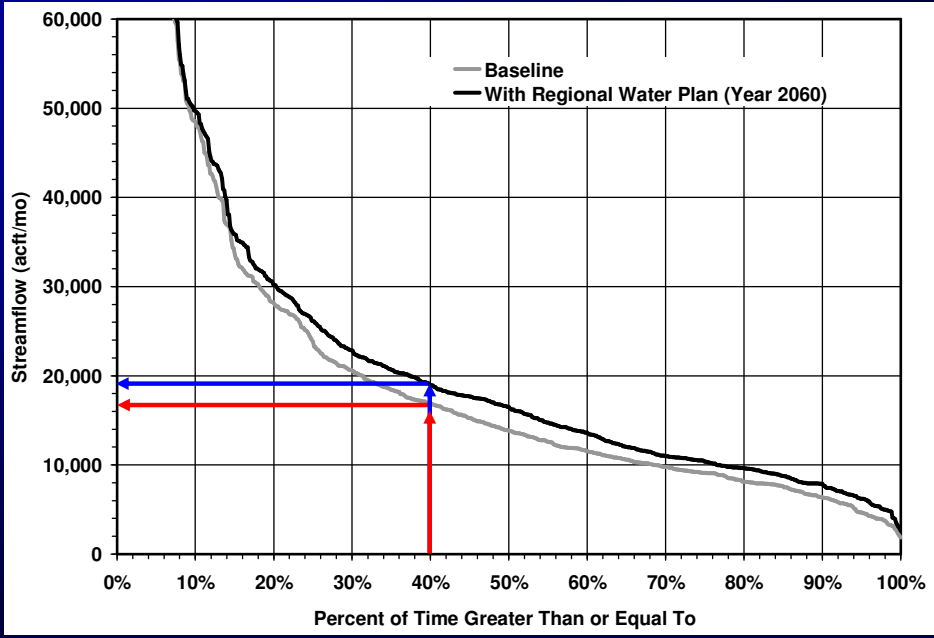
South Central Texas Regional Water Plan

Cumulative Effects of SCTRWP – San Antonio River @ FC



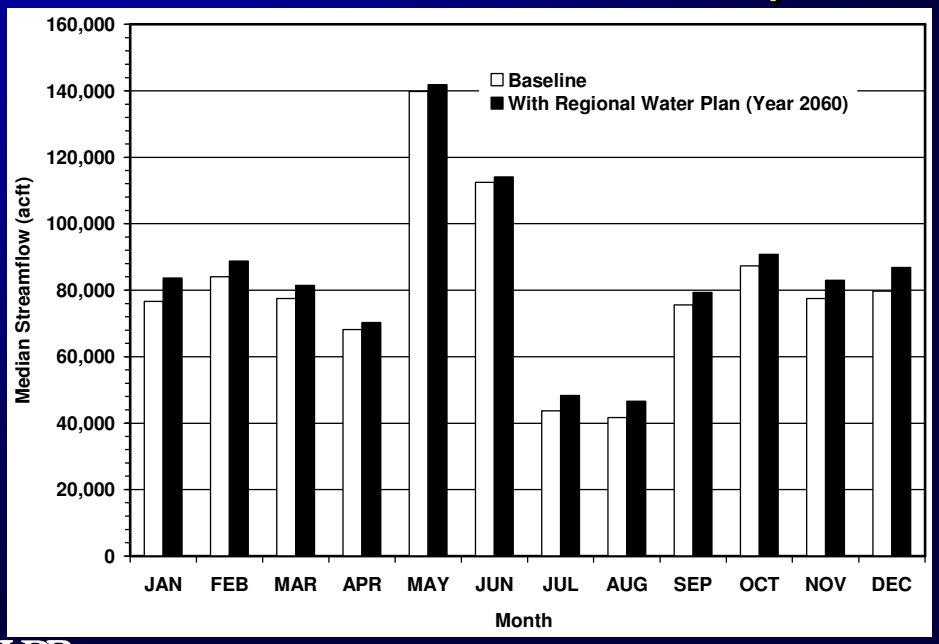
HDR

Cumulative Effects of SCTRWP – San Antonio River @ FC



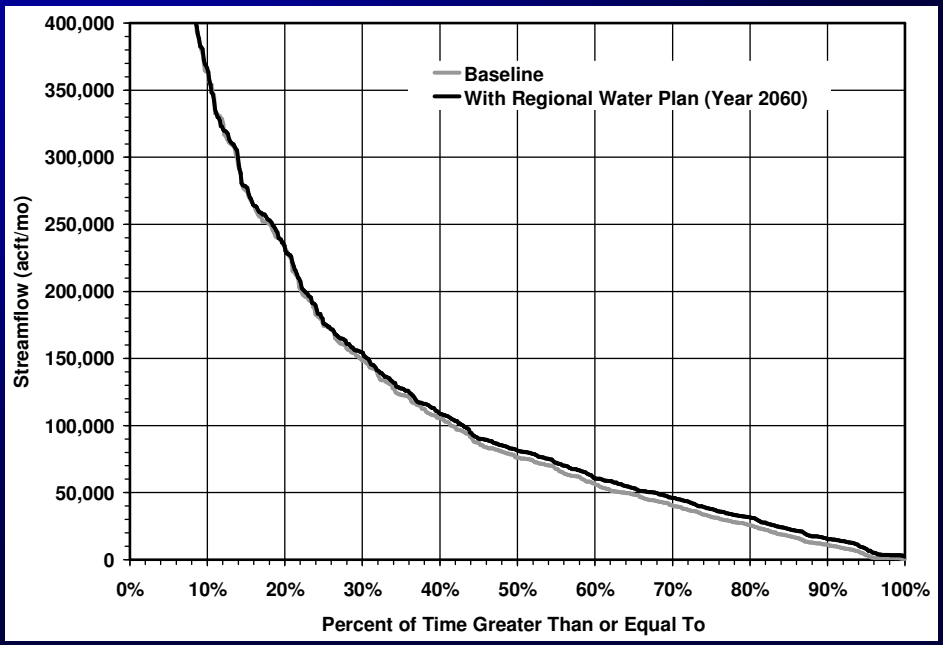
HDR

Cumulative Effects of SCTRWP – Guadalupe Estuary



HDR

Cumulative Effects of SCTRWP – Guadalupe Estuary



HDR

Ecologically-Based Assessment

- Spring/Early Summer Freshwater Pulse Criteria
- Low-Flow Inflow Criteria for the Guadalupe Estuary

HDR

Spring/Early Summer Freshwater Pulse Criteria

- Examine how often adequate seasonal spring-to-early-summer pulses of inflows would occur.
- These "freshwater pulses," sometimes referred to as "freshetes," are generally indicated to support strong levels of reproduction and growth.
- A seasonal spring/early summer window of 4 consecutive months with the occurrence of a freshwater pulse.
- For the Guadalupe Estuary, the highest four consecutive months in this window are April – July.

HDR

Low-Flow Inflow Criteria for the Guadalupe Estuary

- Focused on whether enough freshwater would be available to maintain salinity conditions within reasonable tolerance ranges and enable sufficient populations of organisms such as oysters, shrimp, and crabs to survive drought periods.
- A period of 6 consecutive months below MinQsal inflow is used because such a period represents a significant portion of the life-cycle of several principal estuarine species.
- This analysis is limited to periods of six consecutive months falling only within the March-October window because low flows in the winter and early spring months would be of lesser concern for biological activity within Texas estuaries.

HDR

Ecologically-Based Assessment

- GSA WAM used in determining Guadalupe Estuary Inflow for Ecologically-Based Assessment
- Four Simulations
  - Natural Conditions
  - Present Conditions
  - Baseline (Full Permits & Current Effluent)
  - Regional Water Plan

HDR

Ecologically-Based Assessment - Results

Number of Years with Low 4-Month Spring/Early Summer Freshwater Inflow Pulses Defined by State Criteria

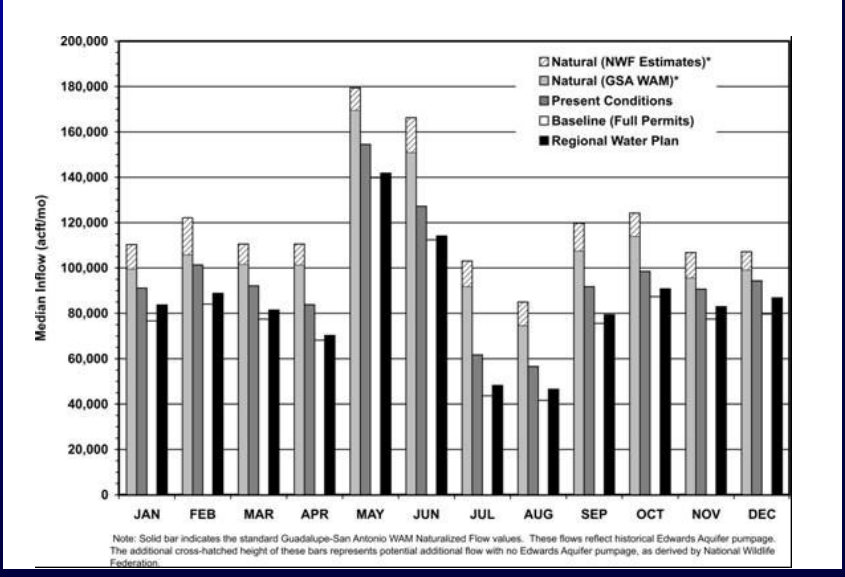
Estuary	No. of Years	Natural (NWF Estimates)	Natural (GSA WAM)	Present Conditions	Baseline (Full Permits)	Regional Water Plan
Guadalupe Estuary	49	19	20	21	23	22

Number of Occurrences of 6 Months or Longer Periods Below Drought Tolerance Level (MinQsal) within Critical (Mar-Oct) Months

Estuary	No. of Years	Natural (NWF Estimates)	Natural (GSA WAM)	Present Conditions	Baseline (Full Permits)	Regional Water Plan
Guadalupe Estuary	49	2	4	5	7	7

HDR

Ecologically-Based Assessment - Results



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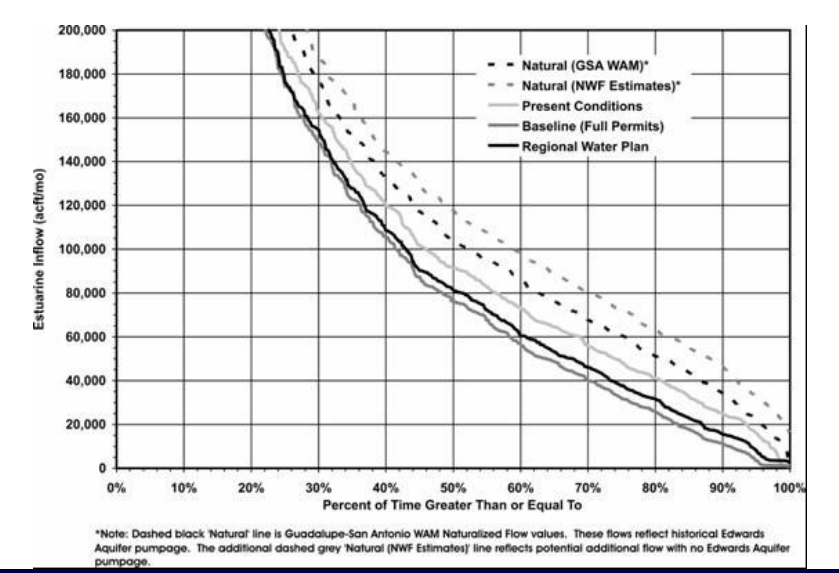
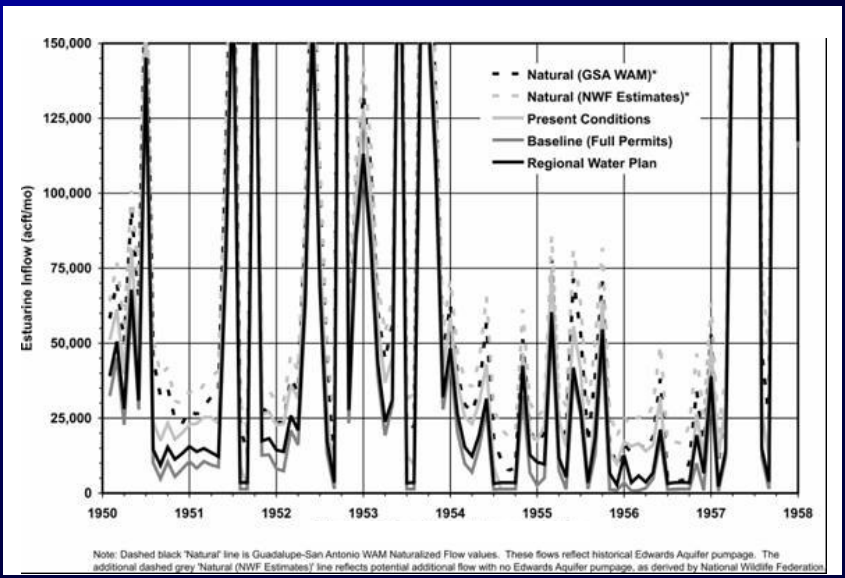
Ecologically-Based Assessment - Results



*Note: Dashed black 'Natural' line is Guadalupe-San Antonio WAM Naturalized Flow values. These flows reflect historical Edwards Aquifer pumpage. The additional dashed grey 'Natural (NWF Estimates)' line reflects potential additional flow with no Edwards Aquifer pumpage.

HDR

Ecologically-Based Assessment - Results



Note: Dashed black 'Natural' line is Guadalupe-San Antonio WAM Naturalized Flow values. These flows reflect historical Edwards Aquifer pumpage. The additional dashed grey 'Natural (NWF Estimates)' line reflects potential additional flow with no Edwards Aquifer pumpage, as derived by National Wildlife Federation.

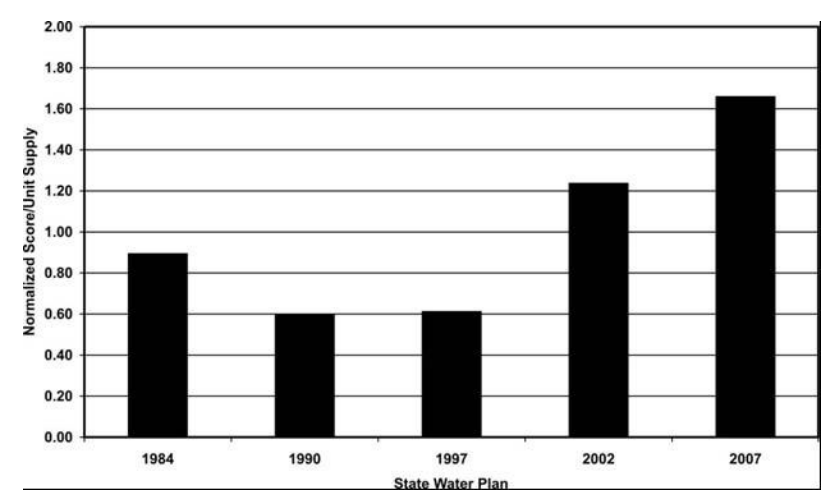
HDR

Environmental Assessment

- Comparison of the 2006 Regional Water Plan with Past State Water Plans in Terms of Cumulative Potential Impacts Associated with Implementation & Operations
- Matrix-Based Approach Considering the Following:
  - Endangered & Threatened Species
  - Vegetation & Wildlife Habitats
  - Water Quality & Aquatic Habitats
  - Cultural Resources

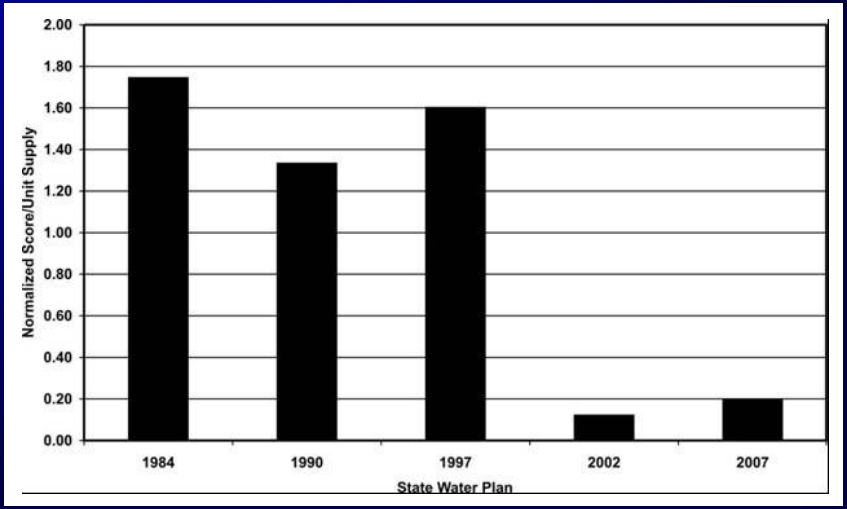
HDR

Cumulative Potential Impact Scores for Endangered and Threatened Species



HDR

Cumulative Potential Impact Scores for Vegetation and Wildlife Habitats



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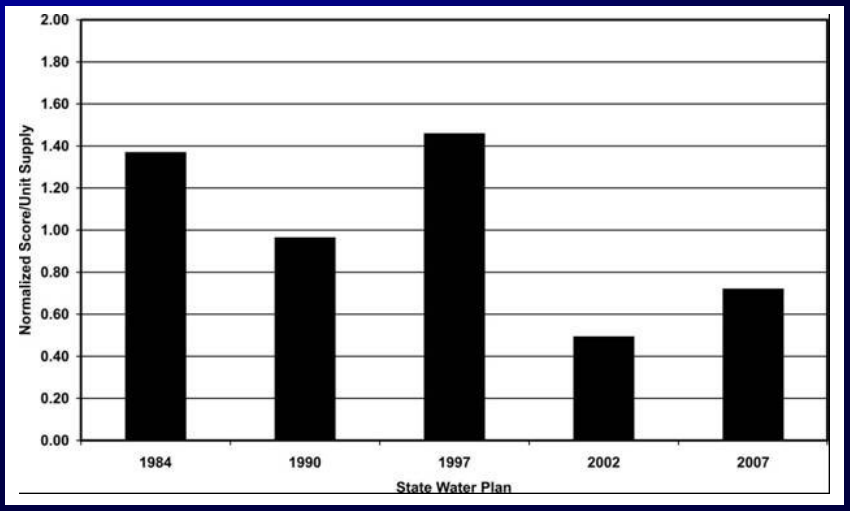
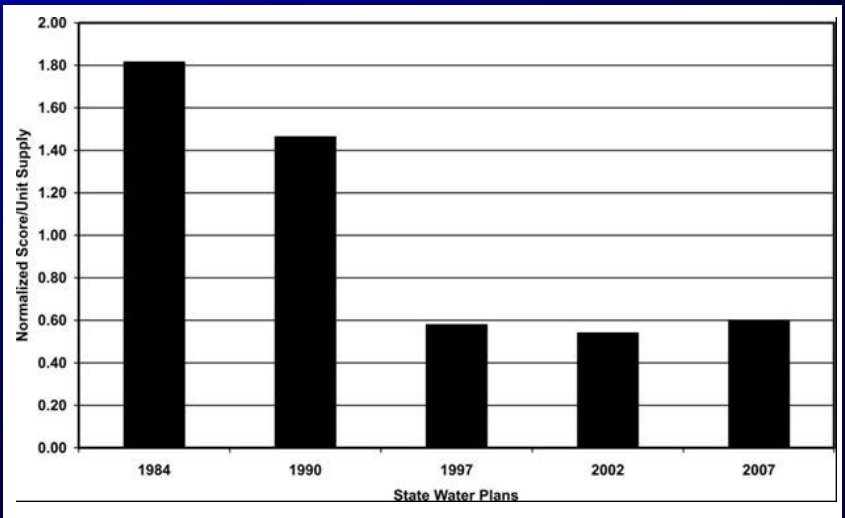
Cumulative Potential Impact Scores for Water Quality and Aquatic Habitats



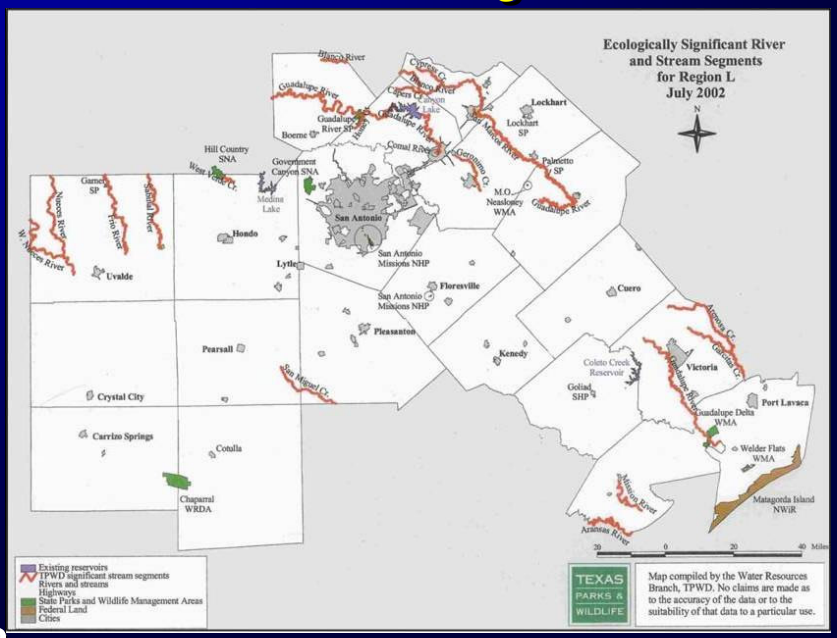
HDR

Cumulative Potential Impacts to Cultural Resources



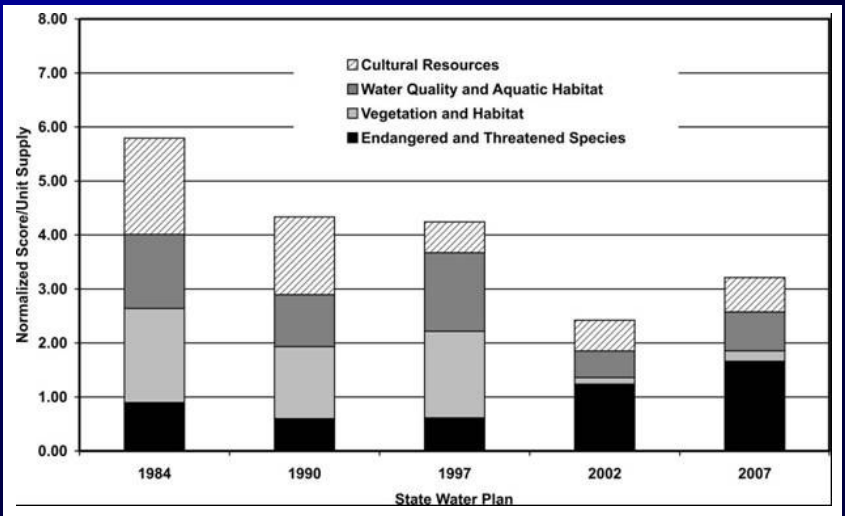
HDR

Ecologically Significant River and Stream Segments



HDR

Cumulative Potential Impact Scores for South Central Texas Regional Water Planning Area



HDR

Comparison of Environmental Assessments in 2006 Regional Water Plans

	Planning Region															
Analyses / Measure	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Number of Pages in Section 7	17	5	8	12	4	7	18	11	6	4	8	72	21	4	2	3
Number of Streamflow and Freshwater Inflow Comparison Locations	6	5	11	18	6	5	9	26	10	4	13	11	9	9	7	7
Endangered and Threatened Species Tabulated	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cumulative Effects Analyses (GW, SW, GW/SW Interactions, etc)	✓*	✓*	✓*	✓		✓*	✓	✓	✓*		✓	✓	✓	✓		
Ecologically-based Assessment of Estuarine Inflow Changes								✓				✓				
Overall Quantitative Environmental Assessment of Plan				✓								✓				
Environmental Comparisons to Past State Water Plans												✓				

HDR

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Appendix B
Summary of Comments Regarding Environmental Issues in the 2006 South Central Texas Regional Water Plan

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Summary of Comments Regarding Environmental Issues in the 2006 South Central Texas Regional Water Plan

Instream flows, bay and estuary inflows, and impacts on wildlife

Consensus Criteria for Environmental Flow Needs have been used for approximating streamflow requirements and bay and estuary inflows related to WMSs, except where site-specific information is available. When relevant strategies are presented to TCEQ for permitting, they will be subject to further review regarding their impacts, and may require modification or mitigation.

Environmental concerns about freshwater inflows related to changes in overall flow patterns, including the timing, duration, and frequency of various flow levels, not just to absolute changes in flow quantities both in stream and to the bays and estuaries have largely been addressed in the 2006 plan. However, the biological/ecological significance of flow changes in terms of species of interest, their habitats, etc., may still require additional assessment. The necessary science and resulting policy decisions may be provided through instream and bay and estuary programs established in recent legislation.

Impacts on estuarine salinity gradients of a desalination project and of the LCRA-SAWS project have not been thoroughly evaluated during the course of SCTRWPG deliberations due to limited funding being allocated elsewhere.

New appropriations from the Guadalupe River and/or increased use of previously unused water rights from the Guadalupe River will have impacts on freshwater inflows to San Antonio Bay. Certain calculations posit the exercise and consumption of all existing water rights, while historically this has never occurred. While consistent with Texas water law (except in the case of inter-basin transfer), does this provide an accurate assessment of WMS effects on freshwater inflows?

What are the impacts on instream flows of increasing reuse of treated municipal wastewater or privately owned groundwater? It is anticipated in the 2006 regional plan that effluent discharge will outpace consumptive reuse in the future, which, in turn, will ameliorate freshwater inflows to the Guadalupe Estuary.

Bay and estuary wildlife species are affected by regional water strategies. Natural resource needs, including those for wildlife, have been taken into account in the regional planning process.

The SCTRWPG adopted a policy regarding environmental studies, recommending that these studies be continued regardless of the status of the LGWSP.

Sedimentation and flooding in the Guadalupe delta are among other subjects of study, but are not included within the SCTRWPG's programs.

Springs, seeps, and related habitat

Increased reliance on groundwater may have deleterious impacts on springs and seeps, springs habitats, and surface flows. Species associated with springs and seeps may be at risk if the flows from these features are compromised. [Note: Uniform pumpage from the Edwards of about 225,000 acft/year approximates the sustained yield that would maintain uninterrupted discharge of about 60 cfs from Comal Springs during the drought of record. If annual pumpage is at 572,000 acft/year or 400,000 acft/year going into the drought, it is unlikely that limitation to 225,000 acft/year will ensure springflow greater than 60 cfs.]

Threatened and endangered karst species may be at risk due to proposed recharge sites. Site-specific information on such sites is not within the scope and budget of regional water planning, however.

Ecologically significant stream segments

No such segments have been recommended by the SCTRWPG due to anticipation of clarification by the legislature. However, the planning group has recognized the importance of protecting sites of "high ecological value."

Trinity Aquifer withdrawals

Little additional information is available about the impacts on springs and aquifer levels of planned Trinity Aquifer withdrawals, although they do conform with the Trinity-Glen Rose GCD.

Water supply planning

The regional water plan must be consistent with long-term protection of the state's water, agricultural, and natural resources. Concern was expressed regarding the plan's inclusion of projects that supply more water than the region is projected to need and the resulting potential for unrealistic portrayals of future conditions, either positive or negative. Concern has also been raised about population projections for which the group must plan. Relevant issues include provision of management supplies, degree of exercise of existing water permits, amount of wastewater reuse, evaluation of alternative strategies, and the like.

Compiled by Susan Hughes from Volume 1, Section 10 of the 2006 SCTRWP, November 1, 2007

Appendix C
Report of the Environmental Assessment Committee of the South Central Texas Regional Water Planning Group (Region L)

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Report of the Environmental Assessment Committee
of the South Central Texas Regional Water Planning Group (Region L)
January 28, 2008

Pursuant to the first meeting of this committee on December 19, 2007, the committee reconvened January 18, 2008, to review key issues and make recommendations to the Planning Group for the next biennium's environmental assessment of water management strategies, as well as additional considerations, financial constraints, and priorities.

The following were members of the committee:
Donna Balin (Region L) (attended second meeting only)
Evelyn Bonavita (Region L)
Norman Boyd (TPWD)
Tyson Broad (Sierra)
Mike Gonzalez (SARA)
Pat Guzman (TCEQ) (not attending)
Myron Hess (NWF) (not attending)
Susan Hughes (X&A)
Norman Johns (NWF)
Cindy Loeffler (TPWD)
Gary Middleton (Region L)
Con Mims (Region L)
Matt Nelson (TWDB)
Dan Opdyke (TPWD)
Iliana Peña (Region L) (attended first meeting only)
Bob Perez (SARA)
Brian Perkins (HDR)
Sam Vaugh (HDR)

Models

The decision on which Edwards Aquifer model to use is fundamental to moving forward. HDR will present a matrix to assist the Planning Group in making that decision.

Regarding the Carrizo/Wilcox model, TWDB is OK with either model. Developing new overlay maps (drawdown isoplats) and incorporating new gains/losses data might be a special project at the end of the biennium.

In the past we have looked at maximum impact — drawdown over 50 years or maximum transient drawdown — and plan to continue. It is possible to look at regional effects on surface water resources. Such regional fluxes are valid in terms of supply and effects on streamflow. Groundwater Management Areas (GMA) may provide additional, finer data.

Groundwater Management Areas — Desired Future Conditions (DFC)

HDR will bring information regarding choosing a cutoff date for GMA's DFCs to be submitted in order to be considered in this round of planning. The impacts of not using a GMA's DFCs is the potential for inconsistencies between the regions and GMAs, however, regions have deadlines to meet.

Streamflow

The Planning Group uses something close to Run 1 now. Run 3 provides only for return flows explicitly identified in surface water rights and would require additional water management strategies, including new reuse commitments. Some water rights in the Guadalupe - San Antonio River Basin were granted on the basis of historically discharged effluent. Any changes would have to be incorporated in the scope of work and approved by the TWDB. None are recommended by this committee. As has been the case in the past, TWDB approval of Region L's accounting for treated effluent in calculating surface water supplies, evaluating water management strategies, and assessing environmental effects will be required.

In the last planning cycle the National Wildlife Federation (NWF) funded a supplemental, ecologically-based assessment of changes in freshwater inflows to the Guadalupe Estuary associated with implementation of the regional plan. If we are to continue doing this element of work in the future, funding must be identified. It is considered both valuable and informative, so the committee recommends keeping it in the scope of work, perhaps at a second priority level.

Improving natural flow projections to account for zero Edwards pumping would be desirable, however this activity should be part of the much larger task of updating all Guadalupe – San Antonio River Basin natural streamflow data (which now ends in 1989). One consequence of such natural streamflow updates would be changes in the consensus criteria for environmental flow needs resulting in reduced surface water availability and increased unit cost of surface water management strategies. The criteria are supposed to be based on daily naturalized flows. Changes would have to be approved by TCEQ and the TWDB. This is a component of a much bigger process that would not be funded by TWDB, but should be funded in the future by TCEQ. No changes are called for now, but this should be a recommendation to TCEQ and the legislature. Also recommend to TCEQ updating their models to incorporate SB3 EAA critical period rules and pumping limits.

Ecologically Significant Stream Segment Designation

The committee recommends Region L discuss designating these — especially in the upper Uvalde and Medina County area. The legislature provided a better explanation of this designation, i.e., the state can't fund a reservoir on a designated segment. Clarifying legislation has passed, and it's in the water code, so we should take action. For scoping purposes, a process for doing this must be determined, starting with evaluating the TPWD-identified segments, possibly refining the parts of the segments to be examined, looking at resources, etc. It's up to the Planning Group to nominate the segments and the legislature to designate them. Regarding whether designating a segment would preclude a recharge dam being built there, it is felt the Planning Group could be very explicit in its definitions, i.e., long-term impoundment (reservoir) vs. recharge structure. Availability of state funding to support the designation process will be key.

Uncertainty and Risk

Climate Change — TWDB sponsored a discussion on integration of climate change in the state water planning process recently, however there is no summary or decision of the Board available to date. The consensus of TWDB staff and participants in the discussion was to put a full chapter on the topic in the state water plan. TWDB staff said they might support an example WUG-based evaluation on climate change. The committee suggests the Planning Group consider approaching the TWDB for funding to

examine potential effects of climate change on supplies for one or more WUGs in Region L. CH2MHill has been doing a study in association with the LCRA-SAWS project on which the Group might invite a report. Further, if money is available, pursue relevant studies, e.g., a sensitivity analysis, on climate change as an element of considering regional water supplies and the environment.

Water Management Strategy Environmental Impact Assessment

Environment as a Water User Group — Treating the environment as a WUG was discussed, because until a group is identified as a WUG, the level of quantification needed to fully develop needs, etc., is not available. Results from ongoing work outlined in SB2 and SB3 of successive legislative sessions will help with this issue. The committee recommends the Planning Group keep this in mind as a future activity and observe what's going on elsewhere, including in other states.

Power Cost Adjustments — In order to appropriately reflect the economics of power-intensive WMSs (desal, pumping over long distances, etc.), the committee suggested using a unit cost greater than 6¢/kWh for power, since current prices are likely higher than that. Mike Fields and/or a website would have these. No change in power costs over time is required, due to TWDB constraints and the fact that all such costs are standardized on current dollars. The cost of power, per se, is not an environmental consideration except as it affects resource consumption.

TXblend analysis/salinity modeling – TXblend predicts salinity in bays and estuaries by modeling mixing of fresh and saline waters. Impacts on estuarine habitat and species of interest can be inferred from the results of model application. The supplemental work funded by NWF, including examination of pulses, during the previous study period provide complementary insights. TWDB may be taking the WMSs of the regions and plugging them into the WAMs. HDR can provide the hydrologic part of this to the TWDB.

Biologically significant flow statistics — More effort needs to be devoted to looking at daily numbers of biological relevance for assessment of changes in instream flows. TPWD may be able to help with using new software packages. It may be too early to consider, but bay/basin stakeholder committees will be meeting in the future. The Guadalupe Estuary is second tier and won't be appointed until this fall. Without these data the region will be out of synch with the Senate Bill 3 process. On the other hand, Region L could be perceived as moving out ahead of the comprehensive science-based process involving bay-basin stakeholder groups as defined in SB3. It may or may not be appropriate for Region L to use available funds to advance this process. HDR could provide hydrology data to apply for this region. Recommendation: Advise that Region L will provide data to TPWD to do evaluation of additional instream flow statistics for use in the quantitative environmental assessment, subject to TPWD funding and staff availability, TWDB approval, and coordination with the bay-basin group for the Guadalupe Estuary. Integration of results in the Region L plan will be at the discretion of the regional water planning group and subject to both availability of funding and TWDB approval.

Updates on projects moving toward implementation — Funding is needed to update water management strategies to reflect any changed conditions. The Planning Group's goal is to ID major categories of things agencies will be concerned with as projects go to permitting, as well as public "hot buttons."

Cumulative effects analysis — Region L has been analyzing cumulative effects and should continue, in addition to individual strategy analyses.

Land stewardship and riparian protection — The committee recommends a discussion be included in the regional plan.

Interregional Issues of Importance to the Legislature

Given the difficulty in getting a surface-water permit, some water marketers are going to groundwater districts for permits to drill wells in the alluvium of streams and rivers. This will impact future streamflows. Is there a provision in water law to prevent the long-term deleterious impacts of such projects, which are "off the radar" because they need neither a TCEQ permit nor TWDB funding? Some of this water is to be exported from Region L.

Submitted by Susan K. Hughes, facilitation consultant

# # #

Appendix D
Comments from Texas Water Development Board and Responses

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ATTACHMENT 1

TWDB Contract No. 0704830697

Region L, Region-Specific Studies 1-5:

TWDB Comments on Draft Final Region-Specific Study Reports:

1) Lower Guadalupe Water Supply Project for GBRA Needs
2) Brackish Groundwater Supply Evaluation
3) Enhanced Water Conservation, Drought Management and Land Stewardship
4) Environmental Studies
5) Environmental Evaluations of Water Management Strategies

Region-Specific Study 5: Environmental Evaluations of Water Management Strategies

Please include a list of the names of the attendees of the December 19th, 2007 and January 18th, 2008 meetings described in Appendix C.

Response – Names of the committee members along with notes regarding meeting attendance are listed in Appendix C.

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