EXECUTIVE SUMMARY

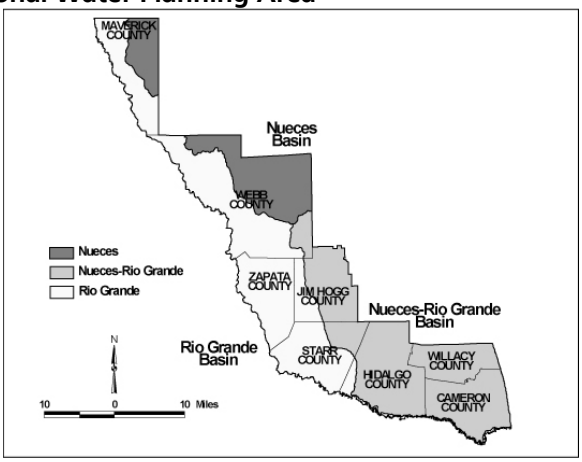
Introduction: Overview of the Regional Water Planning Process

In 1997, the 75th Texas Legislature enacted Senate Bill 1 (SB 1), often referred to as the Brown-Lewis Water Management Plan after its Senate and House sponsors. The legislation grew out of the drought of the early to mid 1990s and the increasing public awareness of rapidly growing water demands in the state. The issues and concerns addressed in SB 1 included state, regional, and local planning for water conservation, water supply and drought management, administration of state water rights programs, interbasin transfer policy, groundwater management, water marketing, state financial assistance for water-related projects, and state programs for water data collection and dissemination.

SB 1 radically altered the manner in which state water plans are prepared, establishing a "bottom up" approach based on regional water plans that are prepared and adopted by appointed regional water planning groups (RWPGs) representing 11 different stakeholder interests. There are 16 RWPGs; the members serve without compensation. The planning process is coordinated by the Texas Water Development Board (TWDB), which assembles the 16 regional water plans into one comprehensive State Water Plan.

Initially designated by TWDB as "Region M," the Rio Grande Regional Water Planning Area (or the Rio Grande Region) consists of the eight counties adjacent to or in proximity to the middle and lower Rio Grande. They are: Cameron, Hidalgo, Jim Hogg, Maverick, Starr, Webb, Willacy, and Zapata (see Exhibit 1).

Exhibit 1: Rio Grande Regional Water Planning Area



The Rio Grande RWPG now consists of 19 members representing all 11 interest group categories specified in SB 1 (see Exhibit 2 for membership as of April 1, 2010). In addition to its voting membership, the Rio Grande RWPG includes non-voting members representing state agencies and the Mexican federal government.

Exhibit 2: Rio Grande Regional Water Planning Group

INTEREST	NAME	RESIDENT COUNTY
Public	Mary Lou Campbell, Secretary* Mercedes	Hidalgo
Counties	John Wood County Commissioner, Brownsville	Cameron
Municipalities	Roberto Gonzalez* Water Works, Eagle Pass	Maverick
	John Bruciak, General Manager Brownsville PUB, Brownsville	Cameron
	Tomas Rodriguez City of Laredo	Webb
Industries	Donald K. McGhee Hydro Systems, Inc., Harlingen	Cameron
Agriculture	Robert E. Fulbright* Hinnant & Fulbright, Hebbronville	Jim Hogg
	Ray Prewett Texas Citrus Mutual, Mission	Hidalgo
Environmental	Sonia Najera The Nature Conservancy	Cameron
Small Business	Carlos Garza AEC Engineering, LLC., Edinburg	Hidalgo
Electric Generating Utilities	Ella de la Rosa Magic Valley Electric Cooperative	Hidalgo
River Authorities	James Darling, Vice-Chairman* Rio Grande Regional Water Authority	Hidalgo
Water Districts	Sonny Hinojosa HCID No. 2, San Juan	Hidalgo
	Sonia Lambert CCID No. 2, San Benito	Cameron
Water Utilities	Charles Browning North Alamo Water Supply Corp., Edinburg	Hidalgo
Other	Glenn Jarvis, Chair* Attorney, McAllen	Hidalgo

The first round of regional water planning culminated with the State Water Plan of 2002. The second round of planning began later that year and ended in 2006 with the incorporation of revised regional water plans into the 2007 State Water Plan "Water for Texas." This third round of regional water planning took place from 2007 to 2010. The results of these efforts will be included in the 2011 State Water Plan. The third round of regional water planning involved updating population and water demand projections, and analyses of new water management strategies.

Chapter Summaries

The remainder of this Executive Summary provides a synopsis of each chapter.

- Chapter 1 presents a description of the regional water planning area. This includes information regarding current water uses and major water demand centers, sources of surface and groundwater supply, agricultural and natural resources, and the

demographic and socioeconomic characteristics of the region. Also included are summaries of existing regional water plans, recommendations in the current state water plan, and local water plans, as well as an assessment of threats to agricultural and natural resources.

- Chapter 2 presents current and projected population and water demands. This information is reported by city and county and for the portion of each river basin within the Rio Grande Region. Water demand projections are presented for six water use categories: municipal, manufacturing, irrigation, steam electric power generation, mining, and livestock.

- Chapter 3 provides a total analysis of the region's water supply.

- Chapter 4 identifies and evaluates selected water management strategies based on needs.

- Chapter 5 analyzes the impacts of water management strategies on key parameters of water quality and the impacts of moving water from rural and agricultural areas.

- Chapter 6 describes consolidated water conservation and drought management recommendations of the regional water plan.

- Chapter 7 describes how the regional plan is consistent with long-term protection of the state's water resources, agricultural resources, and natural resources.

- Chapter 8 presents recommendations for unique stream segments, reservoir site, and legislative options.

- Chapter 9 provides recommendations to the Legislature on funding for water infrastructure.

- Chapter 10 describes public participation, facilitation, and plan implementation issues.

Physical Description of the Rio Grande Region

The climate of the Rio Grande Region ranges from a humid subtropical regime in the eastern portion of the region to a tropical and subtropical regime in the remaining portion of the region. Prevailing winds are southeasterly throughout the year and the warm tropical air from the Gulf of Mexico produces hot and humid summers and relatively mild and dry winters.

Average annual net lake evaporation in the Rio Grande Region varies from 40 to 44 inches at the coast to approximately 60 to 64 inches at the central portion of the region near southern Webb County. The amount of rainfall varies across the Lower Rio Grande Region from an average of 28 inches at the coast to 18 inches in the northwestern portion of the region. Most precipitation occurs during the spring from April through June, and during the late summer and early fall, from August through October.

The Rio Grande Region is located entirely within the Western Gulf Coastal Plains of the United States, an elevated sea bottom with low topographic relief. Topography in the region ranges from a rolling, undulating relief in the northwestern portion becoming progressively flatter near the Gulf Coast. The Rio Grande flows southeasterly through the region before turning east to its confluence with the Gulf of Mexico.

In general, soils in the Rio Grande Region generally consist of calcareous to neutral clays, clay loams and sandy loams.

The Lower Rio Grande Valley is the northern boundary of much of the semitropical biota of Mexico. A number of plant and animal species from the more xeric and mesic areas to the west and northeast, respectively, converge in the area.

The lower Laguna Madre is a hypersaline bay, most of which lies in the eastern portions of Cameron and Willacy counties. Shallow depth, extensive seagrass meadows, and tidal flats characterize it. The lower Laguna Madre supports a wide variety of marine aquatic organisms and wildlife.

Public and private interests have created several refuges and preserves in the Lower Rio Grande Valley to protect remaining vegetation and the habitats of endangered and threatened species. These include the Lower Rio Grande Valley National Wildlife Corridor/Refuge, Laguna Atascosa National Wildlife Refuge (NWR), Santa Ana NWR, Anzalduas County Park, Falcon State Park (SP), Bentsen-Rio Grande Valley SP, Boca Chica SP, Las Palomas Wildlife Management Area (WMA), Arroyo Colorado WMA, Sabal Palm Audubon Center and Sanctuary, the Nature Conservancy's Chihuahua Woods Preserve, and the SouthBay Coastal Preserve.

Demographic and Socioeconomic Characteristics of the Rio Grande Region

The South Texas border region has seen significant growth over the past 40 years. Gross regional product in this region quadrupled from $5.3 billion in 1970 to $20.3 billion in the 2000's. During the same period, employment in the South Texas border region was 177,000, but by 2008 had grown to 537,000. In 2000, the region accounted for 6.7 percent of the population and 4.4 percent of the state's employment base.

Exhibit 3: Rio Grande Region Counties Eligible for EDAP Assistance
Under Section 17.923 of the Water Code
Texas Water Development Board

Counties	Average Unemployment Rate 2006-2008 (%)	Percent Above State Rate	Average Per Capita Income 2006-2008 ($)	Percent Below State Rate
Texas Average	4.7	n/a	36,940	n/a
Cameron	6.5	39.3	19,146	-48.2
Hidalgo	7.1	51.1	17,853	-51.7
Maverick	11.8	151.1	16,231	-56.1
Starr	11.4	142.6	13,464	-63.6
Webb	5.2	10.6	20,843	-43.6
Willacy	8.8	87.2	19,740	-46.6
Zapata	5.7	21.3	16,978	-54.0

The TWDB has classified seven out of the eight counties in the Rio Grande Region as eligible for assistance through the Economically Distressed Assistance Program (EDAP). EDAP eligibility is limited to counties with an unemployment rate higher than 25 percent of the state average over the latest three-year period and an average per capita income rate 25 percent below the state average.

Current and Projected Population & Water Demand for the Rio Grande Region

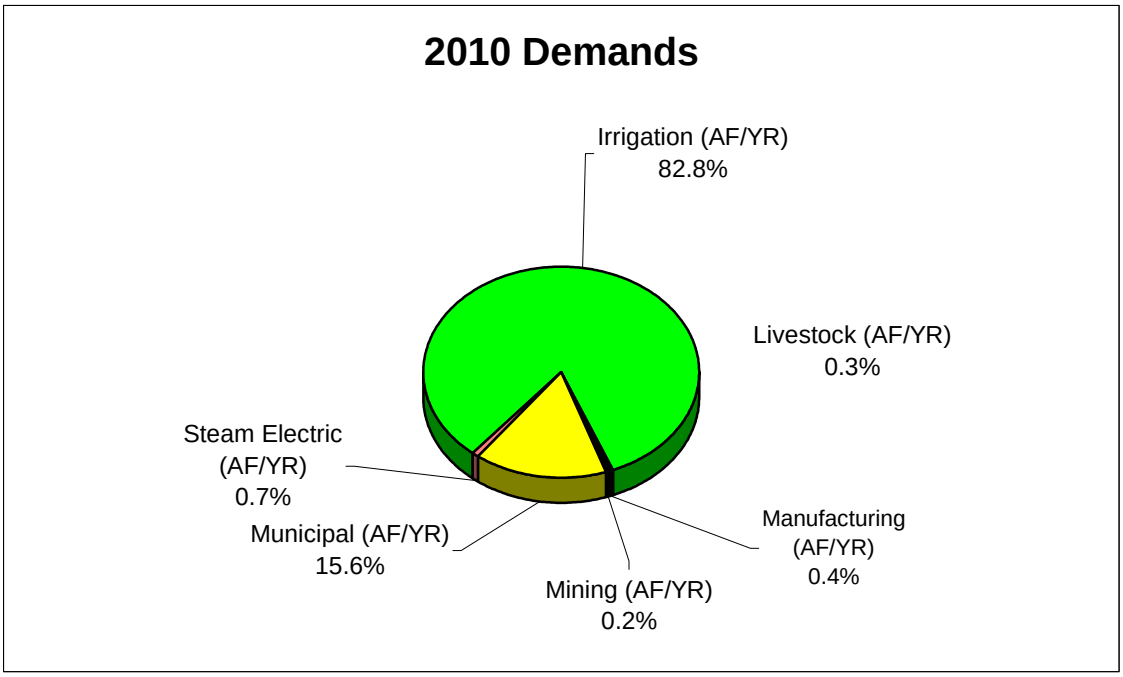
The TWDB projects population in the eight counties comprising the Rio Grande Regional Water Planning Area will more than double from 2010 to 2060.

Exhibit 4: County Population Projections

County Name	2010	2020	2030	2040	2050	2060
Cameron	424,762	510,697	599,672	688,532	777,607	862,511
Hidalgo	775,858	987,920	1,225,227	1,481,812	1,761,811	2,048,909
Jim Hogg	5,593	5,985	6,286	6,538	6,468	6,225
Maverick	58,252	67,929	77,165	85,292	92,831	99,091
Staff	69,379	83,583	98,262	113,102	127,802	141,961
Webb	257,647	333,451	418,332	511,710	613,774	721,586
Willacy	22,763	25,212	27,455	29,276	30,542	31,205
Zapata	14,025	16,217	18,415	20,486	22,354	23,733
Totals	**1,628,279**	**2,030,994**	**2,470,814**	**2,936,748**	**3,433,188**	**3,935,223**

Total annual water demand for the region is projected to decrease from 2010 until 2030, and then steadily *increase* until 2060. This trend is attributable to diminishing irrigated acreage and rising urban populations, especially in the Rio Grande Valley, as land use changes from agriculture to urbanization. Water demand for irrigation in the region is projected to fall from the current 82.8% of total water use to 59.1% by 2060. During the same period, municipal water demands are projected to increase from almost 16% to almost 38%.

Exhibit 5: Total Water Demands by Type of Use, 2010 and 2060



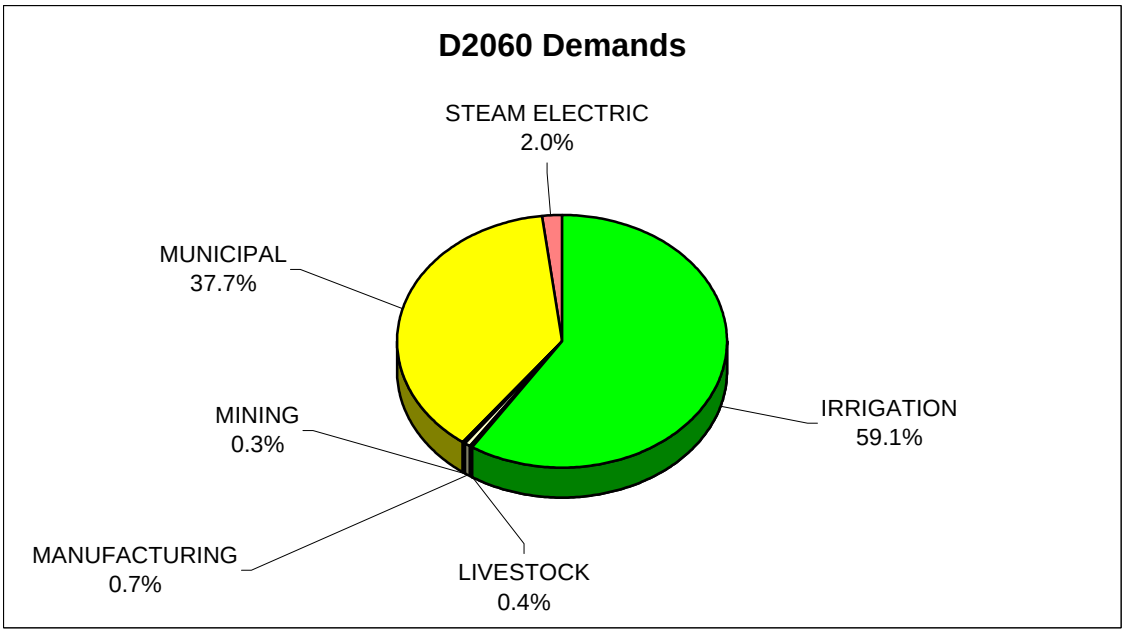


Exhibit 6: Water Demand Projections (acre-feet/year)

Water Demand Projections	2010	2020	2030	2040	2050	2060
Irrigation (AF/YR)	1,163,634	1,082,232	981,748	981,748	981,748	981,748
Livestock (AF/YR)	5,817	5,817	5,817	5,817	5,817	5,817
Manufacturing (AF/YR)	7,509	8,274	8,966	9,654	10,256	11,059
Mining (AF/YR)	4,186	4,341	4,433	4,523	4,612	4,692
Municipal (AF/YR)	288,323	349,410	416,396	487,858	565,475	646,006
Steam Electric (AF/YR)	13,463	16,864	19,716	23,192	27,430	32,598
Total Water Demand (AF/YR)	1,482,932	1,466,938	1,437,076	1,512,792	1,595,338	1,681,920

Evaluation of the Adequacy of Current Water Supplies

Current Rio Grande Supplies

The Rio Grande Region in Texas encompasses portions of three river basins: the Rio Grande, Nueces, and Nueces-Rio Grande Coastal. However, practically all of the surface water available to and used within the region is from the Rio Grande. Nearly all of the dependable surface water supply is from the combined yield of the Amistad and Falcon International Reservoirs, the two major reservoirs on the Rio Grande. Most of the inflow to this reservoir system comes from the Rio Conchos in the State of Chihuahua, Mexico, and the Pecos River in Texas. The estimated firm yield of the reservoir system (i.e., the amount of water available in the drought of record) for the U.S was approximately 1.01 million acre-feet per year.

This represents more than 94 percent of the total amount of water presently available to the region from all sources (e.g., groundwater, reuse, Rio Grande tributaries, and other local sources). Over time, however, the total dependable water supply from the Rio Grande is projected to decrease significantly, largely as a consequence of reduced conservation storage capacity due to sedimentation of the Amistad/Falcon Reservoir System. Between the years 2010-2060, the firm yield of the reservoir system is projected to decrease by nearly 32,500 acre-feet (approximately 3 percent).

Because of the manner in which available supplies from the Amistad/Falcon Reservoir System are managed and allocated, the impact of declining supplies will be borne directly by irrigation and mining water users. Under the water rights system for the middle and lower Rio Grande, domestic-municipal-industrial (DMI) water rights have a very high degree of reliability. A DMI reserve of 225,000 acre-feet is continually maintained in the reservoir system. By comparison, irrigation and mining water rights are residual users of stored water from the reservoirs.

An additional concern involves the operation of reservoirs in Mexico's portion of the watershed that contributes flows to the Amistad/Falcon Reservoir System. Mexico has constructed an extensive system of reservoirs on the tributaries, especially in the Conchos River Basin. The combined storage capacity of all of Mexico's major reservoirs on Rio Grande tributaries is approximately 2.5 times the country's available conservation storage in Amistad and Falcon Reservoirs. This has serious implications in light of Mexico's statement that it operates its tributary reservoirs not for the purpose of meeting its obligations under the 1944 Treaty but rather solely to capture water for meeting and expanding its own internal water demands.

Mexico has only recently repaid a long-term deficit in excess of 1 million acre-feet with respect to the minimum tributary inflows to the Rio Grande required by the Treaty. This situation calls into question the certainty the amount of Rio Grande water that will be available in the future to the Texas water right holders.

Other water supply sources for the region include:

- The Arroyo Colorado, which traverses Cameron, Hidalgo, and a small portion of Willacy counties, represents a second potential water supply. Use of the water in the Arroyo Colorado for municipal, industrial or irrigation purposes is severely limited because of poor quality conditions; its daily flows are comprised primarily of return flows from agriculture and municipalities and locally generated runoff. Nonetheless, the Arroyo Colorado is an important source of freshwater inflows to the lower Laguna Madre, which is both economically and ecologically important to the region.

- Groundwater, primarily from the Gulf Coast Aquifer. Most groundwater in the region is of poor quality and cannot be used for agriculture or municipal use without treatment. Technological advances are driving down the costs of desalinating brackish groundwater, and this supply has become an option for municipal use, particularly to meet peak demands
- Reuse or "reclaimed water," which provides about 13,000 acre-feet per year (one percent) for irrigation, manufacturing, and steam electric uses.

Exhibit 7 provides a summary of the total amounts of available current water supplies for the Rio Grande Region by water use category for each decade through 2060.

Exhibit 7: Current and projected water supplies for the Rio Grande Region (AF/yr)

Water Use Category	2010	2020	2030	2040	2050	2060
Irrigation	757,168	750,179	743,691	737,203	730,713	724,724
Municipal	323,884	327,654	330,487	331,411	331,247	331,118
Steam Electric	16,216	16,216	16,216	16,216	16,216	16,216
Livestock	5,817	5,817	5,817	5,817	5,817	5,817
Manufacturing	6,550	6,553	6,556	6,559	6,561	6,564
Mining	4,941	5,088	5,169	5,249	5,329	5,396
Region M Total	**1,114,576**	**1,111,507**	**1,107,936**	**1,102,455**	**1,095,883**	**1,089,835**

Identification, Evaluation, & Selection of Water Management Strategies Based on Needs

The Rio Grande Region faces significant water supply needs even though surpluses of water exist for some categories of use in some counties in some years. In general, deficits in municipal, manufacturing, and steam electric increase over the life of the planning study while irrigation deficits decline due to urbanization. A water supply "need" means that current or projected demands are greater than supply, producing a water supply "deficit" or shortage. Supply in "excess" of demand, on the other hand, results in a water supply "surplus" for the particular user.

Exhibit 8: Water Supply Needs for the Rio Grande Region by Category of Use (AF/yr)

Category Use	2010	2020	2030	2040	2050	2060
Municipal	26,479	64,277	115,311	177,900	252,083	330,625
Manufacturing	1,921	2,355	2,748	3,137	3,729	4,524
Irrigation	407,522	333,246	239,408	245,896	252,386	258,375
Steam Electric	0	1,980	4,374	7,291	11,214	16,382
Mining	0	0	0	0	0	0
Livestock	0	0	0	0	0	0
TOTAL WATER NEEDS (AF/yr)	**435,922**	**401,858**	**361,841**	**434,224**	**519,412**	**609,906**

Exhibit 9: Water Supply Surpluses for the Rio Grande Region by Category of Use (AF/yr)

Catergory of Use	2010	2020	2030	2040	2050	2060
Municipal	59,848	42,521	29,811	21,558	18,064	15,737
Manufacturing	962	634	338	42	34	29
Irrigation	1,056	1,193	1,351	1,351	1,351	1,351
Steam Electric	2,753	1,332	874	315	0	0
Mining	755	747	736	726	717	704
Livestock	0	0	0	0	0	0
TOTAL WATER SURPLUSES (AF/yr)	**65,374**	**46,427**	**33,110**	**23,992**	**20,166**	**17,821**

Opportunities for developing additional water supplies for municipal use are limited in the Rio Grande Region because of hydrologic characteristics, economics, and legal constraints associated with the 1944 Mexico/U.S. Water Treaty. Few opportunities exist to increase the water supply yield of the Rio Grande. However, a number of strategies for augmenting municipal water supplies have been examined as part of this planning effort. These include advanced municipal water conservation, the Brownsville weir and reservoir, reuse of reclaimed water strategies for optimizing surface water supply from the Rio Grande, groundwater development, brackish and seawater desalination, and acquisition of additional Rio Grande supplies for domestic-municipal-industrial (DMI) uses.

Advanced water conservation is aimed at reducing the amount of water used per capita, thereby reducing overall municipal demand. Water rights purchase, water rights acquisition by long-term contract, and water rights acquisition through urbanization all involve transferring rights of Rio Grande water from irrigation usage to DMI usage.

Since municipal water has the highest priority in the Amistad/Falcon system, irrigation water is in a constant state of shortage. Accordingly, conveyance and on-farm improvements are needed to reduce the impact of irrigation shortages. Municipal water management strategies are not cost-effective when applied to irrigation use.

Two water management strategies were evaluated to conserve water and provide additional supply for irrigation use: on-farm improvements and conveyance system

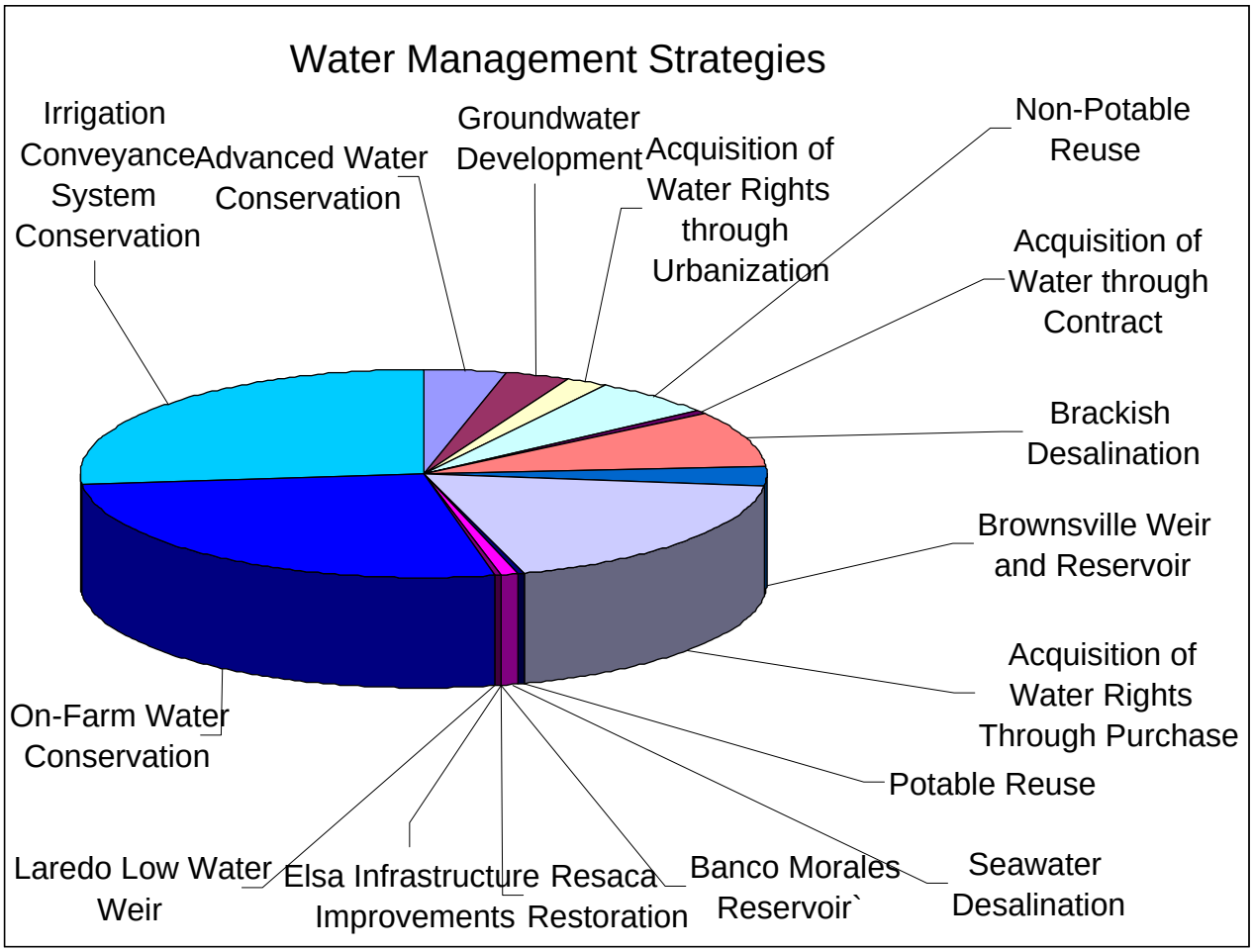
efficiency improvements. Technologies and methods currently available for on-farm water conservation include: plastic pipe (poly pipe), low energy precision application, irrigation scheduling using an evapotranspiration network, drip irrigation, metering, unit pricing of water, and growing water-efficient crops. The proposed conveyance efficiency program consists of six principal components: no-leak gates, additional water measurement devices, converting smaller concrete canals in poor condition to pipeline, lining smaller earthen canals, and implementing a verification program to monitor and measure the effectiveness of the efficiency improvements. However, there are few programs that provide financial assistance to irrigation districts for infrastructure improvements. Because agricultural water conservation is a central element of this regional water plan – and is essential to maintaining the viability of this sector of the regional economy – the Rio Grande RWPG recommends that new public funding sources be developed to assist irrigation districts with implementing conservation programs.

The proposed water supply yield and cost per acre-foot associated with each water management strategy (WMS) are shown below.

Exhibit 10: Water Management Strategy Summary

Strategy	Total Capital Cost	Water Supplies Per Decade					
		2010	**2020**	**2030**	**2040**	**2050**	**2060**
Advanced Water Conservation	$ 22,583,710	2917	6339	11986	16512	24867	32793
Groundwater Development	$ 27,474,302	3772	8572	17139	20492	22284	24520
Acquisition of Water Rights through Urbanization	$ 56,167,089	299	3,433	6,467	9,496	12,868	16,406
Non-Potable Reuse	$ 173,803,091	2,417	9,444	12,378	20,137	29,810	46,382
Acquisition of Water through Contract	$ 16,263,877	312	738	1,665	2,352	3,198	4,671
Brackish Desalination	$ 263,599,392	38,364	44,627	48,309	54,472	66,696	71,700
Brownsville Weir and Reservoir	$ 98,411,077	20,643	20,643	20,643	20,643	20,643	23,643
Acquisition of Water Rights Through Purchase	$ 631,081,709	9611	19461	41602	70944	110913	151237
Potable Reuse	$ 7,519,850	1,120	1,120	1,120	1,120	1,120	1,120
Seawater Desalination	$ 185,940,937	125	125	143	6,049	6,421	7,902
Banco Morales Reservoir	$ 25,790,900	238	238	238	238	238	238
Resaca Restoration	$ 52,000,000	877	877	877	877	877	877
Laredo Low Water Weir	$ 294,400,000	0	0	0	0	0	0
Elsa Improved Infratructure	$ 8,325,386	105	105	105	105	105	105
Irrigation							
On-Farm Water Conservation	$ 194,417,692	36,528	73,085	109,614	146,144	182,698	219,228
Irrigation Conveyance System Conservation	$ 130,757,978	91,160	182,313	191,435	200,551	209,667	218,783
TOTAL	**$ 2,188,536,991**	**208,488**	**371,120**	**463,721**	**570,132**	**692,405**	**819,605**

Exhibit 11: Water Management Strategies



Impacts of WMS on Key Parameters of Water Quality and Impacts of Moving Water from Rural and Agricultural Areas

The following table summarizes the impacts of WMS on water quality.

Exhibit 12: Water Quality Impacts by Water Management Strategy

Water Management Strategy	Positive Impacts	Negative Impacts
Additional Groundwater	• Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased wastewater flows to receiving streams, i.e. higher organic levels • Increased urban runoff during storm event
Advanced Water Conservation	• Decreased wastewater flows	• Increased concentration of organic matter in wastewater
Non-potable Reuse	• Reduced wastewater flows • Decreased sediment and/or agricultural chemical runoff due to storm events or excessive	• Increased urban runoff during storm event

	irrigation • Decreased wastewater flows, resulting in lower organic levels in receiving streams	
Potable Reuse	• Reduced wastewater flows • Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation • Decreased wastewater flows result in lower organic levels in receiving streams	• Increased urban runoff during storm event
Dams, Weirs, and Storage • Brownsville Weir • Laredo Low Water Weir • Banco Morales Reservoir • Resaca Restoration	• Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows resulting in higher organic levels in receiving stream
Purchase of Water Rights	• Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows to receiving streams, i.e. higher organic levels
Acquisition of Water Rights by Urbanization	• Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows to receiving streams, i.e. higher organic levels
Acquisition of Water Rights by Long-term Contracts	• Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows to receiving streams, i.e. higher organic levels
Brackish Desalination	• Improved water quality in wastewater effluent • Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows to receiving streams, i.e. higher organic levels • Increased levels of TDS in receiving streams due to concentrate discharge
Seawater Desalination	• Improved water quality in wastewater effluent • Decreased sediment and/or agricultural chemical runoff due to storm events or excessive irrigation	• Increased urban runoff during storm event • Increased wastewater flows to receiving streams, i.e. higher organic levels • Increased levels of TDS in receiving streams due to concentrate discharge

Improving Water Infrastructure and Distribution • Improvements to Elsa Infrastructure	• Increase distribution efficiency • Increase storage capacity	• None

Consolidated Water Conservation & Drought Management Recommendations

The Regional Water Plan provides guidance for selecting municipal water conservation strategies specific to the region, agricultural conservation plan for irrigation districts, and a model water conservation plan for a water user group.

The Rio Grande Regional Water Planning Group has incorporated into the 2010 Regional Water Plan strategies presented by the statewide Water Conservation Implementation Task Force in the *Water Conservation Best Management Practices Guide* (TWDB Report 362, Nov. 2004). Recommended strategies include:

- golf course conservation
- metering all new connections & retrofit on existing connections
- showerhead, aerator, and toilet flapper retrofit
- school education
- landscape irrigation conservation
- water wise landscape design
- athletic field conservation
- public information
- rainwater harvesting
- park conservation
- residential clothes washer incentive program

The Regional Water Plan also incorporates the following drought relief options offered by the U.S. Department of Agriculture through the Farm Service Agency: Conservation Reserve Program, Emergency Haying and Grazing Program, Farm Operating Loans, Farm Ownership Loans, Environmental Quality Incentive Program, Non-insured Crop Disaster Assistance Program, Farm Labor Housing Loans and Grants Program, and the Natural Resources Conservation Service.

The Regional Water Plan provides a template for agricultural conservation that follows TCEQ rules governing development of water conservation plans for public water suppliers. These rules define a water conservation plan as "a strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water."

The Regional Water Plan also provides a conservation plan for a water user group. According to TCEQ rules, water conservation plans for public water suppliers must have a utility profile, accurate metering, specification of goals, universal metering, and public education. Most have additional content for public water suppliers that are projected to

supply 5,000 or more people in the next ten years and may have additional optional content.

Long-Term Protection of the State's Water Resources, Agricultural Resources, and Natural Resources

Because the Rio Grande is the main source for both DMI use and irrigation use, optimizing the supply of water available from the river is an important aspect of protecting the state's water, agricultural, and natural resources. A key strategy here is implementing on-farm practices and rehabilitating irrigation systems to conserve water.

There is tremendous potential for water savings in both areas: 219,000 ac-ft through on-farm improvements and 218,000 ac-ft through conveyance system improvements. In the long run, total water savings associated with both strategies would allow irrigators to offset water supply deficits. However, the implementation timeframe will not offer immediate relief.

Another factor impacting the area of resource protection is Mexico's compliance with the 1944 Treaty. Even though Mexico has repaid its water debt, there is little assurance of future compliance should the region be gripped by another severe drought. Texas A&M University studies have shown that the Lower Rio Grande Valley lost nearly $1 billion in decreased economic activity and 30,000 jobs as a direct result of Mexico's failure to comply with its treaty obligations over the period 1992 to 2002.

Environmental flow needs are in the forefront of all issues dealing with long-term protection of the Texas' natural resources. One possibility for maintaining and increasing environmental flows is the acquisition of Rio Grande water rights for environmental usage through the Texas Water Trust. These water rights could be managed to produce sufficient flows throughout the region. However, this option may not be viable because of the current water rights purchase and transfer structure.

Given the WUG format currently being implemented by the TWDB, no option exists to formally allocate projected water supplies for environmental use. Alternatively, environmental flows in the Rio Grande could be included as a separate WUG in the next round of regional planning to ensure minimums would be met in a manner consistent with all other WUGs.

International cooperation from Mexico is critically needed to maintain flow levels. If the United States were to implement an environmental flow program without Mexico's participation, the desired effect would be significantly reduced.

Another of the region's critical environmental issues is the growth of invasive plants such as the spread of salt cedar and other aquatic plants. Unfortunately, eradication methods are both costly and physically strenuous. The natural rise and fall of water elevation in rivers and streams somewhat curtails these plants by drowning out new seedlings.

However, in areas of minimal water flow, a perfect scenario exists for invasive plant growth.

Texas coastal estuaries, where freshwater from inland runoff mixes with the salty waters of the Gulf of Mexico, support an amazing abundance of wildlife. Young fish, shrimp, and crabs feed and hide in brackish estuary waters until they are mature enough to survive in the Gulf of Mexico. Resident and migratory birds by the thousands rest and feed in estuarine marshes. In fact, 95 percent of the Gulf's recreationally and commercially important fish and other marine species rely on estuaries during some part of their life cycle.

Approximately 323,000 AF/yr in new municipal water supplies are proposed in the 2010 Region M water plan. All of this except approximately 2,900 AF/yr of advanced water conservation can affect either freshwater inflows to the Lower Laguna Madre or streamflows in the Rio Grande. Alterations in flows on the Rio Grande are beyond the scope of the present evaluation. For Nueces-Rio Grande coastal basin streams draining to the Lower Laguna Madre there are no major dams, diversions, or other water management strategies proposed that can cause changes in streamflows. However, many of the proposed water management strategies can influence freshwater inflow through alteration of wastewater discharges based upon supplies imported from the Rio Grande basin or groundwater. Many of region's growing municipalities lie in the Nueces-Rio Grande coastal basin and will have greatly altered wastewater discharge into the streams that drain to the Laguna Madre.

The results of National Wildlife Federation analyses indicate no problems for freshwater inflows to the Lower Laguna Madre. The key spring and early summer inflow pulses needed to support strong productivity would not be impacted significantly. Nor would the ability of the Nueces-Rio Grande coastal basin to provide low flows during drought be altered very much. It should be kept in mind that much of the increase in wastewater discharge shown here is based on imports of water into the Nueces-Rio Grande coastal basin. These obviously come at the expense of the neighboring Rio Grande basin. An analogous effort to evaluate flow needs and effects of the Region M plan could be undertaken there in the next cycle of regional water planning.

Unique Stream Segments/Reservoir Sites/Legislative Recommendations

TWDB rules allow the RWPG to include in the regional water plan recommendations concerning legislative designation of ecologically unique streams, sites for future reservoir development, and policy issues. The Rio Grande RWPG elected to consider recommendations in each of these areas.

Ecologically Unique Stream Segments

State law prohibits state agencies and local units of government from developing a water supply project that would destroy the ecological value of a river or stream segment that has been designated by the Texas Legislature as ecologically unique. Furthermore, the

TWDB cannot finance water supply projects located on a stream segment that has been designated as ecologically unique.

TWDB rules specify the criteria that are to be applied in the evaluation of potential ecologically unique river or stream segments. These are: biological function, hydrologic function, riparian conservation areas, high water quality/exceptional aquatic life/high aesthetic value, and threatened or endangered species/unique communities.

To assist the Rio Grande RWPG, the Texas Parks and Wildlife Department (TPWD) developed a list of candidate stream segments in each region that appear to meet the criteria for designation as ecologically unique. The Rio Grande RWPG also received suggestions from the U.S. Fish & Wildlife Service, Zapata County, and the Texas Shrimp Association through two stakeholder "focus group" meetings during the first round of planning.

The Rio Grande RWPG reviewed the nominations submitted by TPWD and others with regard to legislative designation of river or stream segments as ecologically unique. The group elected not to include any recommendations.

Reservoir Sites

TWDB rules also provide that RWPGs "may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation and the expected beneficiaries of the water supply to be developed at the site."

Three reservoir sites have been considered by the Rio Grande RWPG: the proposed Brownsville Weir and Reservoir; the proposed Banco Morales Reservoir, and the proposed Laredo Low Water Weir. None are recommended for designation as a unique reservoir site at this time.

Legislative Recommendations

Under TWDB rules, regional water plans may include "regulatory, administrative, or legislative recommendations that the regional water planning group believes are needed and desirable to facilitate the orderly development, management, and conservation of water resources and preparation for and response to drought conditions."

Many of the issues and needs of the region arise from the fact that the Rio Grande is an international river whose waters are shared by the U.S. and Mexico. No other regional water planning area faces this reality. Consequently, the recommendations made by the Rio Grande RWPG for action to address regional water needs are divided into two categories: some recommendations fall within the authority of the State of Texas; others must be addressed through the auspices of the International Boundary and Water Commission and/or other international and federal agencies.

Recommendations on State Issues

1 The Texas Legislature should appropriate funds to the Texas Water Development Board to implement and provide assistance to water user groups in developing and implementing appropriate Advanced Water Conservation measures, including a statewide public outreach and education program.

2 The State of Texas should consider factors other than merely population in funding the planning process in Region M because of the unique circumstances affecting water supply in the area.

3 The State should continue financing brackish groundwater projects and the demonstration seawater desalination project as means to increase water supply alternatives in the region.

4 The State should authorize the Rio Grande Watermaster to manage the Rio Grande WAM and should fully appropriate to the Texas Commission on Environmental Quality fees paid by Rio Grande water right holders as specified in Section 11.329 of the Texas Water Code for the purpose of fully funding Rio Grande Watermaster operations.

5 The State should assist in finding new technical and financial resources to help the region combat aquatic weeds and salt cedar and thus protect its water supplies. The Rio Grande RWPG joins with the Far West Texas and Plateau RWPGs to encourage funding for projects aimed at eradicating salt cedar and other invasive plant species in the Rio Grande watershed and for ongoing long-term brush management activities.

6 The State should continue providing technical and financial resources to fully develop the regional GAM.

7 The State should amend the planning process to allow for treating each irrigation district with the region as a WUG, rather than as part of "County-Other," in order to allow for development of individual water management strategies for the districts.

8 The Texas Commission on Environmental Quality should provide assistance to the Rio Grande RWPG as it reviews rules on converting water rights from one use to another and considers appropriate rule amendments, if necessary.

9 Entities within the region are encouraged to cooperate to resolve water issues through such means as regional water and wastewater utilities.

10 The formation of groundwater conservation districts is encouraged as a means to protect groundwater supplies, which are increasingly being tapped as a new water supply for municipal and industrial use.

11 The State should appropriate sufficient funds to the Texas Railroad Commission to allow for capping abandoned oil and gas wells that threaten groundwater supplies.

12 The Texas Legislature should provide technical and financial assistance to implement water management strategies identified in the regional water plans.

13 The Texas Legislature should appropriate funds to continue the regional water planning process.

Recommendations on National and International Issues

1 The International Boundary and Water Commission (IBWC) should renew efforts to ensure that Mexico complies with Minute 309 and set in place means to achieve full compliance with the 1944 Treaty, including enforcement of Minute 234, which addresses the actions required of Mexico to completely eliminate water delivery deficits within specified treaty cycles. Water saved in irrigation conservation projects in Mexico should be dedicated to ensure deliveries to the Rio Grande pursuant to the 1944 Treaty under Article 4B(c) and Minute No. 234.

2 The United States and Mexico should reinforce the powers and duties of both Sections of the IBWC pursuant to Article 24(c) which provides, among other things, for the enforcement of the Treaty and other Agreement provisions that "… *each Commissioner shall invoke when necessary the jurisdiction of the Courts or other appropriate agencies of his Country to aid in the execution and enforcement of these powers and duties.*"

3 The Minute 309 conservation projects funded by the North American Development Bank and other projects funded by national and international agencies to modernize and improve the facilities of irrigation districts in the Rio Grande Basin should be supported and given priority. In particular, both countries should support continued grant funding for conservation projects through the NADBank's Water Conservation Investment Fund.

4 The conservation irrigation projects currently underway through the Bureau of Reclamation for improvement to the irrigation systems of irrigation districts in the Rio Grande Basin in the United States should be supported and implemented.

5 For purposes of clarity, the IBWC should approve a Minute setting out the definition of "extraordinary drought" as that term is implicitly defined in the second subparagraph of Article 4B(d) as an event which makes it difficult for Mexico " … to make available the *run-off* of 350,000 acre feet (431,721,000 cubic meters) annually." A drought condition occurs when there is less than 1,050,000 acre feet annually of *run-off waters* in the watersheds of the named Mexican tributaries in the 1944 Treaty, measured as water enters the Rio Grande from the named tributaries.

6 Accounting of water between the United States and Mexico pursuant to the 1944 Treaty should be consistent with the 1906 Convention, which provides that all

waters measured at Fort Quitman, Texas, are 100 percent allocated to the United States.

7 For better water management in the Lower Reach of the Rio Grande, downstream of Anzalduas Dam, both countries should reaffirm operational policies that Mexico continue to take its share of waters through the Anzalduas canal diversion at the Anzalduas Dam or account for its water at that point, including any diversions by Mexico from the proposed Brownsville Weir Project storage, to the extent of its participation in the project.

8 IBWC should convene a binational meeting of water planners and water use stakeholders in both countries within six months following completion of the annual water accounting in which an annual deficit in flows from the named Mexican tributaries in the 1944 Treaty occurs. This meeting would be designed to share data and information useful in planning for water needs and contingencies in the intermediate future.

9 IBWC should restore the Rio Grande below Fort Quitman, Texas.

10 The IBWC should assume all local and regional financial responsibility for upkeep and maintenance of El Morillo Drain.

11 IBWC should coordinate bilateral efforts to review and evaluate existing sources of data regarding groundwater development in both countries in the Rio Grande Basin below Fort Quitman to the Gulf of Mexico. This effort should be focused on the potential impact on surface water supply in the Rio Grande watershed, with the goal of pursing such actions as may be necessary to evaluate present conditions and promote programs protecting the historical surface water supply in affected regions.

12 Regional watershed planning should be encouraged on both sides of the Rio Grande throughout the basin, including efforts to promote binational coordination of long-range water plans.

13 Interstate compacts between affected states in Mexico, similar to the Rio Grande Compact and Pecos River Compact between affected states in the United States, which deal with apportionment of available water supply from the Rio Grande and its tributaries to each state consistent with existing domestic and international law should be encouraged.

Water Infrastructure Funding Recommendations

The Infrastructure Financing Report (IFR) requirement was incorporated into the regional water planning process in response to Senate Bill 2 (77th Texas Legislature). For purposes of the IFR, each RWPG is required to determine proposed financing for all of the water management strategies that were proposed in this third round of regional planning. For each of these strategies, the RWPG must determine the funding needed to implement the strategy and the types of funding that are likely to be accessed.

According to TWDB guidelines, the primary objectives of the IFR are to determine:

- the number of political subdivisions with identified needs for additional water supplies that will be unable to pay for their water infrastructure needs without some form of outside financial assistance;
- how much of the infrastructure costs in the regional water plans cannot be paid for solely using local utility revenue sources;
- the financing options proposed by political subdivisions to meet future water infrastructure needs (including the identification of any state funding sources considered); and,
- what role(s) the RWPGs propose for the State in financing the recommended water supply projects.

In the majority of cases, municipal WUG strategies include urbanization, advanced water conservation measures and purchase of Rio Grande supplies. There are a total of eight counties, 52 cities, and 15 water supply corporations in this regional planning area. Surveys were sent to only those that had been listed in the plan with a need during the 50-year plan.

Public Participation, Facilitation, and Plan Implementation Issues

Public Participation

Public participation is the basis of the regional water planning process initiated by SB 1 in 1997. TWDB rules require RWPGs to have at least one meeting prior to preparation of the regional water plan, provide ongoing opportunities for public participation during the planning process, and hold at least one public hearing prior to adoption of the "initially prepared" regional water plan. RWPGs are also required to comply with TWDB rules specifying how and to whom notice of public meetings and public hearings is to be provided.

As in the first and second cycles of regional water planning, the Rio Grande RWPG has gone well beyond minimum requirements set by the state for public participation, providing multiple opportunities for public input and for direct participation in the planning process and development of the draft plan. The group also intensified efforts in the third round of planning to ensure public involvement and participation in the process.

The Rio Grande RWPG has held regular meetings throughout the planning process, generally on a monthly basis. Each meeting has provided opportunity for public comment. As planning progressed, the opportunity for comment was moved from the end of the agenda to the beginning in order to better accommodate the needs of the public.

A variety of mechanisms have been used to publicize Rio Grande RWPG meetings, including notices to the media and postings to the Rio Grande RWPG's website *www.RioGrandeWaterPlan.org*. The website was developed in late 2003 as a resource for the public on issues of concern to regional water planning and information on the

planning process. According to web statistics, an average of 252 unique visitors made an average of 359 visits per month in 2009.

A simple, easy-to-read brochure about the region and the regional planning process was developed in April 2010 and was distributed at a variety of forums and through direct mail. The brochure also directs readers to the website for additional, in-depth information.

The Executive Summary of the plan is translated into Spanish, and is posted on the website.

The Rio Grande RWPG and its consultant team also actively solicited comment from local entities on the basic data used to develop the plan, including water infrastructure financing and draft population and water demand projections. In addition, presentations were made to a variety of groups with an interest in water planning, including water utility associations, citrus growers, and irrigation district boards of directors.

The Rio Grande RWPG provided extensive notice of and opportunity for public comment on the *Initially Prepared Plan*. A public hearing on the plan was held in Weslaco, Texas, on April 21, 2010. An additional public hearing was held in Laredo, Texas, on April 28, 2010.

Facilitation

Facilitation of the regional water planning process for the Rio Grande Region has been provided by the staff of the Lower Rio Grande Valley Development Council (LRGVDC), with assistance from the consultant team. In addition to performing administrative duties relating to the management of State funds, the LRGVDC also made all arrangements for meetings of the Rio Grande RWPG, which included posting required meeting notices, preparing meeting agendas, and distributing agenda back-up materials to members of the RWPG. The LRGVDC tape-recorded all Rio Grande RWPG meetings and prepared the official meeting minutes. A Spanish translator was provided if requested in advance of the meeting.

The consultant team also assisted in facilitating the planning process by providing presentations of technical information at RWPG meetings and assisting in identifying key water planning and policy issues.

Plan Implementation Issues

A number of key issues will affect whether this plan is successful in achieving its primary purpose of developing strategies for meeting the near and long-term water needs of the Rio Grande Region. Generally, the key issues relating to the implementation of this plan can be grouped into three categories:

- Issues and water management strategies that require additional in-depth evaluation. The recommendations presented in this regional water plan are based on a reconnaissance-level evaluation of projected water demands, water supply, needs, and various strategies for meeting future needs. Additional, more detailed feasibility-level planning will be necessary prior to implementing many of the recommended strategies. Also, in many cases, feasibility-level planning will need to be followed by engineering

design and permitting activities. For the most part, the additional planning and project development activities required for strategy implementation will be the responsibility of local water suppliers (e.g., cities, water supply corporations, and irrigation districts). However, state and/or federal technical and financial assistance would greatly facilitate timely project development and implementation.

- Local buy-in and action to implement local water supply strategies. This regional water plan is best viewed as providing a framework for local action to implement strategies for meeting future water needs. The role of the Rio Grande RWPG is purely advisory. The RWPG has no authority to compel other entities to implement the actions recommended in this plan, nor does it have the authority or resources to undertake implementation activities on its own initiative. Rather, implementing strategies recommended for meeting future water needs is a primary responsibility of local water suppliers, which include cities, water supply corporations, other public water supply entities, and irrigation districts. With or without outside assistance, more detailed feasibility-level planning studies and engineering design is largely the responsibility of local water suppliers. Similarly, the costs of implementing water conservation and water supply strategies will be borne largely by the ratepayers served by local water suppliers. It is therefore essential that there be a strong commitment on the part of the governing bodies and management of local water suppliers to implement the strategies recommended in this plan.
- Funding for the implementation of plan recommendations. The availability of and access to funding for the implementation of recommended water management strategies is crucial. Most local water suppliers in the Rio Grande Region are governmental or quasi-governmental entities (e.g., water supply corporations) that have the authority to charge and collect taxes and/or fees for the services they provide. These entities also have the ability to borrow money to acquire additional water supplies and to develop and rehabilitate water-related infrastructure. For the most part, the direct costs for the services provided by these entities should be borne by the individual water users through taxes and/or fees for services. However, it should be recognized that there is also an appropriate role for the state and federal governments in financing water conservation, water supply development, and infrastructure projects. At present, there are a number of state and federal financial assistance programs for water-related infrastructure projects that are available to municipal water suppliers. However, there are few programs that provide financial assistance to irrigation districts for infrastructure improvements. Because agricultural water conservation is a central element of this regional water plan – and is essential to maintaining the viability of this sector of the regional economy – the Rio Grande RWPG recommends that new public funding sources be developed to assist irrigation districts with implementing conservation programs.

No interregional conflicts have been identified in the planning process or are contained in the plan.