San Antonio

REGIONAL WATER RESOURCE STUDY

SUMMARY

TO THE CITIZENS OF SAN ANTONIO AND OF THE FIVE COUNTIES SERVED BY THE EDWARDS UNDERGROUND WATER DISTRICT

We transmit this Summary Report from the results of the Regional Water Resources Study completed in April, 1986 for your information and serious consideration. This Region, this state, and this nation are now in the process of major economic and social change. We know in our Region the very fundamental part our water resources — from the Edwards Aquifer and from our streams and rivers — has played in our past. Our decisions now will determine how wisely they are to be managed to protect our future.

We urge each of you to read this Summary carefully, to ask questions, to seek more information about the issues involved through discussion with your neighbors throughout our five counties. Our problems and our needs for water are not the same throughout these five counties, but we share a common source of water which can meet those problems and needs. It is our responsibility and opportunity to understand the resource we have to work with, the needs each of us has in using that resource, and to share equitably and harmoniously in the future management of our water so that the Region prospers and grows.

Henry G. Cisneros
Mayor
City of San Antonio

Robert C. Hasslocher
Chairman
Edwards Underground Water District

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SAN ANTONIO REGIONAL WATER RESOURCE STUDY

SPONSORS

The City of San Antonio and the Edwards Underground Water District

THE STUDY OBJECTIVES

Continued long-term availability of water from the Edwards Aquifer requires both a technical knowledge of the *quantity* it can supply, and an understanding of the inseparability of quantity and the *quality* of the water in the Aquifer. Protection of quality is of primary importance to the future of the Region. Present efforts directed toward water quality protection must be continued and must be intensified if necessary. The Regional Study and this implementation effort have as their focus and intent the achievement of a Regional consensus on those measures and actions required to provide the Region's water users with an adequate long-term water supply of high quality. To this end, the study set out to provide a report that will:

- Enable reasonable people to make responsible decisions concerning public and private investments in the water resources of the Region,
- Insure that those decisions are consistent with regional economic development and environmental integrity and
- Inspire long-term confidence in these decisions.

STUDY PERIOD

1980-2040 • 1980 was chosen as a place to start in time to examine the changes that will take place in the Region between now and 2040. That is what the Study is all about — what will our Region look like and be like 5 years from now; 20 years from now for our children; and 50 years from now for our grandchildren.

WHY IS ANY ACTION NEEDED?
THE ISSUES

The Edwards Aquifer is now the sole source of water for the City of San Antonio and the primary source for Uvalde, Medina, Bexar, Comal and Hays Counties. By 2040, water levels in wells will drop in Uvalde by 80 feet, in Hondo by 135 feet, in San Antonio by 145 feet, in New Braunfels by 85 feet, and in San Marcos by 30 feet. Increased pumping costs may force many enterprises out of business.

If we continue our present practices with the added growth expected in the Region, we will see these consequences:

- Flow from Comal and San Marcos Springs — the major source of flow to the Guadalupe River — will cease after the year 2000, and sooner and more frequently in droughts before 2000.
- Lowered water levels in the Edwards will increase the risks of progressive degradation of water quality, either as the result of intrusion of water of poor quality in the Aquifer or contamination from surface land uses.
- If new projects are required, the time necessary to plan them and get them in place so they can provide water is 15 years *plus*. Decisions must be made *now* if we are to have projects in place by 2000-2005. If we go into a prolonged drought now, there are *no alternatives, no backup water supply, no quick solutions.*
- Water quality in the Guadalupe River will be seriously degraded as less water is available for dilution of return flows entering the river from towns and farming areas in its drainage area.
- Aquatic life in the springs and rivers will suffer damage or be wiped out.
- Lawsuits and/or federal or state intervention will be likely if local and regional actions are not taken to avoid these effects of continuing present policies.

THE REGION AND ITS LONG-TERM CHALLENGES

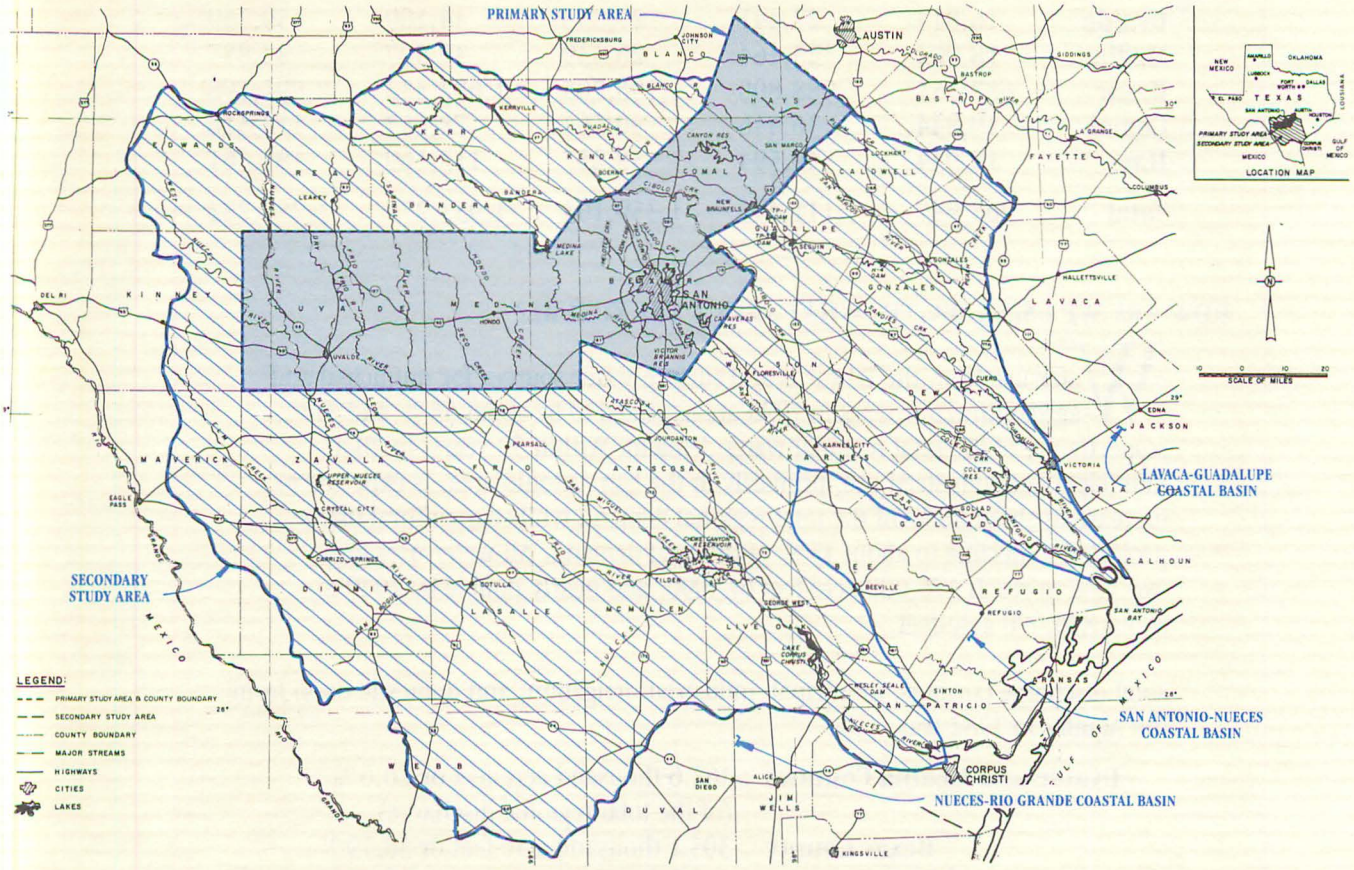
Five counties are in the primary study area: Uvalde, Medina, Bexar, Comal and Hays each overlying and dependent on the Edwards Aquifer for water supply. The Guadalupe-Blanco, San Antonio, and Nueces Rivers travel through the area to the Gulf of Mexico. The area between the primary study area and the Gulf relies on streamflows fed by spring discharges and return flows for water supply. This area we refer to in the Study as the secondary area not because it is secondary in importance but because this Study was focused on the Edwards area to see what its resources are and how those resources can best be used. It does, however, rely on the same resources; long-term interests in water conservation and development are common to the primary and secondary areas; and those interests can be shared to meet common needs.

The Edwards Aquifer is an abundant source of water; it is also vulnerable to effects of the recurrent droughts that affect Central Texas.

The Regional Study has provided a framework to solve these regional problems:

- Provide an adequate and reliable water supply for a population expected to grow from 1.1 million people in 1980 to 3.2 million people in 2040.
- Meet short and long term water demands — even when droughts occur.
- Protect water quality in the Edwards and the stream systems — both from direct pollution and from movement of poor quality water into the Aquifer during periods of prolonged overpumping.
- Share water resources and costs for their development and use fairly among all purposes and parts of the Region.

STUDY AREA BOUNDARIES



- Recognize primary uses of water as they differ from East to West in the Region and permit choices of solutions that are tailored to fit needs and preferences of each area.
- Avoid crisis decisions — whether forced by droughts, floods, or recessions.
- Retain control of costs and choices of resource allocation at the most appropriate local level.
- Maintain flexibility over time to respond properly to changing conditions as the people in the Region choose.
- Avoid committing either money or resources before they are needed for recognized and agreed purposes.
- Retain management control of decisions at the most local level of government appropriate.

REGIONAL POPULATION: HOW IS IT GROWING?

County	1960	1980	1990	2010	2040
Uvalde	16,814	22,441	27,238	44,109	59,750
Medina	18,904	23,164	26,339	35,507	43,857
Bexar	687,151	988,800	1,196,705	1,682,332	2,891,598
Comal	19,844	36,446	50,564	78,157	112,516
Hays	19,934	40,594	58,257	113,169	181,561
Total	762,647	1,111,445	1,359,103	1,953,274	3,289,282

HOW ARE WE USING WATER: WHAT ABOUT THE FUTURE?

Water use from the Edwards and surface water sources for municipal and agricultural purposes in 1990 are expected to be about 56% and 31%, respectively, of the total regional water demand. Within 50 years, in 2040, municipal and industrial use, primarily in the San Antonio area, is expected to increase to about 85% of the total regional demand while agricultural use is projected to decline to about 15% of the total demand. All water uses are expected to reach 476,000 acre-feet by 1990, and nearly double by 2040 to about 896,000 acre-feet.

Total discharge (springs, municipal, industrial, irrigation, and domestic uses) from the Aquifer in 1982 was:

Uvalde and Medina Counties	162.6 thousand acre-feet or 20.6% (of the total regional discharge);
Bexar County	305.1 thousand acre-feet or 38.79%;
Comal and Hays Counties	318.7 thousand acre-feet or 40.52%

What does this tell us?

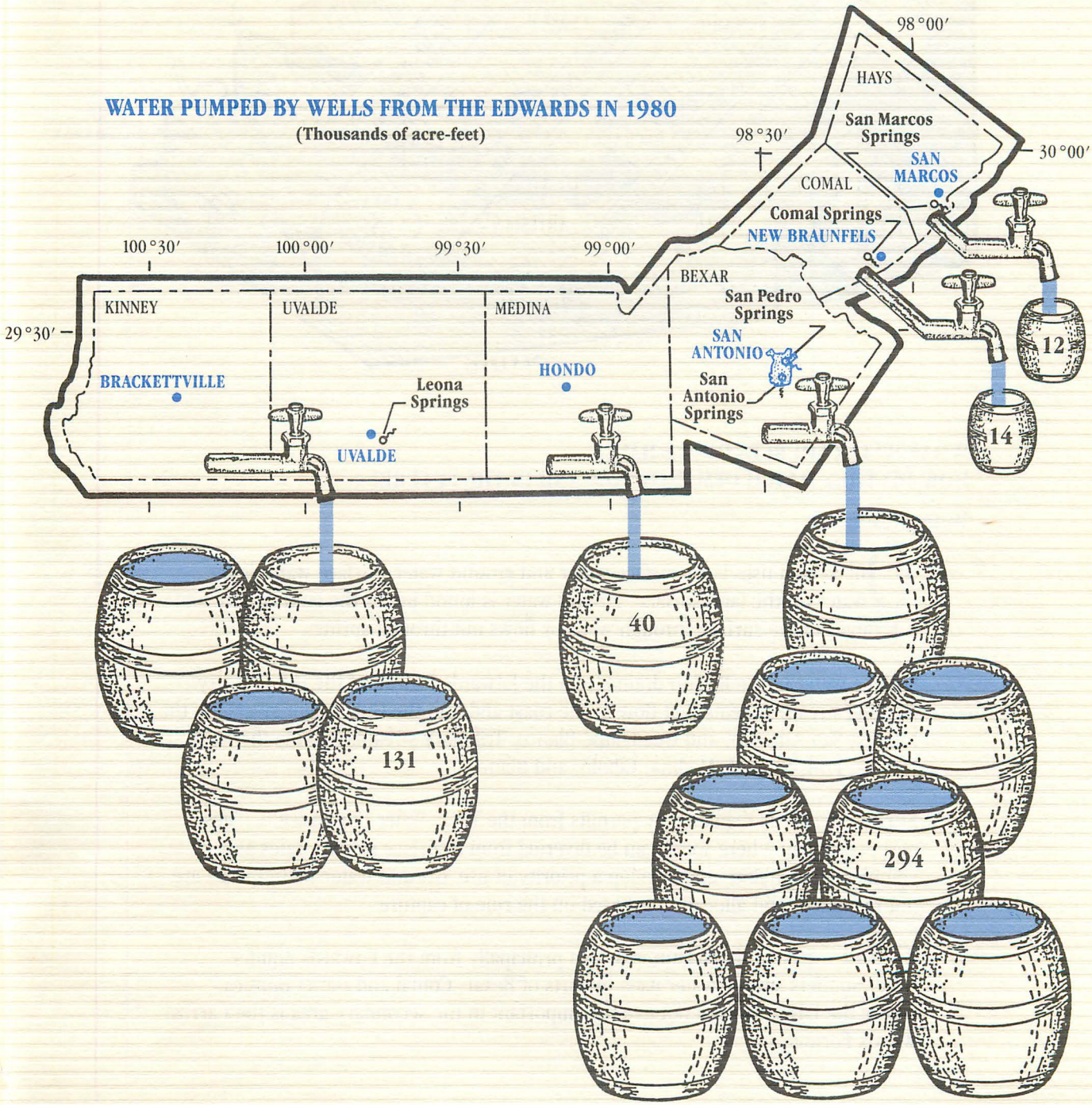
While agricultural enterprises remain a strong and stabilizing influence in the area, the key increase in water demand will be in municipal centers — principally San Antonio. This growth in San Antonio water demand is the result not only of the City's growth but also the growth in the surrounding urban areas.

In the secondary study area between the Edwards 5-county Region and the Gulf, growth in water demand will not be as rapid — projected to increase from about 450,000 acre-feet in 1980 to about 710,000 acre-feet in 2040.

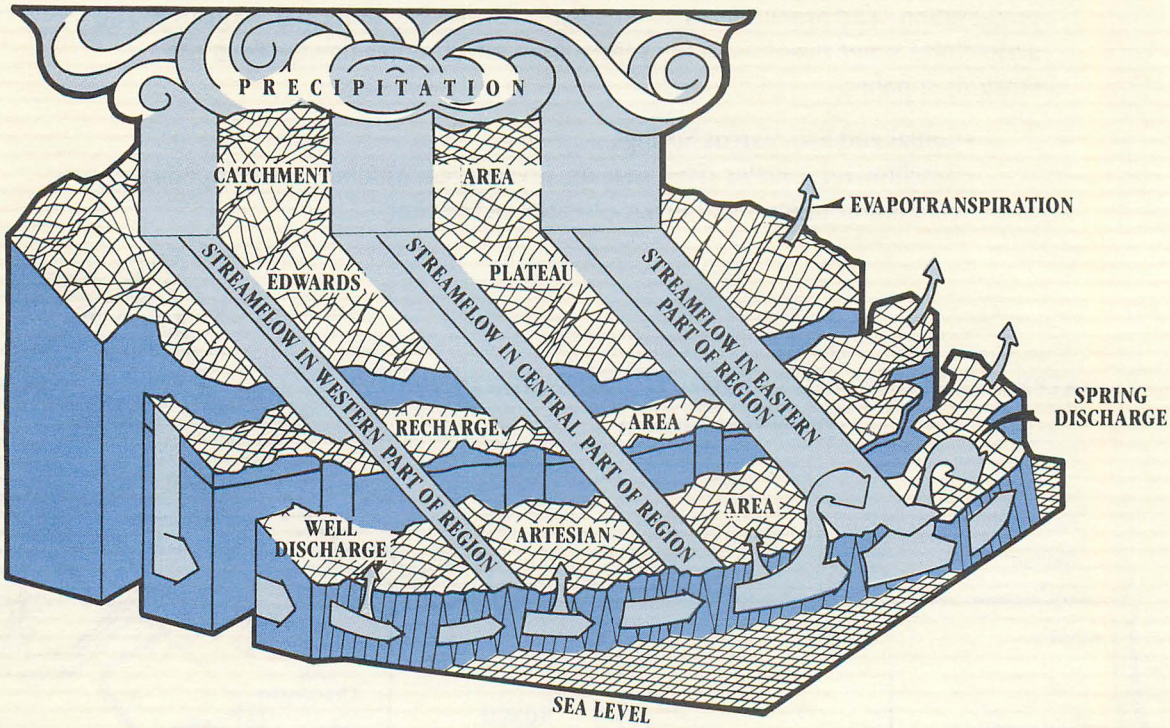
We will need to manage our water resources in a way that satisfies a major increase in demand. A comparison of future uses and presently developed supply sources show that we will need to consider the option of surface reservoirs to meet needs and protect the Aquifer in periods of droughts.

Our Region is a unique area — the Edwards Aquifer, the Hill Country, the springs: these are not like other places and have qualities of beauty and history that merit preservation. The primary area — in addition to serving municipal, industrial, and agricultural water needs — is the source from which water flowing from the Edwards supplies:

- Comal and San Marcos Springs
- Baseflow for 3 major river systems: Nueces, San Antonio, Guadalupe-Blanco
- Freshwater inflows to 2 major estuaries of the Gulf.



THE HYDROLOGIC SYSTEM



WHAT WATER SOURCES DO WE HAVE? HOW DO THEY MATCH DEMANDS NOW AND IN THE FUTURE?

Water Resources

Our Region uses both surface water and ground water. Surface water is the water on the land surface; ground water is found under the land surface and is brought to the surface through wells or flows out through springs.

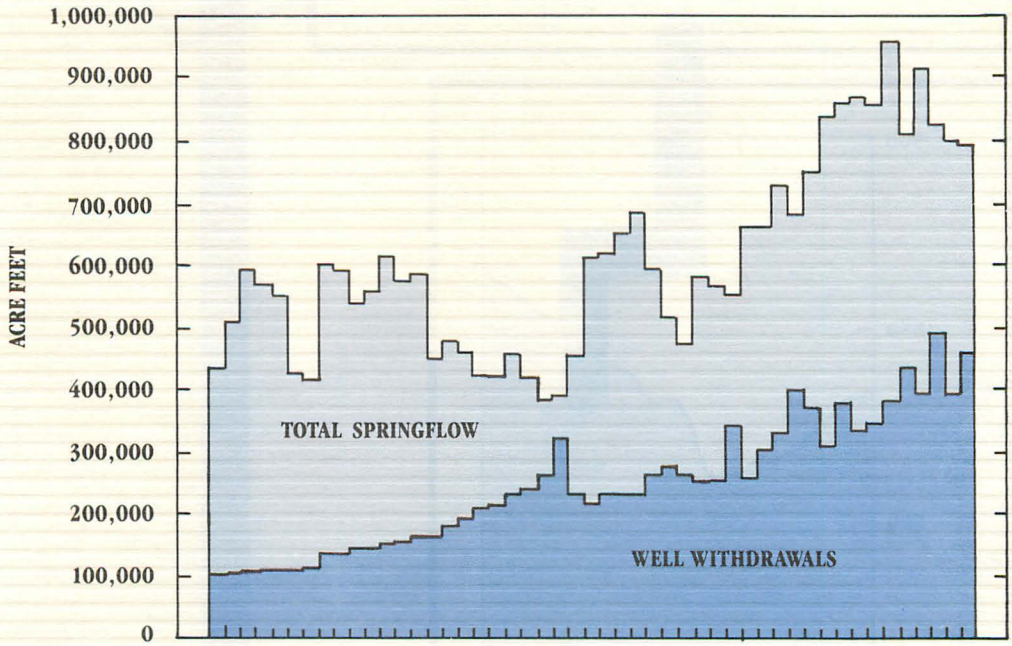
Surface water in the Region drains from the Edwards Plateau of the Hill Country forming stream systems that flow to the coast and into the Gulf. Major rivers are the Nueces, San Antonio, and Guadalupe-Blanco. Tributary streams include the West Nueces, Frio, Sabinal, Medina, Cibolo, and Blanco.

Surface water is regulated by permits from the Texas Water Commission. These permits specify where water can be diverted from a surface stream, rates and volumes of diversion, and develop a priority of use. Ground water withdrawals are not regulated, and allocation is based on the rule of capture.

Ground water in the Region is drawn principally from the Edwards Aquifer. Other aquifers supply water used in parts of Bexar, Comal and Hays Counties, where the Edwards does not extend. Important in the secondary area is the Carrizo-Wilcox Formation.

Recharge is the process by which water from rainfall and surface streamflow enters the Edwards through cracks or pores between soil particles, thus continually adding to the water in storage in the Aquifer. Most of the recharge enters the Aquifer in the west in the Nueces Basin (66%), and 34% enters the Aquifer from the Medina River and further east in the Region. Water flows in streams fed by springs from the drainage area of the Edwards Plateau to the recharge zone of the Balcones Fault Zone Aquifer where the Edwards is exposed at the surface.

AQUIFER DISCHARGE



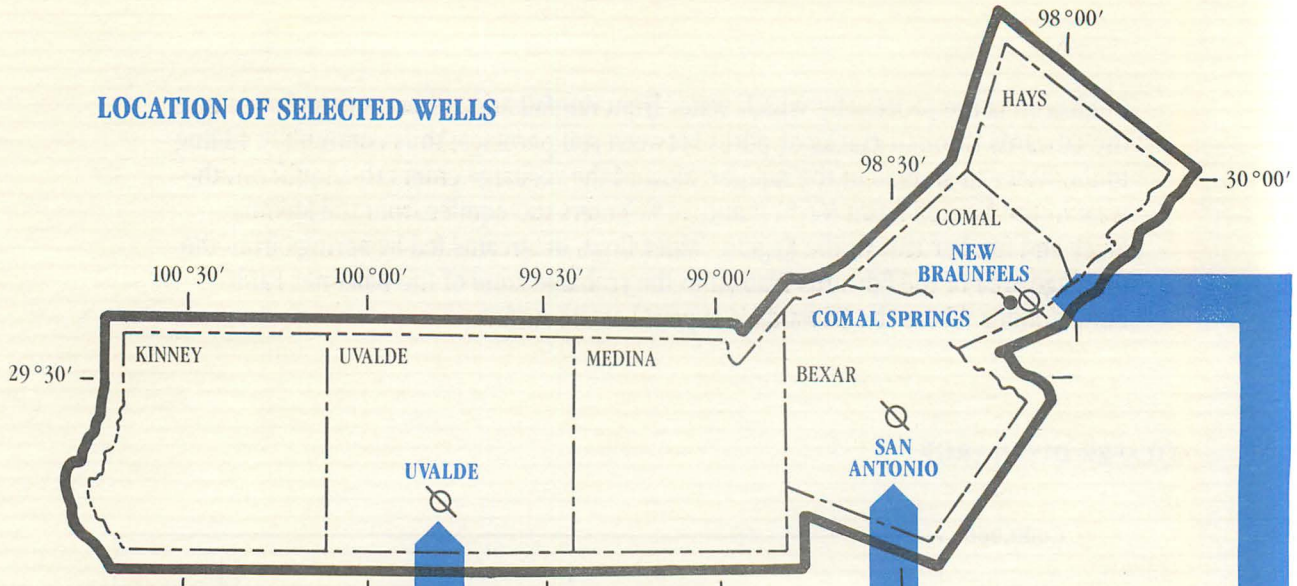
Major movement and change over geologic time caused in the Edwards a complex hydrologic system with very direct interconnections with surface streams. Water in the Aquifer flows generally from west to east. Because of the extensive faulting and movement, water levels (above sea level) are higher in the west than in the east. Leona Springs at Uvalde, for example, is about 870 feet above sea level and San Marcos Springs in Hays County about 570 feet.

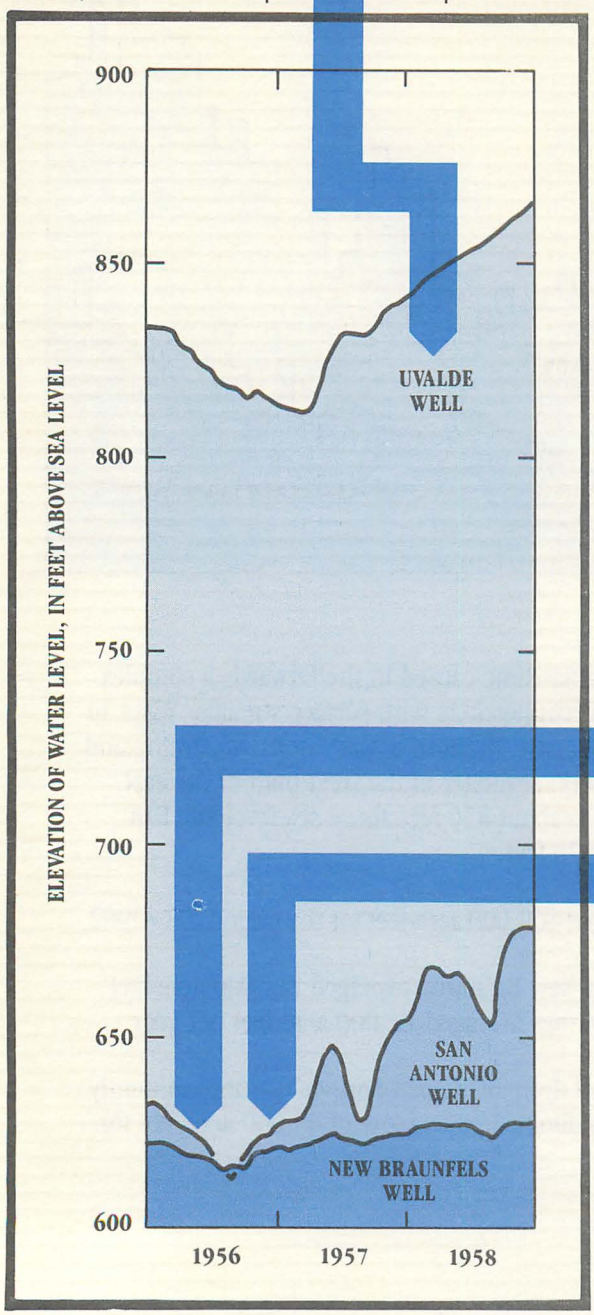
Annual recharge to the Edwards averaged 608,000 acre-feet for the period 1934-1982.

Major discharge from Comal Springs at New Braunfels averaged 212,000 acre-feet from 1940 to 1982, and San Marcos Springs averaged 111,000 acre-feet per year.

In 1956, at the last stage of a prolonged drought, Comal Springs was intermittently dry and flow from San Marcos Springs diminished to a low of 48,000 acre-feet for the year.

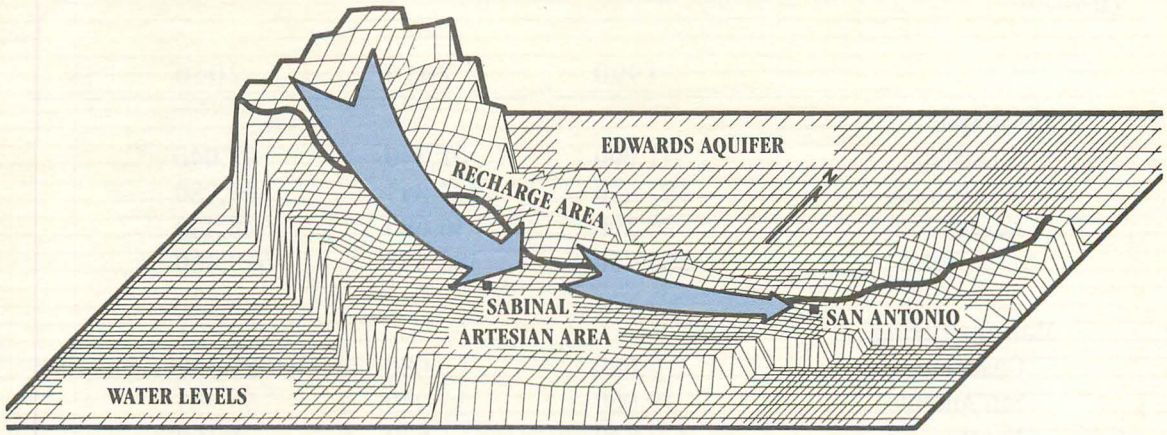
LOCATION OF SELECTED WELLS





WATER LEVELS IN SELECTED INDEX WELLS

GROUND WATER MOVEMENT



Estimates vary as to the total amount of water stored within the some 2,000 square miles of the Edwards Aquifer. As much as 15 million acre-feet of water may be present within the formation. How much of this is recoverable through wells is not known. Also not known are the potential effects on water quality of withdrawing more water on a continuing basis than is being recharged.

Suggestions have been made that the wells could be drilled and pumped to provide artificially the flow now coming from the springs. This would be done to compensate for a planned use of water in storage in the Aquifer and resulting lowering of water levels throughout the Region. This would cause, however, serious loss of aquatic life and long-term impacts on the Region's economy as water levels were progressively lowered.

Streamflow measurements show higher flows in the Nueces and Guadalupe-Blanco Rivers than in the San Antonio River.

WATER DEMANDS

Water use in the Region is directly linked to how many people live here, how they are concentrated, and the ways they make their living. Major water uses, the amounts of water for each use by county in 1980, and projected to be used in 1990 and 2040 are shown by the three river basins because the water needs of the Region are met by a combination of ground and surface water:

REGIONAL WATER USES: 1980

(Acre-feet)

County	Ground Water	Surface Water	Total
Uvalde	81,196	2,213	83,409
Medina	79,266	38,652	117,918
Bexar	252,747	50,645	303,392
Comal	11,890	3,419	15,309
Hays	10,442	952	11,394

REGIONAL WATER DEMAND PROJECTIONS

(Acre-feet)

	1990	2010	2040
Municipal			
Guadalupe	41,000	61,830	91,040
San Antonio	197,450	287,845	509,980
Nueces	26,300	36,680	48,440
Total	264,750	386,355	649,460
Manufacturing			
Guadalupe	7,680	12,080	21,730
San Antonio	19,060	32,070	56,995
Nueces	340	620	1,160
Total	27,080	44,770	79,885
Steam Electric			
Guadalupe	0	0	0
San Antonio	29,285	29,285	29,285
Nueces	0	0	0
Total	29,285	29,285	29,285
Mining			
Guadalupe	1,130	1,605	2,250
San Antonio	620	815	1,140
Nueces	425	600	840
Total	2,175	3,020	4,230
Irrigation			
Guadalupe	4,450	1,235	1,250
San Antonio	17,510	24,315	25,725
Nueces	124,600	98,370	99,480
Total	146,560	123,920	126,455
Livestock			
Guadalupe	1,080	1,245	1,245
San Antonio	1,245	1,245	1,245
Nueces	3,370	3,870	3,870
Total	5,695	6,360	6,360
Totals by Basin			
Guadalupe	55,340	77,990	117,510
San Antonio	265,170	375,580	624,370
Nueces	155,030	140,140	153,790
Total	475,545	593,710	895,675

The best information available shows clearly that each of these major sectors of water use is an important contributor to the regional economy. The proportional need for water is expected to change over the next 50 years as people shift their way of living. Agricultural demands will continue and increasing numbers of people will concentrate in municipal areas. At the same time, these increasing urban concentrations are expected to impose heavier demands on recreational opportunities. The interdependence of the various parts of the regional community will continue to grow.

WHAT CAN WE DO TO ENHANCE WATER AVAILABILITY?

Significant actions have been taken and are underway to make the best use of water available to us, and to look at additional sources. Some of these possibilities are:

Water conservation

The potential savings to be achieved through reduced water usage and avoidance of water waste applies both to saving money in water rates or pumping costs and saving water in storage in the Aquifer. The 1984 drought was a trigger and a test for Operation Water Conservation by the City and the District. Results showed conclusively that conservation can be an effective tool of water management in times of drought crises, reducing water consumption potentially (for short periods) as much as 30 %. For the long haul, public awareness of the potential savings to each user could reduce the demand on the Edwards by as much as 10 to 15 %.

Water reuse

Direct reuse of wastewater for public consumption with present technology does not appear to be a cost-effective option for the Region. Too many unanswered questions of effects on public health remain. However, the possibility of reuse for specific purposes such as watering golf courses and other public recreational facilities, industrial uses, flow for the San Antonio River downtown, some irrigation uses — all offer significant potential.

Weather modification

The District conducts a weather modification program begun in 1985 under a 4-year permit from the State. The purpose is to enhance rainfall possibilities from unstable moist air masses moving inland from the Gulf of Mexico. The target area includes parts of the Edwards Plateau and Uvalde and Medina Counties. The program goal is to increase rainfall in the target area by 10 to 15 %. Measured results of the program's effectiveness will not be available until its conclusion in 1989.

Desalting

Saline waters are available for desalting in formations underlying the Edwards Aquifer. Some of the same processes are applicable in reclaiming waste water. Cost of pumping, high energy costs, and problems in disposal of residual salts are major constraints in exploring this potential.

Import to the Region

Water can be transported from outside the Region to supply needs. Most attractive possibilities from the standpoint of geographic proximity are the Colorado River and the Rio Grande. High costs of transmission and storage coupled with the present heavy demands on both these river systems make both the cost and legal factors seem prohibitive for an import to our Region.

What is being done now?

Additionally, a number of programs are now underway to make maximum use of available water. The Region is now practicing a number of Aquifer protection measures to avoid damaging quality. The District has built and operates recharge dams. The City has undertaken major steps to improve and maintain high standards of wastewater treatment, and has directed a close look at reuse. These possibilities have been examined. They must be pursued vigorously, but with a clear understanding of their costs and limitations.

SO WHAT IS THE BALANCE BETWEEN SUPPLY/DEMAND?

Managed prudently, the Edwards and our rivers can provide adequately for all the Region's water needs, and can continue the orderly flow of water from the Region to sustain downstream uses.

The streamflow of the Nueces, San Antonio, and Guadalupe-Blanco River Basins is committed under state appropriative water rights law to uses both in the Region and downstream to the coast and into the bays and estuaries.

During periods of average or more rainfall, available water sources can meet present levels of demand. When rainfall and riverflow are below average (as in the 1950's and as recently as the summer drought of 1984) the balance shifts. Water levels decline severely, springflow decreases or disappears and streamflow is reduced to almost nothing.

WHAT ARE OUR CHOICES?

The Region has choices as to the future of its water resources and their use and protection. One choice would be to do nothing and let things go on as they are going. Another choice would be to use the water in storage in the Edwards in amounts exceeding the amount of annual recharge. While this choice may be attractive in the short run, it leaves the Region vulnerable to the long term consequences of lowered water levels and hazards to water quality on a permanent basis. Use of stored water might be combined with alternatives of surface water reservoirs.

The results of continuing as we are now doing will be damaging to the lifestyle and pocketbook of almost every person and family living in the 5-county area. We will not all suffer the same damages, but we will all suffer losses. Some of those losses will be permanent and irreversible.

There are positive steps the Region can take. The Regional Study defined three alternatives to continuing present policies that we can consider, accept, modify, or combine depending on how they meet our needs. The features of the alternatives are:

- Physical facilities, such as surface lakes and pipelines to move water
- Pumping options for the Edwards
- Financial options for equitable cost-sharing
- Legal options for making sure decisions are made locally and regionally.

All of these pieces are interchangeable among alternatives. They are like building blocks: if they fit, we can use them; if they don't fit, we can reject them or change them.

These framework alternatives to continuing present policies are:

Alternative I

Leave present laws and institutions in place; construct surface water reservoirs as and where needed and physically possible.

Alternative II

Revise present laws and institutions as required to achieve more comprehensive management of water resources and provide water needs. No surface water reservoirs would be constructed.

Alternative III

Revise present laws and institutions as required. Construct surface reservoirs as needed.

Our choices:

Using the options the various building blocks offered us will allow us to:

- Combine all or any parts of the broad alternatives and/or retain what is now in place.
- Place any of the pieces into operation as they are needed and desired.
- Adapt any of the separate physical, economic, political, and financial building blocks to the time and part of the Region where it is needed.

As we move forward, an active, flexible, planned program of implementation provides the Region with:

- Assurance of long-term water supply and best opportunity to avoid impacts of serious droughts
- Protection of local and regional decision-making against possible federal or state intervention that may occur in the absence of regional initiative
- Protection of an invaluable resource and assurance of its availability for future generations.

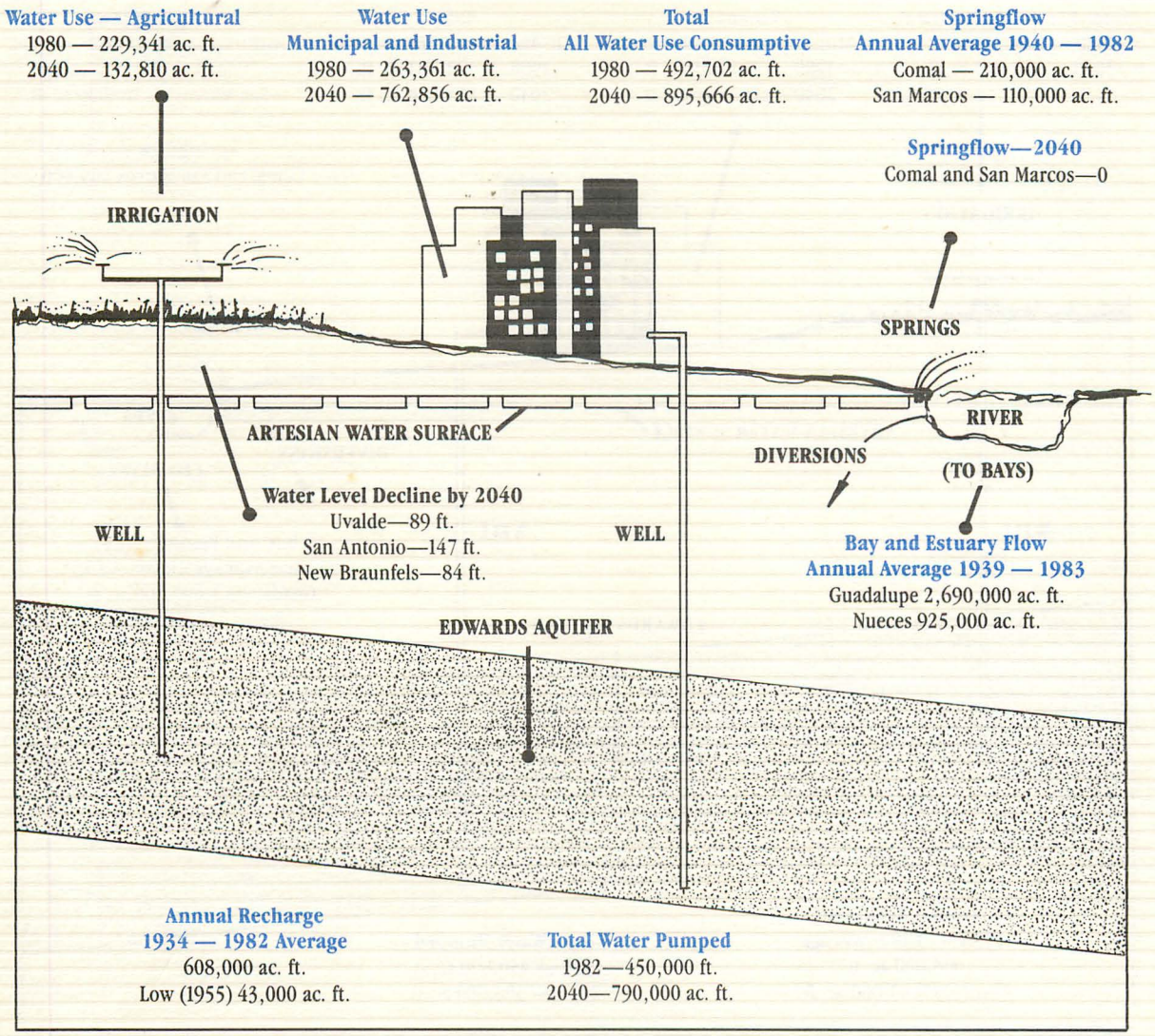
WHAT WOULD BE INVOLVED: IN CONSTRUCTION AND IN COSTS?

Remembering the analogy of building blocks, the three alternative frameworks give the Region choices. More importantly the framework plan provides flexibility so we can choose and schedule specific actions over time as our water needs and financial situation indicate that action should be taken. Cost will be determined by whether and when specific projects are put into line for construction.

The three alternatives offer these graphically presented overall frameworks of choice. Remembering that any piece can be selected, and that there is no need to buy the package whole if it does not fit our needs. The following shows what is included in each alternative, some pros and cons of each, information on costs of each to individuals, and methods by which these costs could be recovered. Any system of charges to recover costs would need to be carefully designed and applied to make certain that costs were borne in proportion to the benefits to each user and area.

OUR ALTERNATIVES

PRESENT POLICIES

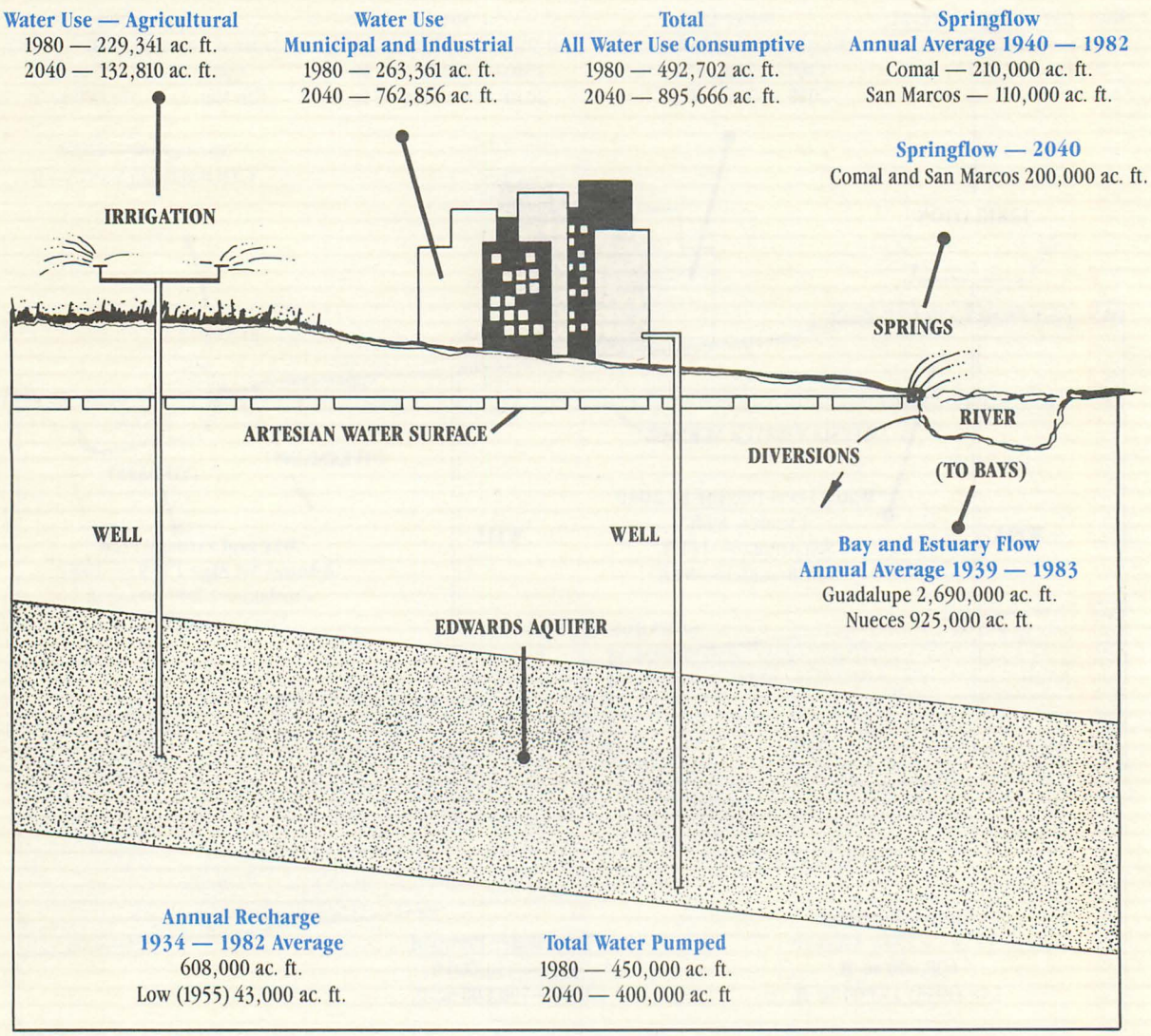


Available Water Resources—Reservoirs
Yield 2040—420,000 ac. ft./yr.

Percent of Total Use Met with Firm Supply Ground and Surface
60 %

Percent Pumped and Discharged from Edwards in Excess of Recharge
30 %

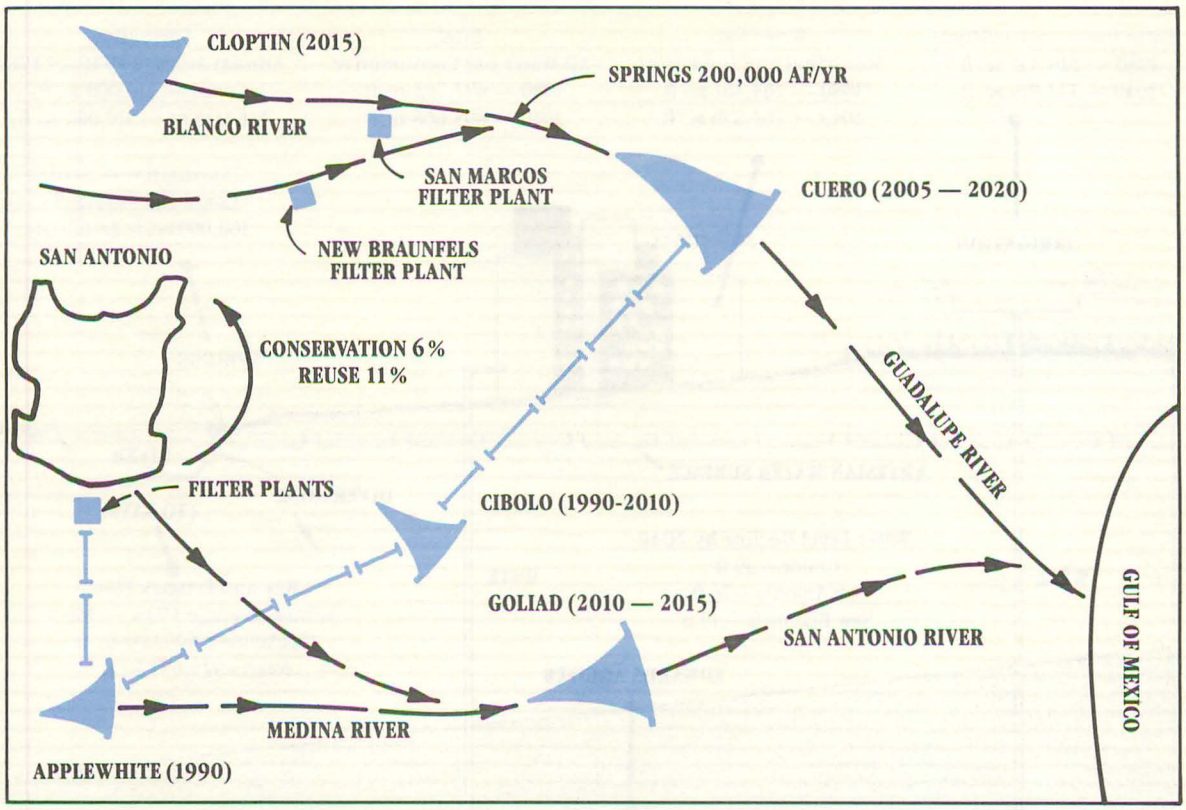
ALTERNATIVE I



Available Water Resources — Reservoirs
Yield 2040 — 810,000 ac. ft./yr.

Percent of Total Use Met with Firm Supply — Ground and Surface
85 % — Percent pumped is charged from Edwards in excess of recharges

ALTERNATIVE I



DESCRIPTION

- New reservoirs, no new laws
- Edwards pumpage — 10 % less than 1982
- Voluntary conservation

IMPACT

- Maintains economic growth, springflows, and bays
- Protects Edwards water quality
- Highest water cost increases for participants

COST

San Antonio City Water Board Users

Costs could increase by as much as 70 % from current average rate per month of $10.00 up to $17.00 per month by 2040.

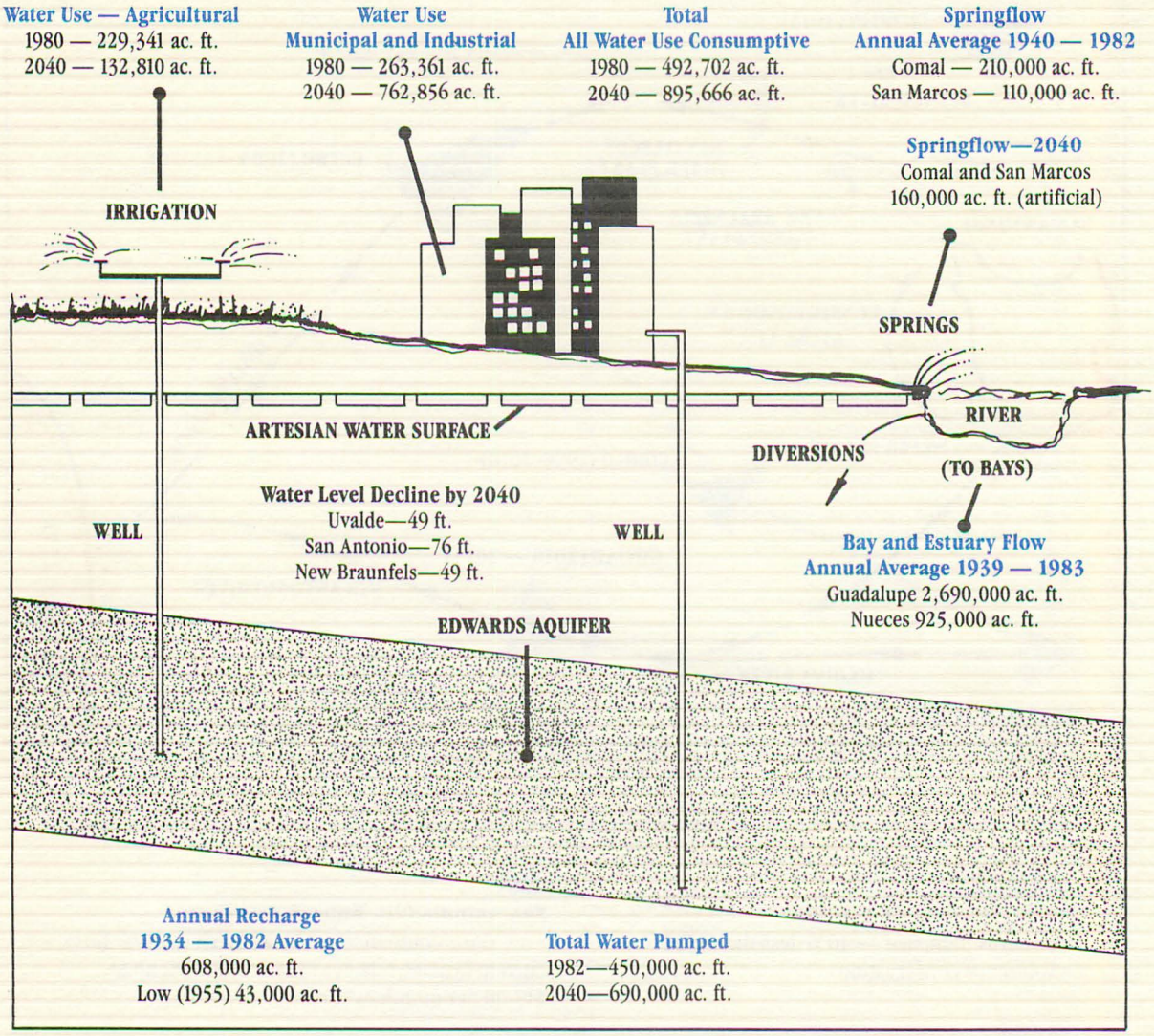
Uvalde Farmer

Pumping costs could increase by 10 % from $2,700 per year to $3,000 per year by 2040.

Cost — $1.7 Billion

Cost recovery could be achieved by applying user charges, ad valorem taxes, and connection charges to municipal users in San Antonio, San Marcos, and New Braunfels after costs are incurred.

ALTERNATIVE II

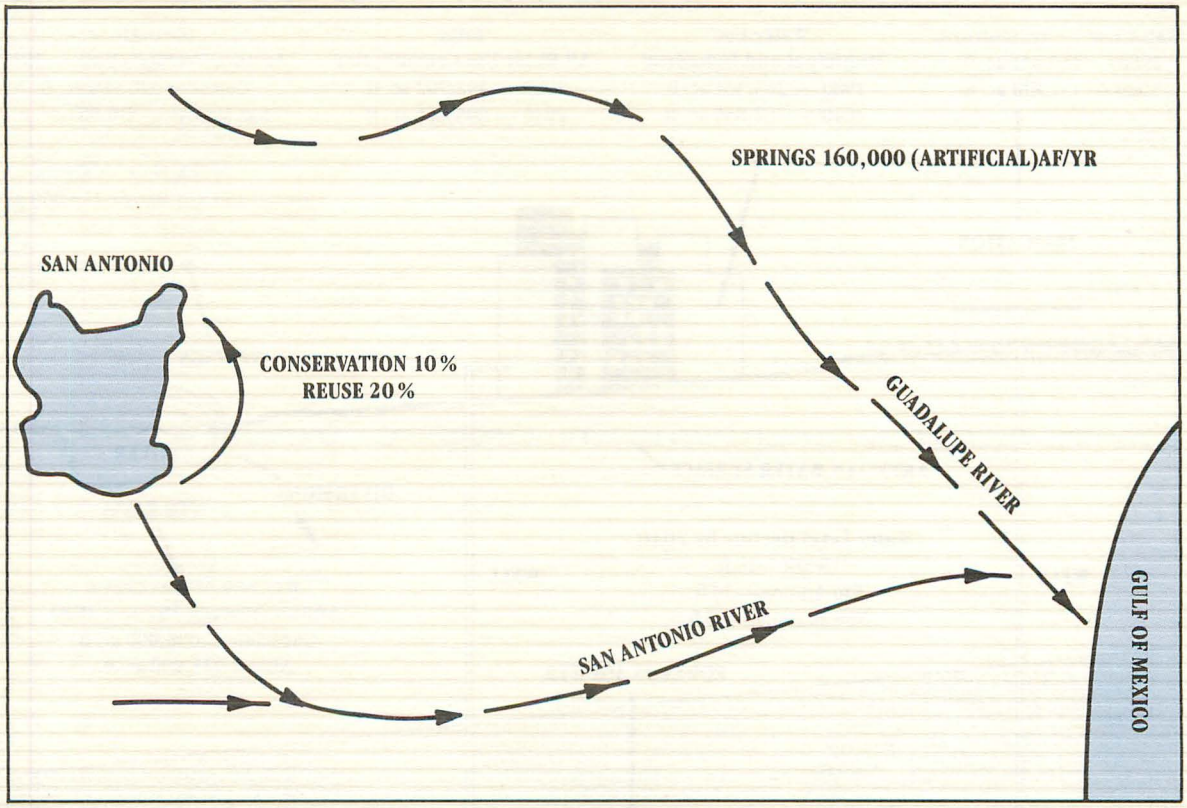


Available Water—Surface Reservoirs
Yield 2040—420,000 ac. ft./yr.

Percent of Total Use Met with Firm Supply Ground and Surface
65 %

Percent Pumped and Discharged from Edwards in Excess of Recharge
15 %

ALTERNATIVE II



DESCRIPTION

- New laws, no new reservoirs
- Edwards pumpage 50% more than 1982 (15% overdraft)

IMPACT

- Does not maintain economic growth
- Danger to Edwards water quality
- Mandatory conservation
- Lowest water cost increase for participants
- Springs go dry frequently
- Maintained artificially
- Potential for federal action to protect instream flows and bays and estuaries

COST

San Antonio City Water Board Users

Costs could increase by as much as 20% from current average rate per month of $10.00 up to $12.00 per month by 2040.

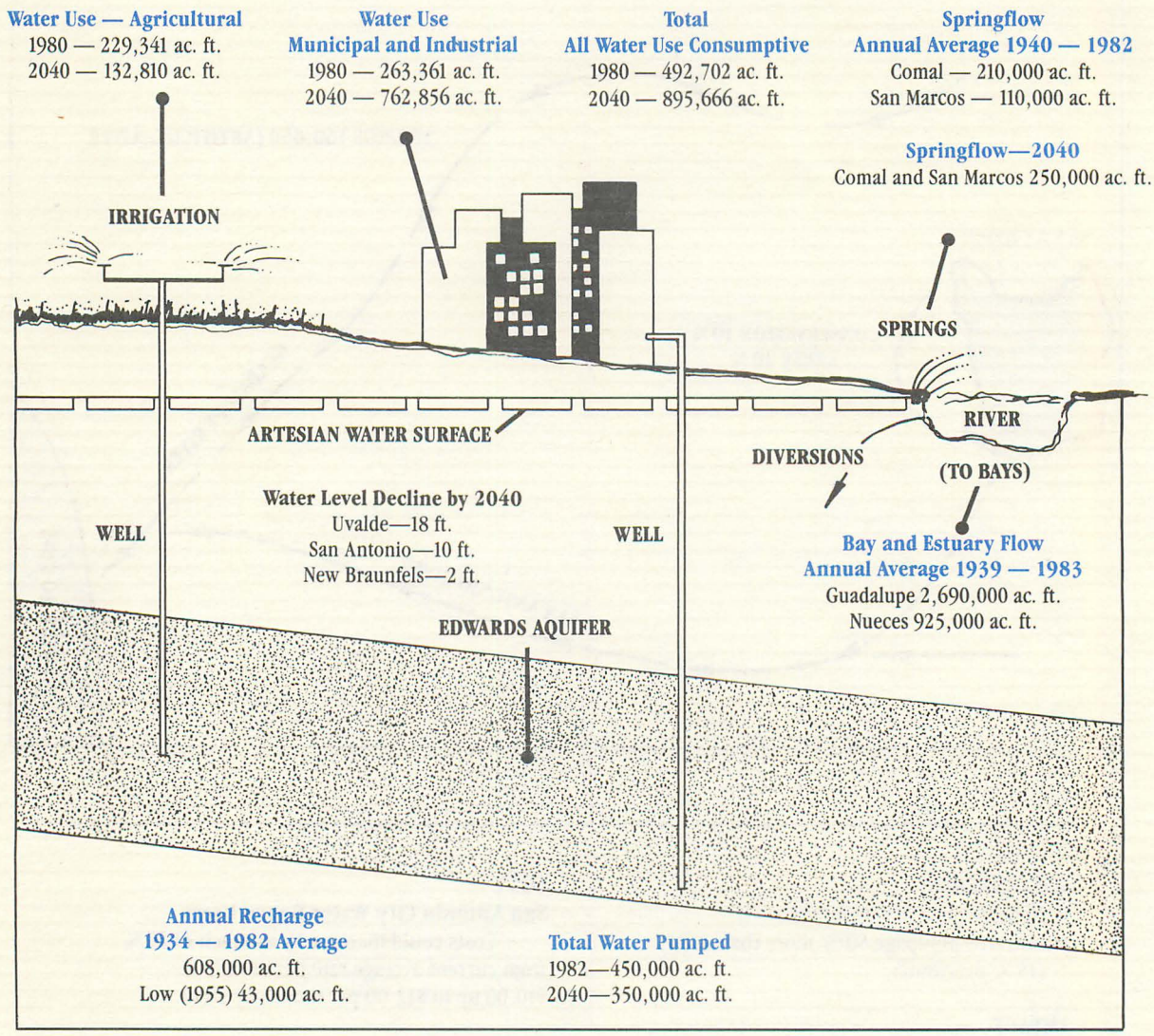
Uvalde Farmer

Pumping costs could increase by 45% from $2,700 per year to $3,900 per year by 2040.

Cost—$0.5 Billion

Cost recovery could be financed through pumpage fees, user charges, sales taxes, ad valorem taxes, and connection fees in the five county area.

ALTERNATIVE III

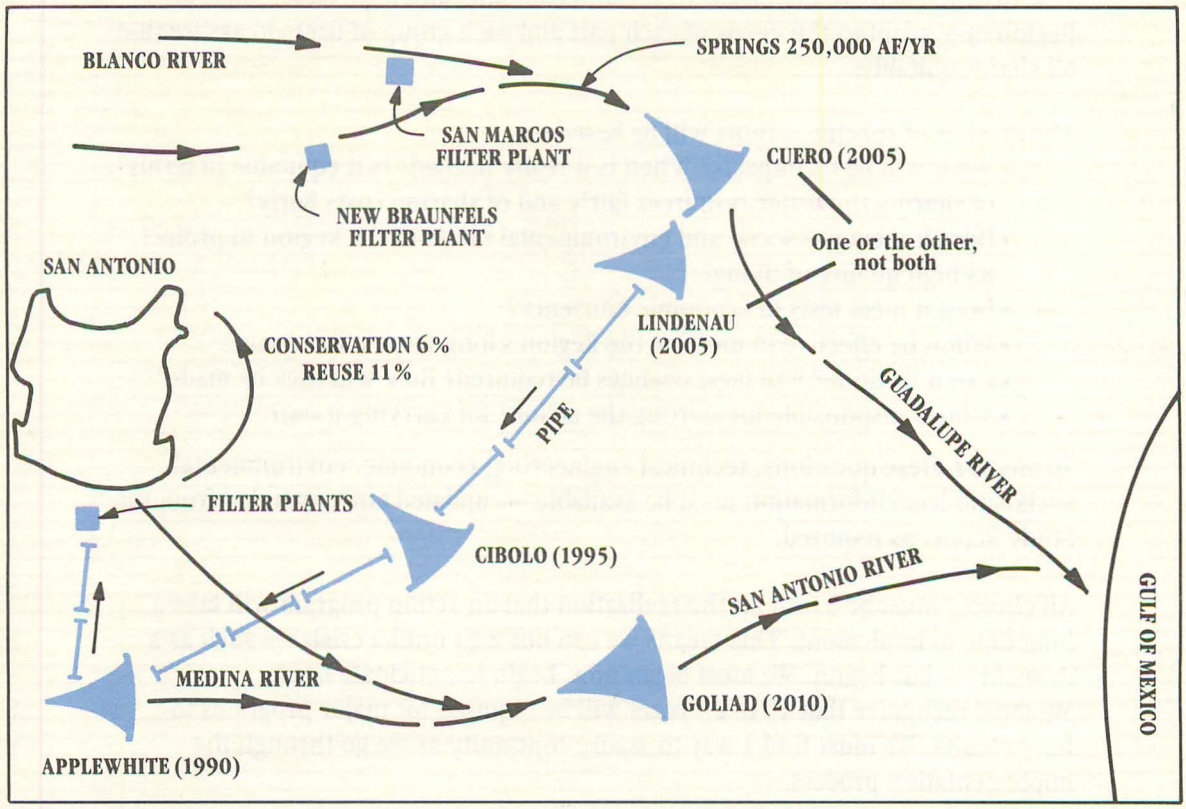


Available Water—Surface Reservoirs
Yield 2040—930,000 ac. ft./yr.

Percent of Total Use Met with Firm Supply Ground and Surface
90 %

Percent Pumped and Discharged from Edwards in Excess of Recharge
0 %

ALTERNATIVE III



DESCRIPTION

- New reservoirs, new laws
- Edwards pumpage 20% less than 1982

IMPACT

- Maintains economic growth and springflows
- Protects Edwards water quality
- Voluntary conservation
- Medium water cost increases for participants

COST

San Antonio City Water Board Users

Costs could increase by as much as 50% from current average rate per month of $10.00 up to $15.00 per month by 2040.

Uvalde Farmer

Pumping costs could increase by 30% from $2,700 per year to $3,500 per year by 2040.

Cost—$1.8 Billion

Cost recovery could be financed by applying one or more of the measures available to water users throughout the five counties.

HOW TO CHOOSE? WHEN TO CHOOSE?

These are the broad framework alternative for the choices to be made. Within each are the physical, social, economic, and legal factors that the Region may adapt to the needs of each part and each group of users to assure that all share equitably.

The choices of specific actions will be based on:

- What will be its impacts? When is it really needed? Is it equitable in terms of sharing the water resources fairly and of sharing costs fairly?
- Does it meet the social and environmental needs of the Region to protect its high quality of living?
- Does it meet tests of economic efficiency?
- Will it be effective in meeting the Region's long-term water goals?
- Can it be done? Will legal changes be required? How will they be made?
- Who is responsible for starting the action? for carrying it out?

To answer these questions, technical engineering, economic, environmental, social and legal information must be available — updated and expanded from the Study Report as required.

All choices must be based on the realization that an action program will take a long time to implement. This means we can not wait until a crisis — such as a drought — has begun. We must begin now, begin to anticipate needs. We must recognize that 10 to 20 years will be required for major programs to have results. We must find a way to assure continuity as we go through the implementation process.

HOW WILL COSTS BE MET? CAN THEY BE CONTROLLED?

Federal financial support for developing surface water supplies for the Region cannot be expected under present administration policies and budgetary constraints. Some federal assistance could be available for specific water quality protection programs, but would potentially involve significant federal regulatory management of water use and allocation in the Region. Some limited state financial assistance could be available for local projects where hardship is demonstrable. No state financial assistance programs are available on a broad regional scale. Thus, the Region must look to its own resources for financing, and must solve its own financial needs.

As shown on the previous pages, there are costs associated with any of these alternative actions just as there are costs associated with inaction. The difference is that by taking a planned course we can control those costs.

We can control costs, if the Region continues a strong planning capability that keeps a regular update on changes in population, in economic indicators, in physical indicators such as water levels, stream flows and quality conditions.

With continuity in planning, no cost for any action needs to be incurred before it is needed, and can be scheduled far enough in advance that costs can be subjected to proper public scrutiny and decision.

With this flexibility, costs can be scheduled for best conditions of bond markets and other financial sources.

An important question is how these costs will be paid and who will pay them? There are several ways the Region can consider to recover these costs. They include:

- User charges (water bills)
- Water availability charges (hook-up charge for new customers)
- Property taxes
- Sales taxes
- Well permit fees (similar to hook-up charge)
- Well pumpage fees (charge to independent well owner per volume of water used).

Additionally, such things can be considered as a "lifeline rate" to protect needy people using minimum amounts of water from incurring increased water costs.

These methods could be applied to those water users who were getting the benefits from the developments for which costs were incurred. That is, for example, if the City of San Antonio was going to use a substantial amount of the water from a surface lake, then the City of San Antonio properly would pay proportionately the costs of constructing the reservoir. If a pipeline was built to transport water to supplement the Edwards, particularly in times of drought, then residents of those counties would properly pay for the cost of the pipeline. The goal is to insure the equity involved in each user of water paying a fair share of costs to assure continued availability of that water. Thus, it will be possible to reach agreements and trades among users and areas as decisions are made. The important thing is that we can decide when to incur costs and for what purpose, who benefits, and how the costs will be recovered.

WHO WILL MAKE THE DECISIONS? HOW?

We, the individual voters in the Region, will have the opportunity to guide the decisions by:

- Being informed,
- Talking to our neighbors in the Region to get their points of view, and
- Talking to our elected officials so they can reflect our choices.

By undertaking that responsibility, we will have taken our best action to avoid having decisions made for us at state or federal levels.

By knowing the facts — and acting on facts rather than fear or ignorance — we can make decisions that benefit us as individuals and the Region as a whole. Only by protecting all of the Edwards Aquifer can we be sure that the area where we have our wells, or buy our water, or enjoy our springs, will be protected.

Our decisions will be implemented through the political process. Knowing the facts, we can elect our local and state officials and legislators on the basis of their understanding of water issues. We can communicate our concerns and our preferences directly to those officials who are responsible for making decisions.

GLOSSARY

Acre-Foot
The quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet, 325,851 gallons, or 1,233 cubic meters.

Aquifer
Any zone below the surface of the earth which stores, transmits, and yields water in sufficient quantities for human use.

Artesian Aquifer
One type of aquifer in which two impermeable layers surround one permeable, water-bearing layer. The water is confined and stored under pressure and will rise above the top of the aquifer when penetrated by a well.

Bad Water
Characterized by having more than 1000 mg/l of dissolved solids. It may be low in dissolved oxygen, high in sulfates and have a higher temperature. The "bad water line" is the southern boundary of good water in the Edwards Artesian Aquifer.

Base Flow
Stream flow originating from groundwater discharge; also referred to as groundwater runoff. During extended dry periods all stream flow may be contributed by base flow.

Capture, Rule of
The Texas rule under which underground water is regarded as the property of the owner of the surface. Thus each owner can "capture" for use percolating waters before they leave his premises, provided only that he does not waste the water or maliciously harm his neighbor.

Discharge
The volume of water that leaves an aquifer either by natural or man-made processes.

Edwards Aquifer
Water bearing zone comprised of Edwards and associated limestones.

Edwards and Associated Limestones (Edwards Formation)
Layers of sediment, deposited during the Cretaceous period which later become limestone rock.

Edwards Aquifer Region
Region of Texas which obtains its water from the Edwards Aquifer. This area consists of the recharge zone and the artesian zone of the Edwards Aquifer.

Estuary
An area where fresh water from rivers mixes with salt water from the sea and is characterized by reduced salinity. Estuaries are important nurseries for many marine species.

Evaporation
The process by which liquid water is transformed into gaseous water vapor due to the heat of the sun.

Faults
Fracture of the earth's crust accompanied by movements.

Impermeable
Material (such as dense rock) that will not permit liquid or water to flow through it.

Infiltration
The process of water entering the ground through cracks, soil or porous rock.

Pollutant
Any substance which restricts or eliminates the use of a natural resource.

Porosity
Any property of geologic formations which have the ability to hold and yield water due to the spaces between particles.

Recharge Zone
The area where a formation allows available water to enter the aquifer.

Return Flows
Water discharged to surface or ground water sources after use, with or without treatment.

Water Table
The part of the aquifer nearest the surface or the upper surface of the zone of saturation.

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