LOWER PECOS VALLEY REGIONAL WATER PLAN

EXECUTIVE SUMMARY

Introduction

The Lower Pecos Valley constitutes Regional Water Planning Area 10 of the statewide water-planning program authorized in 1987 by the New Mexico Legislature. The objectives of the regional water plans are to answer questions about the water supply and the projected water requirements and to present a plan for meeting regional water requirements. Regional planning is intended to reflect the water-related goals and the knowledge of the public and the governing bodies of the region. The 16,800 square-mile Lower Pecos Valley planning area is displayed on attached Atlas Plate 1.

The Pecos Valley Water Users Organization (PVWUO) was formed under a joint powers agreement in 1995 to develop the Regional Water Plan for the Lower Pecos River Basin. The PVWUO planning process follows the outline of the Regional Water Planning Handbook released in 1994 by the New Mexico Interstate Stream Commission (ISC) as it applies to the Lower Pecos Valley.

Plan of Development Process

The ISC sponsored a workshop on planning methods in 1995 in Roswell. Citizen participation was obtained in 1995 and 1996 by public meetings in Artesia, Carlsbad, Fort Sumner, Roswell, Dexter / Hagerman, Hope / Mayhill and Ruidoso / Capitan and through public comment from over 250 participants. Data was collected from the meetings where translation and American Disabilities Act services were provided. Twelve governing bodies are represented in the membership of PVWUO. Draft report material was reviewed by the public and by the ISC in 1999. Public comments from a final draft in year 2001 are integrated in the water plan.

PVWUO used volunteers and consultants in compiling information. Volunteers numbered in the dozens and each was essential to the process. Advisors providing specialized technical information include Woods E. Houghton, William H. See, Balleau Groundwater, Inc. and Enwater Resource Consultants, L.L.C.

The background information for water planning is compiled and presented in six sub-areas of the planning region. The declared New Mexico Office of the State Engineer groundwater basins (Fort Sumner, Roswell, Hondo, Peñasco, Carlsbad and Capitan) are the basic units for water inventory. Areas of De Baca, Chaves, Eddy, Lincoln and Otero Counties are in the planning region. The six declared groundwater basins are described in detail in terms of the resource base, economic conditions and historical patterns of development. The information is for understanding the background and current baseline of water operations in each area. A description of hydrogeology, groundwater use, historical water-table decline trends and the volume of water resource stored in aquifers is given for each of the six groundwater areas. A detailed review of management alternatives to increase supply and to control demand in each sub-basin is presented. The discussion addresses changes to existing works, replacement of facilities, water banking, drought and flood considerations, existing conservation efforts for agriculture, public and domestic supply and vegetation management in each sub-basin and the potential for imported water supplies. Costs and benefits of past programs are presented. The extensive review is a sound basis for evaluating a range of alternatives in the future.

Topography in the planning region ranges from near 12,000 feet in elevation at Sierra Blanca to 2870 feet in elevation on the Pecos River at the New Mexico / Texas line. The growing season may exceed 200 days. Population in year 2000 was 139,000 and municipal centers of population are expected to double in 40 years. Land is held by private owners (7914 square miles), federal public domain (4824 square miles), state land (2498 square miles), National Forest (1284 square miles), Mescalero Reservation (500 square miles) and others totaling 16,800 square miles.

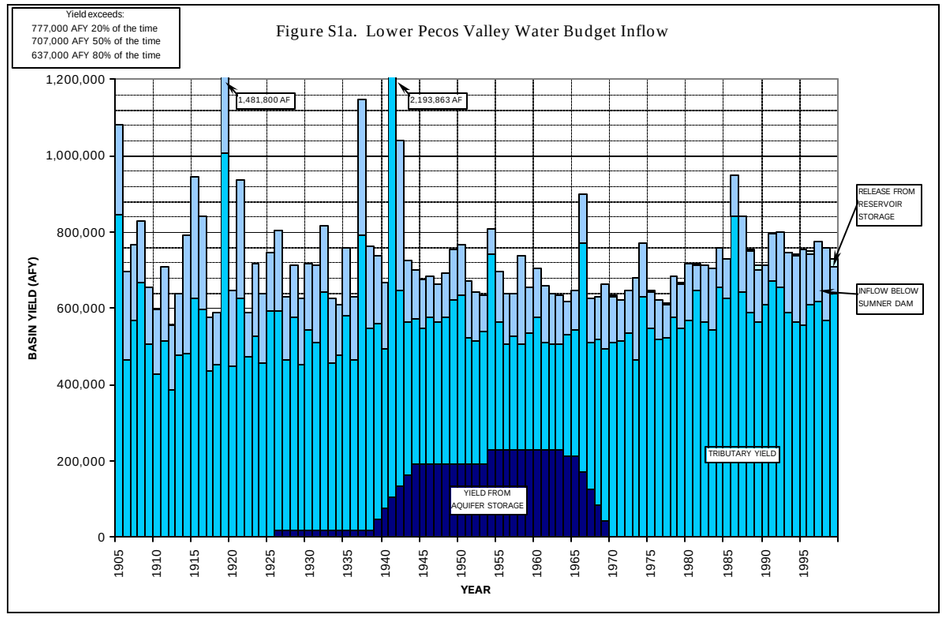
An economic overview of the region shows that various sectors are growing while others are shrinking. The dairy industry is expanding rapidly; other agriculture is neutral. The urban economy is expanding. Economic productivity associated with water is currently valued at $50 to $100 per acre foot (AF) in the region. Future water requirements are projected to arise from a changing emphasis among existing economic sectors, but not from any foreseeable dramatic increase in regional water requirements.

The legal status of water in the basin is a fundamental constraint on planning. The principles of water-resource management applied in the regional plan are outlined. The guiding principle of the PVWUO is that, after adjudication determines by court decree the amount and priority of all water rights, then economic and political direction by interested parties will necessarily determine the correct pattern of contemporaneous water use. The Lower Pecos Valley Regional Water Plan does not prescribe future uses, but instead recommends means to expedite flexible use of the resource as future generations and economic trends require. The plan is analogous to a trail map, not a forced march. The legal context of basin decrees, interstate compact obligations, administrative guidelines and watermaster and owner-manager practices in exercise of their legal rights are critical factors in finding that flexibility. Ongoing litigation lends some uncertainty to the future legal constraints.

Environmental and endangered species requirements for water are uncertain. Habitat designation and recovery is provided in the plan by the same mechanisms as other changes in water requirements for various sectors.

The planning process requires an understanding of the balance of historical sources and uses of water in the basin. The overall use of water cannot exceed the long-term average basin yield available from direct runoff and baseflow of streams, except as the basin yield is leveled-out by temporary accretions to, and releases from, storage. The stored resource in surface reservoirs and in underground aquifer reservoirs serves to accommodate short-term periods of excess and shortfall. Surface-water reservoirs in the basin can provide a few years of carryover storage capacity. The basin is fortunate to contain a world-class set of solutionized-limestone aquifers (San Andres and Capitan Reef Limestone), and basin-fill aquifers that provide decades of carryover storage. The aquifers have been operated successfully to deplete millions of AF of their stored contents during drought and to partially restore the stored volume during wet periods. Such aquifer operations are part of the plan for providing future flexibility in the basin. However, the scale of future aquifer operations is not expected to reach that of the 1950's and 1960's. The feasibility of importing water to raise the average yield available is examined.

Figure S1a. Lower Pecos Valley Water Budget Inflow



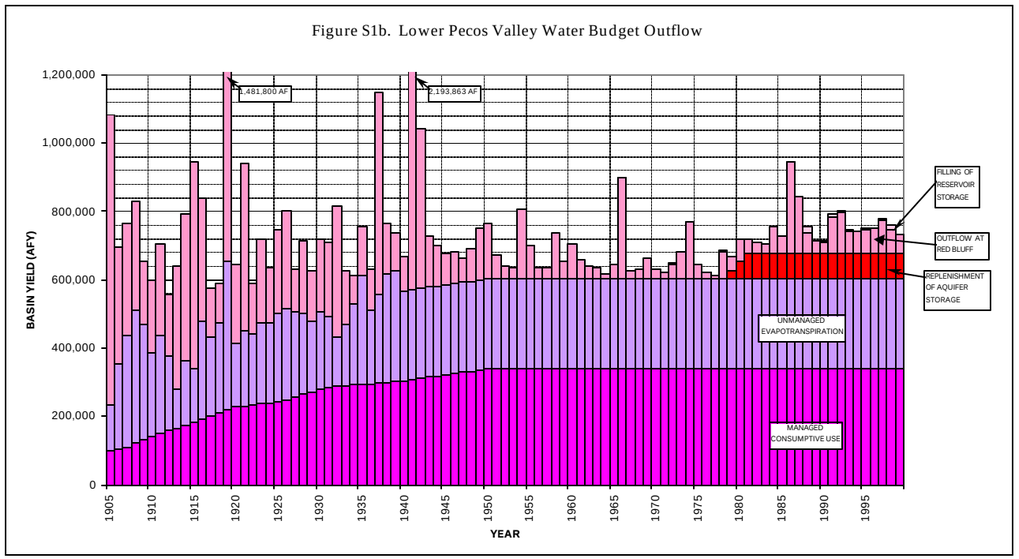
In developing the water plan the historical balance of sources and disposition of water is quantified, as shown on Figure S1a and S1b and illustrated diagrammatically on Figure S2. Future action can do little to alter the basin sources of water, but the unmanaged water losses are amenable to salvage. Intervention in the passive, unmanaged water losses also can enhance the riparian environment by restoring the native mosaic of vegetation cover and enhancing in-stream flows. Consumptive use by agriculture on 128,400 acres totals 321,000 AFY. Reservoir evaporation consumes another 19,000 AFY. Areas of irrigation, riparian vegetation and mountain forest are shown in Atlas Plate 12.

The average annual inflow and outflow of water since 1947 and in the recent decade are compared in Table S1.

Table S1. Lower Pecos Valley Average Water-Balance Amounts

Component	Average amount in the 1990's (AFY)	Average amount since Compact (AFY)
Inflow Components		
Inflow below Sumner Dam	145,000	130,000
Tributary Yield	609,000	491,000
Yield from Aquifer Storage	0	85,000
Sum of Inflow Components	754,000	706,000
Outflow Components		
Outflow at Red Bluff	-75,000	-75,000
Managed Consumptive Use	-340,000	-340,000
Unmanaged Evapotranspiration	-263,000	-263,000
Filling of Reservoir Storage	-1000	0
Replenishment of Aquifer Storage	-75,000	-28,000
Sum of Outflow Components	-754,000	-706,000

Figure S1b. Lower Pecos Valley Water Budget Outflow



The volume of water stored in the first 100 feet below the water table throughout the basin is 88 million AF. That amount is planned to support domestic and stock wells and may be appropriated for other purposes only where any interrelated surface-water depletion can be securely offset.

Unmanaged riparian vegetation in the planning area totals 70,500 acres consuming over 210,000 AFY. Non-reservoir open-water evaporation is over 50,000 AFY. McMillan Delta between Artesia and Brantley Reservoir consumes about ten percent of the total unmanaged riparian loss.

Mountain forests above elevation 7000 feet contain 817,000 acres consuming 22 inches of water or 1.5 million AFY. That amount is not subject to major alteration by management, although the potential for gaining a small rate of yield remains to be tested in the field. Imported water from Lea County adds some water to the basin.

The runoff to the mainstem Pecos River and the tributaries varies about ± 40 percent from average runoff in the driest one-in-five or the wettest one-in-five years. Diversions for agriculture and other uses have varied ± 15 percent. Accordingly, the water plan must provide for that level of variability in supply about 20 percent of the time (one in five years). The Roswell artesian aquifer is capable of leveling out shortage to that degree.

The drought of the 1950's was significantly worse than any other drought in 300 years, according to indexes developed from measurements and tree-ring data. Such a severe degree of drought is not expected to be repeated in the 40-year planning horizon.

Water-quality assessment is part of the planning process. Salinity is the major quality issue in the basin. Water quality deteriorates downstream, but is not worsening through the years. Designated uses and associated water-quality standards are reviewed along with the federal and state permitting programs for dischargers. Known contamination sites are identified. Total maximum daily loads are reviewed on reaches where stream standards are not fully supported, including the Pecos River from Tansill Dam to Black River, Rio Ruidoso above the Ruidoso Waste Water Treatment Plant, Rio Bonito to Angus Canyon and the Rio Peñasco. Man-made contamination is relatively less of a concern in the basin than are natural water-quality problems.

Due to several wet years and decreased consumption of water in the last decade, basin yield has been about 50,000 AFY higher than characteristic for the compact period since 1947. The basin has produced 754,000 AFY in the 1990's and consumed 340,000 AFY under managed beneficial uses and 263,000 AFY under unmanaged passive losses from vegetation in shallow water-table areas along the river. A further benefit of the wet years is replenishment of Roswell Basin aquifer storage at rates near 75,000 AFY. The average yield for the compact period since 1947 has been 706,000 AFY. Less water should be expected in the future than has been seen in the 1990's.

The median yield of surface water expected for planning purposes is 660,000 AFY based on records since 1905.

Water use and demand is presented for each of the six groundwater basins. Irrigation, public water supply and water rights are outlined. The basin-wide watermaster record of surface-water and groundwater diversion is charted. Surface diversion averages 167,000 AFY. Well withdrawal averages 369,000 AFY. These are part of the larger basin total withdrawal. Diversions fluctuate depending on dry or wet years. Other categories of use are listed for the basin as a whole. All community water systems are identified. Commercial, mining, domestic, livestock, recreational and other uses are tabulated.

Conveyance loss and return flow is quantified at about ten percent of diversions and 40 percent of diversions. Return flow largely is reused so that 693,000 AF (year 2000 estimated) of total withdrawal, including reuse at a level of 40 percent of withdrawals, leaves water to deliver to Texas in the stream at the bottom of the basin. The obligation to Texas in 1998 was 81,800 AFY.

Water rights total 966,000 AFY. About two-thirds of decreed rights are in exercise.

Future water requirements are projected for the basin. No new appropriations of water are anticipated. Salvage of unmanaged losses, however, can help support existing appropriations and growth. Each county and each category of use is projected to grow to year 2035, then the total for the basin is derived for year 2040. About 25,400 AFY of expanded water-withdrawal requirement for non-agricultural uses is projected as shown on Table S2. Agriculture, mining and environmental requirements are not predicted due to the variable history and unknown future of those sectors. They are planned to be provided by obtaining additional water or giving up current water to suit actual requirements in the future.

Findings

The water-planning process described above has led the PVWUO to the findings outlined in Table S2 regarding supply and demand.

Table S2. Planning Factors in Lower Pecos Valley

1.	Economic Value of Water	$50-$100 / AF
2.	Sources of Water since 1947:	
	Inflow below Sumner Dam	130,000 AFY
	Tributary yield in basin	491,000 AFY
	Wellfield Yield from Aquifer Storage	85,000 AFY
	Total Sources	706,000 AFY
3.	Disposition of Water Since 1947:	
	Outflow to Texas	75,000 AFY
	Managed Consumptive Use	340,000 AFY
	Unmanaged Vegetation Evapotranspiration	263,000 AFY
	River Refilling Aquifer Storage	28,000 AFY
	Total Outflow	706,000 AFY
4.	Surface Water Yield (No Yield from Aquifer Storage)	
	Median Since 1905	660,000 AFY
	Wet Year in Five	765,900 AFY
	Dry year in Five	545,000 AFY
5.	Precipitation Input	13.1 million AFY
6.	Aquifer Storage to 100 feet	86 million AF
7.	Supply Variability as Percent of Average	± 40 percent
8.	Use Variability as Percent of Average	± 15 percent
9.	Drought of 1950's	Worse case in 300 years
10.	Water Quality	Minor factor
11.	Recent Decade	Anomalously wet; good recharge and runoff
12.	Mountain Vegetation consumptive use at 817,000 acres	1.5 million AFY
13.	Watermaster Surface Diversions, (Average ± 15 percent)	169,000 AFY
14.	Watermaster Well Withdrawals, (Average ± 15 percent)	369,000 AFY
15.	Estimated 2000 Total Withdrawal - Including Reuse	693,000 AFY
16.	Acreage in Irrigation (early 1990's)	128,440 acres
17.	Obligation to Texas in 1998	81,800 AFY
18.	Roswell Groundwater Basin: Pecos River Depletion,	
	10 year	50 percent of pumping
	20 year	75 percent of pumping
	50 year	90 percent of pumping
19.	Future Agricultural, Mining and Habitat Recovery Requirement	Uncertain
20.	Sector Growth to year 2040:	
	Domestic	+ 668 AFY
	Livestock	+ 231 AFY
	Commercial	+ 2857 AFY
	Industrial	+ 431 AFY
	Municipal	+21,208 AFY
	Total	+25,395 AFY
21.	40-year Growth as Fraction of Supply	4 percent

Alternatives

Seventeen alternatives and several subdivisions of alternatives in addition to a baseline of no-action are evaluated in terms of water yield; cost; feasibility in technical, legal and political terms; and impacts in hydrologic, environmental, social and economic terms. The alternatives are:

Alternative 1 – Enhanced Water Market
Alternative 2 – Managed Wellfield Operations
Alternative 3 – Agricultural Water Conservation
Alternative 4 – Moving Reservoir Storage
Alternative 5 – Municipal Water Conservation
Alternative 6 – Industrial Water Conservation
Alternative 7 – Riparian Vegetation Management
Alternative 8 – Watershed Management
Alternative 9 – Dewatering of McMillan Delta
Alternative 10 – Desalination
Alternative 11 – Construction of Interstate Pipeline
Alternative 12 – Cloud Seeding
Alternative 13 – Construction of Large Reservoirs
Alternative 14 – Aquifer Storage and Recovery
Alternative 15 – Reduce Reservoir Surface Area
Alternative 16 – Reducing Conveyance Losses in Pecos River
Alternative 17 – Import Water from Salt Basin

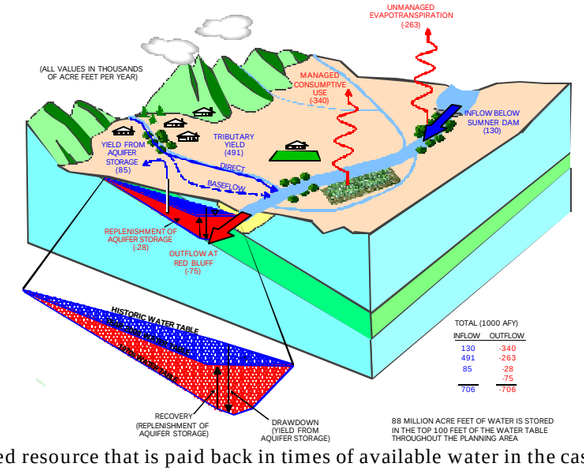
The alternatives are described and evaluated in report Section X. The yield and economic rating of the alternatives found feasible are presented in Table S3:

Table S3. Sorted Feasible Water-Supply Alternatives

Alt. No.	Alternative / Action	Yield	Cost per AF	Feasibility	Impact Rating
1b	Enhanced administrative enforcement	6250	$16	Yes	5
1a	Enhanced water market	12,000	$28	Yes	8
2	Managed aquifer operations	10,000	$50	Yes	9
7	Riparian vegetation management	10,000	$63	Yes	6
9	Dewater McMillan Delta	12,000	$85	Yes	7
6	Industrial conservation	1500	$117	Yes	6
10	Desalinization	22,000	$213	Yes	6
5e	Xeriscaping	5500	$245	Yes	8
5a	Time of day / day of use	800	$250	Yes	9
8	Watershed management	10,000	$283	Yes	9
5g	Rate structure	1300	$579	Yes	5
3b	LEPA / sprinkler / drip	4700	$607	Yes	4
17	Import water from Salt Basin	20,000	$710	Yes	3
3a	Laser leveling	2000	$739	Yes	5
5b	Low flow fixtures / audits / leaks	860	$977	Yes	9
14	Aquifer storage and recovery	2500	$1095	Yes	6
3c	Ditch lining / pipes	1000	$1633	Yes	6

Note: Alternatives above the bold line are preferred for yield, cost, feasibility and impacts.

The preferred actions 1a, 1b and 2 benefit the basin water users by replacing existing demand with services for new demand in the case of water-market transactions, or by temporarily supporting basin yield with a



stored resource that is paid back in times of available water in the case of the aquifer storage operations. Draining McMillan Delta is a specific aspect of riparian vegetation management which increases basin yield for managed use by salvaging unmanaged losses. The PVWUO is especially interested in the prospect of gaining water from alternative 8, watershed management, which is to be tested by a pilot program. The preferred actions are set forth as options for consideration by parties who may wish to implement a water management program in the future.

Implementation

Implementation of the preferred alternatives is recommended for a six-year program involving administrative action, legislative authorization and funding, and pilot / demonstration projects.

Conclusions

1. The Lower Pecos Valley water supply has been 706,000 AFY since 1947 with an expected ± 40 percent variation in wet and dry years. Surface diversions and well withdrawals vary ± 15 percent of average in response to the supply variation. About 35 percent of the basin water supply (excluding water supplied by aquifer operations) is lost in unmanaged evapotranspiration from shallow water in river alluvium and about 15 percent is committed to Texas. The remaining half of the basin yield is consumed beneficially in the Lower Pecos Valley.

2. The expected median basin yield is 660,000 AFY. The wettest year in five would be expected to yield 765,900 AF, and the driest year in five would be expected to yield 545,000 AF, based on records since 1905.

3. The Lower Pecos Valley water-diversion demand is projected to grow in 40 years to be 25,400 AFY above a baseline of about 693,000 AFY in year 2000. The basin yield allocated to beneficial use in the basin must increase or be shifted about 12,000 AFY to accommodate the growth.

4. The Lower Pecos Valley region must undertake to enhance the administrative system of water-rights transfers. Transfers are expected to satisfy a large part of the growth in demand by retiring equivalent levels of former demand. Retirement of demand requires that the value of water in the former use be compensated by the higher value derived from the new use and that the transaction be free of administrative barriers.

5. The region must operate aquifer storage when necessary to serve demand at a relatively constant level during temporary periods of short supply. The region must recharge and restore the aquifer volume during periods of available supply.

6. A project to dewater and to convey Pecos River water efficiently through the low topography of the McMillan Delta has the prospect of producing 12,500 AFY for supplying up to half of the growth of demand, while enhancing the environment of the Delta.

7. Other riparian management, watershed management and existing conservation programs should be continually studied in an effort to improve the water supply of the region.

8. The operation and provisions of the Pecos River Compact are not necessarily being operated in the best interests of New Mexico and additional adjustments may be necessary.

Recommendations

1. Establish a program to develop administrative criteria for expediting water-right transfers in the Lower Pecos Valley.

2. Develop a program to produce water to the Pecos River from managed wellfield operations during shortage in New Mexico for Compact delivery to Texas.

3. Encourage the federal and state agencies, including the U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service, with Carlsbad Irrigation District and Pecos Valley Water Users Organization to design a dewatering conveyance and habitat improvement plan for McMillan Delta under the existing authority of the Carlsbad Irrigation District and U.S. Bureau of Reclamation programs.

4. Seek state legislative approval and funding for selected vegetative management pilot field tests in potential high-recharge areas of the basin. Seek legislative approval and funding for a study of the Lower Pecos River Watershed in the planning area to determine what changes have occurred in the recharge of the groundwater basins and subsequent discharge and direct flow to the stream system due to development and vegetative changes in the watershed, changes in patterns of rainfall and snowfall and occurrence of floodflows and other factors which may have caused losses to recharge of groundwater aquifers.

5. Seek approval and funding for an independent study to be made of the Pecos River Compact and operating manual to determine what changes could or should be made to benefit use of water in New Mexico. Such an independent study could be of assistance to current Compact Administrators.