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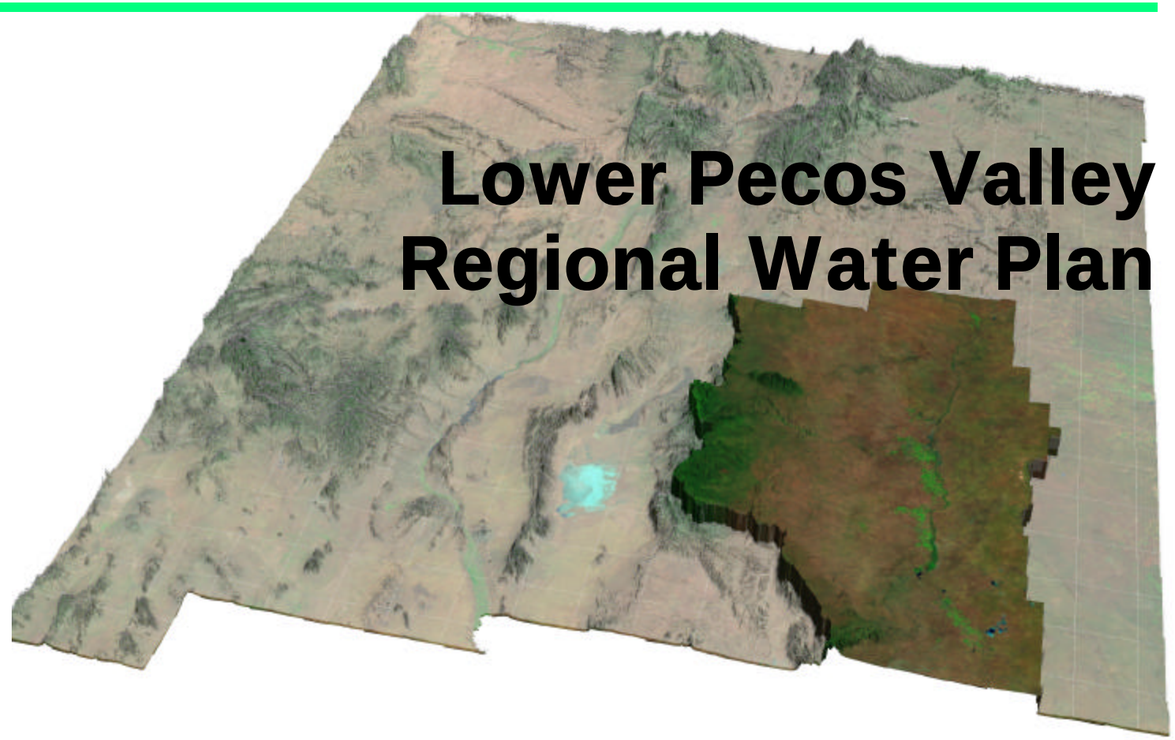

Lower Pecos Valley Regional Water Plan

Volume I
Executive Summary and Atlas

JULY 2001

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LOWER PECOS VALLEY REGIONAL WATER PLAN

VOLUME I: EXECUTIVE SUMMARY AND ATLAS

TABLE OF VOLUME I CONTENTS

	Page
Introduction	1
Plan of Development Process	1
Findings	2
Alternatives	3
Implementation	3
Conclusions	3
Recommendations	4

LIST OF VOLUME I TABLES

		Page
Table S1.	Lower Pecos Valley Average Water-Balance Amounts	2
Table S2.	Planning Factors in Lower Pecos Valley	3
Table S3.	Sorted Feasible Water-Supply Alternatives	3

LIST OF VOLUME I FIGURES

		Page
Figure S1a.	Lower Pecos Valley Water Balance Inflow	1
Figure S1b.	Lower Pecos Valley Water Balance Outflow	2
Figure S2.	Water Balance Schematic	3

LIST OF VOLUME I PLATES

Plate 1. Pecos Valley Regional Water Planning Area and Groundwater Basins
Plate 2. Topography and Drainage Basins in the Planning Area
Plate 3. LANDSAT Imagery of the Planning Area
Plate 4. Township-Range-Section Map of the Planning Area
Plate 5. Population Density in the Planning Area
Plate 6. Land Cover in the Planning Area
Plate 7. Land Ownership in the Planning Area
Plate 8. Basin Adjudication Status in Year 2000
Plate 9. Map of Gaging Station, Perennial Streams and Reservoirs
Plate 10. Precipitation Contours in the Planning Area
Plate 11. Consumptive Irrigation Requirement in the Planning Area
Plate 12. Summary of Vegetated Acres
Plate 13. Net Lake Evaporation Contours in the Planning Area
Plate 14. Vegetation Detail of Western Planning Area
Plate 15. Vegetation Detail of North-West Central Planning Area
Plate 16. Vegetation Detail of South-West Central Planning Area
Plate 17. Vegetation Detail of the Northern Planning Region
Plate 18. Vegetation Detail of the North-East Central Planning Region
Plate 19. Vegetation Detail of the South-East Central Planning Region
Plate 20. Vegetation Detail of the Southern Planning Region
Plate 21. Geologic Map of the Planning Area
Plate 22. Major and Minor Aquifers in the Planning Area
Plate 23. Recharge and Discharge Areas in the Planning Area
Plate 24. Water Table Map and Selected Well Hydrographs
Plate 25. Designated Uses and NPDES Permitted Discharge in Stream Segments
Plate 26. Groundwater Quality in the Planning Area
Plate 27. Groundwater Contamination Sites in the Planning Area
Plate 28. Domestic Wells in the Planning Area
Plate 29. Water Rights Purchased or Leased by the ISC through 1999

VOLUME II: REGIONAL WATER PLAN

TABLE OF VOLUME II CONTENTS

ACKNOWLEDGMENTS 1
SECTION I: INTRODUCTION 3
Background to the Report 3
Goals, Objectives and Guiding Principles of the Lower Pecos Valley Water Plan 4
Individuals Involved in Water Plan Development 4
Previous Water Planning in the Region 5
SECTION II: DOCUMENTATION OF PUBLIC INVOLVEMENT 9
ISC Sponsored Workshop 9
Background for Public Dissemination 9
List of Stakeholders and Participants 9
Items of Concern from Public Participation Meetings 12
SECTION III: STRATEGY CHOSEN TO MAXIMIZE PUBLIC INVOLVEMENT 19
Use of Media and Press Releases 19
Public Meetings 19
SECTION IV: BACKGROUND INFORMATION 21
Setting of the Lower Pecos River Basin 21
OSE Declared Groundwater Basins 25
Fort Sumner Groundwater Basin 25
Description of the Basin. 25
Historical Overview 27
Roswell Groundwater Basin 28
Description of the Basin. 28
Historical Overview 30
Hondo Groundwater Basin 36
Description of the Basin. 36
Historical Overview 38
Peñasco Groundwater Basin 41
Description of the Basin. 41
Historical Overview 43
Carlsbad Groundwater Basin 44
Description of the Basin. 44
Historical Overview 46
Capitan Groundwater Basin 49
Description of the Basin. 49
Historical Overview 51
Socioeconomic Overview 51
Chaves County 52
De Baca County 53
Eddy County 55
Lincoln County 57
Otero County 58
Trends in Agriculture 60
Economic Value of Water 63
Summary of Economic Trends 65
Principles of Resource Management 66
Attributes of the Resource 66
Storage in the Groundwater System 67
Recharge and Discharge 69
Diversion, Consumption and Return Flow 69
Substitution of Water Losses 70
External Impacts 70
Resource Economics 71
Administrative Role 72
Flexibility in Forecasts 72
Compact Obligation to Texas 73
SECTION V: LEGAL ISSUES 77
Introduction 77
General Review of New Mexico Water Law 77
Provisions for Water Use in the Lower Pecos River 77
Special Districts and other Organizations Involved with Water Use 78
Administration of Water Law in the Pecos Valley 78
Interstate Administration 79
Litigation 80
SECTION VI: WATER RESOURCE ASSESSMENT 81
Surface Water 81
Drainage Basins 81
Surface-Water Yields 82
Precipitation 82
Streamflow Data 83
Tributary Inflow 83
Irrigation Consumptive Use 84
Evaporation 84
Storage Reservoirs 90
Santa Rosa Dam and Lake. 92
Sumner Dam and Lake. 92
Brantley Dam and Lake 92
Avalon Dam and Lake 93
Upper Tansill Dam and Carlsbad Lake. 93
Lower Tansill Dam and Lake. 93
Six-Mile Dam. 93

Bonito Dam and Lake.....93
Alto Dam and Lake.....94
Grindstone Dam and Lake.....94
Mescalero Dam and Lake.....94
Silver Springs Dam and Lake.....94
Two Rivers Reservoir.....94
Lake Van.....94
Willow Lake and Dam.....94
Small Ponds, Lakes and Playas.....95
Major Irrigation Canals.....95
Fort Sumner Irrigation District.....95
Hagerman Irrigation Company.....95
Hope Community Ditch.....96
Carlsbad Irrigation District.....96
Other Irrigation Systems.....96
Unmanaged Riparian Vegetation.....97
Mountain Vegetation.....98
Water Imported to Region.....98
Groundwater.....100
Geology and Soils Data.....100
Yield from Aquifer Storage.....100
Fort Sumner Groundwater Basin.....101
Hydrogeology.....101
Water Use.....101
Historical Water Table Declines.....104
Aquifer Resource.....104
Roswell Groundwater Basin.....104
Hydrogeology.....104
Water Use.....105
Historical Water Table Declines.....106
Aquifer Resource.....107
Hondo Groundwater Basin.....107
Hydrogeology.....107
Water Use.....108
Historical Water Table Declines.....108
Aquifer Resource.....108
Peñasco Groundwater Basin.....109
Hydrogeology.....109
Water Use.....109
Historical Water Table Declines.....110
Aquifer Resource.....111
Carlsbad Groundwater Basin.....111
Hydrogeology.....111
Water Use.....111
Historical Water Table Declines.....113
Aquifer Resource.....113
Capitan Groundwater Basin.....114
Hydrogeology.....114
Water Use.....115
Historical Water Table Decline.....115
Aquifer Resource.....115
Natural Variability in Water Supply.....116
Water Quality.....121
Surface-Water Quality.....121
Groundwater Quality.....122
Sources of Contamination.....122
Water-Quality Management Plans.....124
Lower Pecos Valley Regional Water Balance.....126
Introduction.....126
Description of Components.....127
Historical Trends.....129
SECTION VII: PRESENT WATER USE.....137
Introduction.....137
Fort Sumner Groundwater Basin.....137
Irrigation.....137
Fort Sumner Irrigation District.....137
Outside Fort Sumner Irrigation District.....138
Public Water Supply.....140
The Fort Sumner Water System.....140
Water Rights.....140
Emergency Contingency Plans.....141
Drought Considerations.....141
Flood Considerations.....141
Roswell Groundwater Basin.....141
Irrigation.....141
Roswell Area.....141
Hagerman Canal.....142
Pecos River Pumpers and Scattered Surface Use.....142
Upper Felix.....143
Hope Irrigation Project.....144
Public Water Supply.....144
The Roswell Municipal Water System.....144
The Dexter Water System.....145
Hagerman.....145
Lake Arthur.....145
Artesia.....145

Hope....145
Water Rights....145
Emergency Contingency Plans....146
Drought Considerations....146
Flood Considerations....146
Hondo Groundwater Basin....147
Irrigation....147
Hondo Groundwater Basin.....147
Public Water Supply....148
Village of Ruidoso....148
Village of Ruidoso Downs.....148
Village of Capitan....149
Water Rights....149
Emergency Contingency Plans....149
Drought Considerations....149
Flood Considerations....150
Peñasco Groundwater Basin....150
Irrigation....150
Public Water Supply....151
Mayhill....151
Cloudcroft.....151
Water Rights....152
Emergency Contingency Plans....152
Drought Considerations....152
Flood Considerations....152
Carlsbad Groundwater Basin....152
Irrigation....153
Carlsbad Irrigation District.....153
Outside Carlsbad Irrigation District....153
Black River.....154
Delaware River.....154
Public Water Supply....154
Carlsbad....155
Loving.....155
Water Rights....155
Emergency Contingency Plans....156
Drought Considerations....156
Flood Considerations....156
Miscellaneous Uses Throughout Planning Area....156
Domestic Cooperatives....157
Agriculture Related Uses....157
Dairies.....157
Cattle Feed Pens.....159
Commercial Uses....159
Cheese Plants.....159
Oil and Gas Development....160
Mining....160
Other.....160
Domestic Wells....160
Livestock Ponds, Tanks and Wells....161
Recreational Uses....161
Pecos River Compact Deliveries....162
Habitat Uses....163
Summary of Water Rights and Uses....165
Return-Flow Analysis....166
SECTION VIII: FUTURE WATER USE....171
Introduction....171
Projected Water Uses....174
Agriculture....175
Agriculture-Related Uses....175
Public Water Supply Systems....176
Commercial and Industrial Use....176
Domestic Wells....178
Livestock Ponds, Tanks and Wells....178
Recreational....178
Riparian Uses/Instream Flow....178
Vegetation Changes and Water Use....179
Conclusion....179
SECTION IX: WATER-MANAGEMENT CONSERVATION PROGRAMS....181
Introduction....181
Changes to Existing Works....181
Replacement of Existing Facilities....182
Water Banking....182
Vegetation Management....183
Fort Sumner Groundwater Basin....184
Agriculture....184
Public Supplies....188
Domestic Wells....189
Vegetation Management....189
Roswell Groundwater Basin....192
Agricultural....192
Public Supplies....194
Domestic Wells....197
Vegetation Management....198
Hondo Groundwater Basin....200
Agricultural....200

Public Supplies....202
Domestic Supplies....203
Vegetation Management....204
Peñasco Groundwater Basin....206
Agriculture....206
Public Supplies....207
Domestic Supplies....208
Vegetation Management....209
Carlsbad Groundwater Basin....212
Agriculture....212
Public Supplies....213
Domestic Supplies....216
Vegetation Management....216
Capitan Groundwater Basin....219
Industrial Use....219
Domestic Supplies....220
Vegetation Management....220
SECTION X: WATER PLAN ALTERNATIVES....225
Introduction....225
Evaluation Criteria....227
Expected Water Yield....227
Costs....228
Feasibility....229
Technical....229
Legal....229
Political....229
Impacts....229
Pecos River Compact....229
Environmental....229
Social and Economic....229
Cumulative Impacts....229
Alternative 0 – No Change in Current Activities....230
Description....230
Alternative 1a – Enhanced Water Market....231
Description....231
Expected Water Yield....233
Costs....233
Feasibility....234
Technical....234
Legal....234
Political....234
Impacts....234
Pecos River Compact....234
Environmental....234
Social and Economic....234
Alternative 1b – Enhanced Administrative Enforcement....235
Description....235
Expected Water Yield....235
Costs....236
Feasibility....236
Technical....236
Political....236
Impacts....236
Pecos River Compact....236
Environmental....236
Alternative 2 – Managed Wellfield Operations....236
Description....236
Expected Water Yield....237
Costs....237
Feasibility....237
Technical....237
Legal....237
Political....238
Impacts....238
Pecos River Compact....238
Environmental....238
Social and Economic....239
Alternative 3 – Agricultural Water Conservation....239
Description....239
Laser Leveling for Agriculture....239
Use of LEPA, Sprinklers and Drip Systems for Agriculture....239
Lining Ditches with Concrete for Agriculture....239
Expected Water Yield....241
Laser Leveling for Agriculture....241
Use of LEPA, Sprinklers and Drip Systems for Agriculture....242
Lining Ditches with Concrete for Agriculture....242
Costs....242
Laser Leveling for Agriculture....242
Use of LEPA, Sprinklers and Drip Systems for Agriculture....242
Lining Ditches with Concrete for Agriculture....242
Feasibility....243
Technical....243
Legal....243
Political....243
Impacts....244
Pecos River Compact....244

Environmental. 244
Social and Economic. 244
Alternative 4 – Moving Reservoir Storage 244
Description 244
Expected Water Yield 245
Costs 245
Feasibility 245
Technical 245
Legal 245
Political. 245
Impacts 245
Pecos River Compact. 245
Environmental. 246
Social and Economic. 246
Alternative 5 - Municipal Water Conservation 246
Description 246
Time of Day / Day of Use 247
Low-Flow Fixtures, Audits and Leak Repair 247
Covering Reservoirs. 247
Wastewater Effluent Use for Agriculture, Parks, Etc. 247
Xeriscaping 247
Water Rationing. 247
Rate Structure Change. 247
Treated Wastewater Re-Injection 247
Expected Water Yield 248
Time of Day / Day of Use 248
Low-Flow Fixtures, Audits and Leak Repair 248
Covering Reservoirs. 248
Wastewater Effluent Use for Agriculture, Parks, Etc. 248
Xeriscaping 248
Water Rationing. 248
Rate Structure Change. 249
Treated Wastewater Re-Injection 249
Costs 249
Time of Day / Day of Use 249
Low-Flow Fixtures, Audits and Leak Repair 249
Covering Reservoirs. 249
Wastewater Effluent Use for Agriculture, Parks, Etc. 249
Xeriscaping 250
Water Rationing. 250
Rate Structure Change. 250
Treated Wastewater Re-Injection 250
Feasibility 251
Technical 251
Legal 251
Political. 251
Impacts 251
Pecos River Compact. 251
Environmental. 251
Social and Economic. 251
Alternative 6 - Industrial Water Conservation 252
Description 252
Expected Water Yield 252
Costs 252
Feasibility 252
Technical 252
Legal 252
Political. 253
Impacts 253
Pecos River Compact. 253
Environmental. 253
Social and Economic. 253
Alternative 7 – Riparian Vegetation Management 253
Description 253
Expected Water Yield 254
Costs 254
Feasibility 254
Technical 254
Legal 254
Political. 254
Impacts 255
Pecos River Compact. 255
Environmental. 255
Social and Economic. 255
Alternative 8 - Watershed Management 255
Description 255
Expected Water Yield 255
Costs 256
Feasibility 256
Technical 256
Legal 256
Political. 256
Impacts 256
Pecos River Compact. 256
Environmental. 256
Social and Economic. 256

Alternative 9 – Dewatering of McMillan Delta....257
Description....257
Expected Water Yield....258
Costs....258
Feasibility....258
Technical....258
Legal....258
Political....258
Impacts....258
Pecos River Compact....258
Environmental....259
Social and Economic....259
Alternative 10 - Desalination....259
Description....259
Expected Water Yield....260
Costs....260
Feasibility....260
Technical....260
Legal....260
Political....261
Impacts....261
Pecos River Compact....261
Environmental....261
Social and Economic....261
Alternative 11 – Construction of Interstate Pipeline....262
Description....262
Expected Water Yield....263
Costs....263
Feasibility....264
Technical....264
Legal....264
Political....264
Impacts....264
Pecos River Compact....264
Environmental....265
Social and Economic....265
Alternative 12 - Cloud Seeding....265
Description....265
Expected Water Yield....266
Costs....266
Feasibility....266
Technical....266
Legal....267
Political....267
Impacts....267
Pecos River Compact....267
Environmental....267
Social and Economic....268
Alternative 13 - Construction of Large Reservoirs....269
Description....269
Expected Water Yield....269
Costs....269
Feasibility....269
Technical....269
Legal....269
Political....270
Impacts....270
Pecos River Compact....270
Environmental....270
Social and Economic....270
Alternative 14 – Aquifer Storage and Recovery....271
Description....271
Expected Water Yield....271
Costs....271
Feasibility....271
Technical....271
Legal....271
Political....271
Impacts....272
Pecos River Compact....272
Environmental....272
Social and Economic....272
Alternative 15 – Reduce Reservoir Surface Area....272
Description....272
Expected Water Yield....272
Costs....272
Feasibility....273
Technical....273
Legal....273
Impacts....273
Pecos River Compact....273
Environmental....273
Alternative 16 – Reducing Conveyance Losses in Pecos River....273
Description....273
Expected Water Yield....274
Costs....274

Feasibility 274
Technical 274
Legal 274
Political 274
Impacts 274
Pecos River Compact 274
Environmental 274
Social and Economic 275
Alternative 17 - Import Water from Salt Basin 275
Description 275
Expected Water Yield 276
Costs 277
Feasibility 278
Technical 278
Legal 278
Political 278
Impacts 279
Pecos River Compact 279
Environmental 279
Social and Economic 279
Summary of Alternatives 280
SECTION XI: EVALUATION OF ALTERNATIVES AND IMPLEMENTATION 285
Evaluation 285
Overall Assessment and Summary 285
Implementation Schedule 287
SECTION XII: CONCLUSIONS AND RECOMMENDATIONS 291
Conclusions 291
Recommendations 292
BIBLIOGRAPHY 293

LIST OF VOLUME II TABLES

Page

Table 1. Land Ownership in the Planning Area 24
Table 2. Major Employers in Roswell 52
Table 3. Annual Averages of Wage and Salary Employment by Industry for Chaves County (Number of Jobs) 53
Table 4. Annual Averages of Wage and Salary Employment by Industry for De Baca County (Number of Jobs) 54
Table 5. Major Employers In Artesia 55
Table 6. Major Employers in Carlsbad 55
Table 7. Annual Averages of Wage and Salary Employment by Industry for Eddy County (Number of Jobs) 56
Table 8. Major Employers in Ruidoso 57
Table 9. Annual Averages on Wage and Salary Employment by Industry for Lincoln County (Number of Jobs) 58
Table 10. Annual Averages of Wage and Salary Employment by Industry for Otero County (Number of Jobs) 59
Table 11. Percentage Change of Non-Agricultural Employment by Industry in the United States, New Mexico and Selected Counties from 1980 to 1997 60
Table 12. Growth of Dairy in the Pecos Valley (dollars in thousands) 61
Table 13. Non-Dairy Agricultural Receipts in the Pecos Valley, 1980 - 1999 (dollars in thousands) 61
Table 14. Alfalfa Acreage, Yield, Production and Receipt from 1980 to 1999 62
Table 15. The Short Run Value of Water (One Year or Less) in Pecos Valley Agriculture 64
Table 16. The Long Run Value of Water (Permanent Sale) in Pecos Valley Agriculture 65
Table 17. Change in Baseline (80.5 Thousand AF) Delivery Obligation Resulting from Change in Input to Compact Accounting Workbook (thousands of AF except where noted) 76
Table 18. U.S. Geological Survey Hydrologic Units in the Planning Area 81
Table 19. Average Annual Flow in the Pecos River and Major Tributaries at Selected Gaging Stations 85
Table 20. Average Annual Flow in Selected Gaged Tributaries and Canals 85
Table 21. Consumptive Irrigation Requirement (Feet Per Year) 86
Table 22. Vegetation and Open Water Summary by OSE Underground Water Basin 86
Table 23. Annual Evaporation by County 90
Table 24. Average Monthly Class A Land-Pan Evaporation 90
Table 25. Reservoirs Along the Pecos River Mainstem in the Planning Area 91
Table 26. Off-Channel and Tributary Reservoirs in the Planning Area 91
Table 27. Estimates of Groundwater in the Planning Area 102
Table 28. Fort Sumner Groundwater Basin Hydrogeology 103
Table 29. Roswell Groundwater Basin Hydrogeology 106
Table 30. Hondo Groundwater Basin Hydrogeology 107
Table 31. Peñasco Groundwater Basin Hydrogeology 110
Table 32. Carlsbad Groundwater Basin Hydrogeology 112
Table 33. Capitan Groundwater Basin Hydrogeology 115
Table 34. Precipitation Records in the Planning Area 118
Table 35. Natural Variability in Rainfall and Streamflow 120
Table 36. Pecos River Water Quality at Selected Locations 122
Table 37. Average Water-Balance Amounts 127
Table 38. 1995 Water Use in the Fort Sumner Groundwater Basin 138
Table 39. Summary Of Water Rights in the Fort Sumner Groundwater Basin 142
Table 40. 1995 Water Use in the Roswell Groundwater Basin 143
Table 41. Summary of Water Rights in the Roswell Groundwater Basin 147
Table 42. 1995 Water Use in the Hondo Groundwater Basin 148
Table 43. Summary of Water Rights in the Hondo Groundwater Basin 150
Table 44. 1995 Water Use in the Peñasco Groundwater Basin 151
Table 45. Summary of Water Rights in the Peñasco Groundwater Basin 153
Table 46. 1995 Water Use in the Carlsbad Groundwater Basin 154
Table 47. Summary of Water Rights in the Carlsbad Groundwater Basin 157
Table 48. Domestic Water Supply Cooperatives in the Planning Area 158
Table 49. Sumner Dam to New Mexico-Texas State Line Reach Summary of Annual Inflow-Outflow Computations in 1000 AF Units 164
Table 50. Summary of Water Rights and Uses in the Planning Area Reported by OSE 166
Table 51. 1990 Water-Use Inventory in the Lower Pecos Valley Reported by USGS 167
Table 52. Municipal Return Flow in 1995 168
Table 53. Agricultural Return Flow in 1995 168
Table 54. Return Flow from Domestic Wells in the Planning Area 169
Table 55. Estimated Present and Future Water Use by County and Type of Use 172
Table 56. Projected Water Demand by Type of Use in the Planning Area 174
Table 57. Projected Population by County in the Planning Area 177
Table 58. Potential Water-Yield Increases from Areas Receiving More than 18 Inches of Precipitation 185
Table 59. Management Authority in Areas With Over 18 Inches of Precipitation 186
Table 60. Summary of Water Savings Through Conservation in the Fort Sumner Groundwater Basin 191
Table 61. Summary of Water Savings Through Conservation in the Roswell Groundwater Basin 200
Table 62. Summary of Water Savings Through Conservation in the Hondo Groundwater Basin 206
Table 63. Summary of Water Savings Through Conservation in the Peñasco Groundwater Basin 211
Table 64. Summary of Water Savings Through Conservation in the Carlsbad Groundwater Basin 219
Table 65. Summary of Water Savings Through Conservation in the Capitan Groundwater Basin 222
Table 66. Summary of Alternatives, Costs and Yields 281
Table 67. Feasibility Analysis of Water-Supply Alternatives 282
Table 68. Impact Analysis of Water-Supply Alternatives 283
Table 69. Summary of Yield, Cost, Feasibility and Impacts for Water-Supply Alternatives 284
Table 70. Sorted Feasible Water-Supply Alternatives 286

LIST OF VOLUME II FIGURES

		Page
Figure 1.	Historic Photo of Haynes Dream Lake, 1918	34
Figure 2.	Site of Historic Photo of Spring River Dam and Spillway Near the Swimming Pool	34
Figure 3.	Photo of Spring River	35
Figure 4.	Historic Photo of Benson Canyon Looking West, 1928	40
Figure 5.	Modern Photo of Benson Canyon Looking West, 1995	40
Figure 6.	Historic Photo Across Black River Valley Showing Reef Scarp Between Slaughter and Rattlesnake Canyons	48
Figure 7.	Modern Photo Taken at Approximately the Same Location as Figure 6	49
Figure 8.	System Yield During Managed Wellfield Operation and Recovery	68
Figure 9.	New Mexico Delivery Obligation Under Pecos River Compact	75
Figure 10.	Hydrograph and Duration Curve for Pecos River Below Sumner Dam	87
Figure 11.	Hydrograph and Duration Curve for Pecos River Near Acme	88
Figure 12.	Hydrograph and Duration Curve for Pecos River Near Artesia	89
Figure 13.	McMillan Delta	99
Figure 14.	Geologic Section Through Fort Sumner	103
Figure 15.	Geologic Section Through Roswell	105
Figure 16.	Geologic Section Through Hope	109
Figure 17.	Geologic Section Through Carlsbad	112
Figure 18.	Geologic Section Through Pecos River	114
Figure 19.	Palmer Drought Index for the Lower Pecos Valley	117
Figure 20.	Water-Quality Trends on the Pecos River	123
Figure 21.	Schematic of Water Budget Components in the Lower Pecos Valley	128
Figure 22a.	Lower Pecos Valley Water Budget Inflow	130
Figure 22b.	Lower Pecos Valley Water Budget Outflow	130
Figure 23.	Well Hydrographs, Pumping History and Streamflow Depletion in the Roswell Basin	131
Figure 25.	Five-Year Moving Average Annual Discharge at Downstream Pecos River Gaging Stations	133
Figure 26.	Precipitation and Sources of Pumping in the Roswell Basin	134
Figure 27.	Annual Surface-Water Diversions Within the Pecos Valley Surface Water District	139
Figure 28.	Annual Groundwater Diversions from the Roswell Artesian Basin	139
Figure 29.	Discharge, Major Surface Diversions and Return Flow Along the Pecos River Mainstem	167
Figure 30.	Projected Population in the Lower Pecos Valley (1990 – 2060)	177
Figure 31.	Proposed Pipeline from the Salt Basin	277
Figure 32.	Lower Pecos Valley Supply and Conservation Curve	287

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.

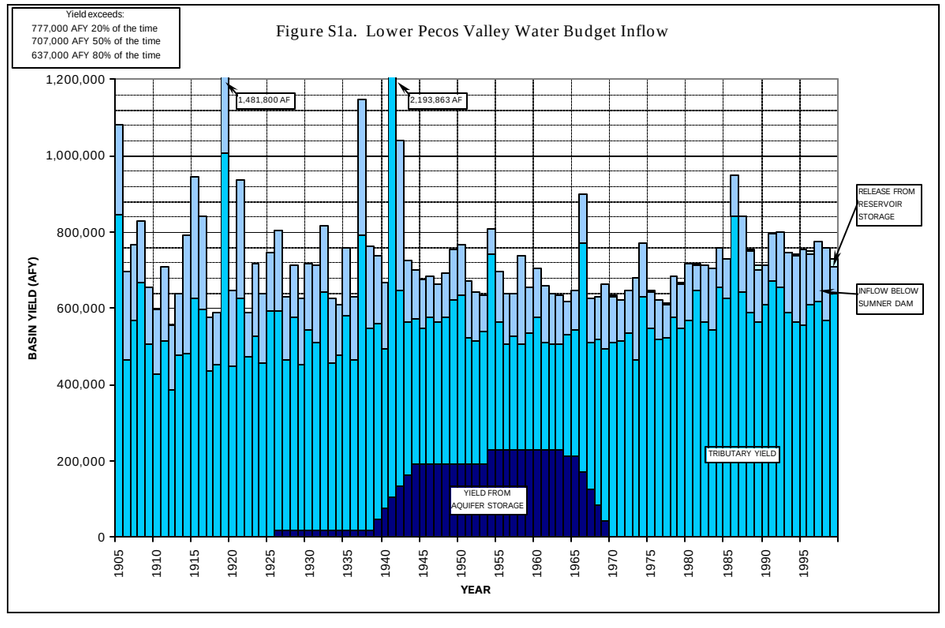
An economic overview of the region shows that various sectors are growing while others are shrinking. The dairy industry is expanding rapidly; other agriculture is neutral. The urban economy is expanding. Economic productivity associated with water is currently valued at $50 to $100 per acre foot (AF) 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



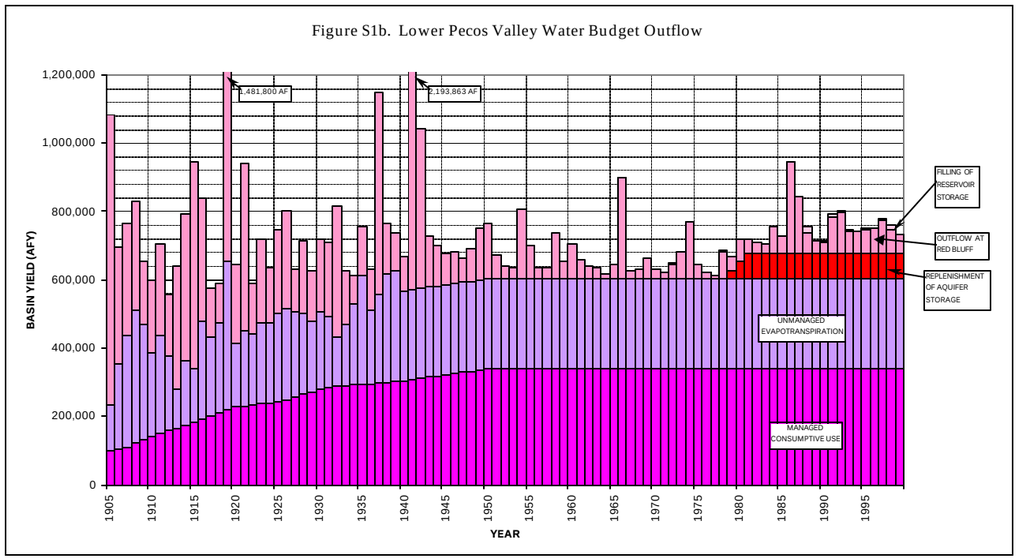
In developing the water plan the historical balance of sources and disposition of water is quantified, as shown on Figure S1a and S1b and illustrated diagrammatically on Figure S2. Future action can do little to alter the basin sources of water, but the unmanaged water losses are amenable to salvage. 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

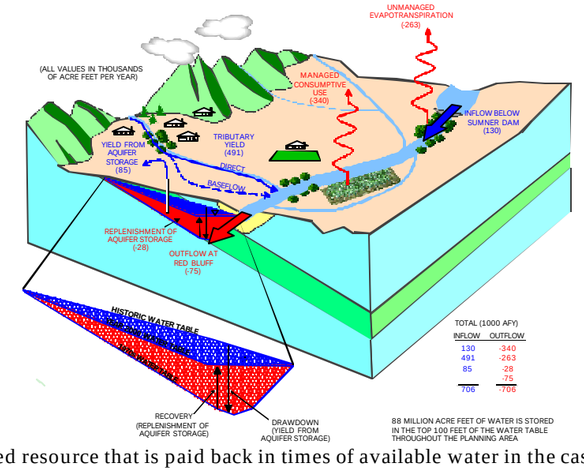
The alternatives are described and evaluated in report Section X. The yield and economic rating of the alternatives found feasible are presented in Table S3:

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.