B. K. Rao

PECOS RIVER COMPACT

No. 65, Original

In The Supreme Court of the United States

Amended Decree

Final Report of the River Master

Water Year 1989

Accounting Year 1990

June 29, 1990

Neil S. Grigg

River Master of the Pecos River

P.O. Box 8581

Ft. Collins, Colorado 80524

PECOS RIVER COMPACT

Report of the River Master
Water Year 1989
Accounting Year 1990

Final Report
June 29, 1990

Neil S. Grigg
River Master of the Pecos River
P.O. Box 8581
Ft Collins, Colorado 80524

Table of Contents

PECOS RIVER COMPACT

Final Report of the River Master
Water Year 1989 - Accounting Year 1990
June 29, 1990

Purpose of the Report

In its Amended Decree issued March 28, 1988 the Supreme Court of the United States appointed a River Master of the Pecos River and directed him to "...Deliver to the parties a Preliminary Report setting forth the tentative results of the calculations required by Section III.B.1 of this Decree by May 15 of the accounting year..." and to consider "...any written objections to the Preliminary Report submitted by the parties prior to June 15 of the accounting year..." and to deliver "...to the parties a Final Report setting forth the final results of the calculations required by Section III.B.1 of this Decree by July 1 of the accounting year." The Preliminary Report was delivered as required, and written objections from both states were received and considered. This is the required Final Report which reports the determination of:

"a. The Article III(a) obligation;

b. Any shortfall or overage, which calculation shall disregard deliveries of water pursuant to an Approved Plan;

c. The net shortfall, if any, after subtracting any overages accumulated in previous years, beginning with water year 1987."

Result of Calculations and Statement of Shortfall or Overage

The results of the calculations in this Final Report show that New Mexico's delivery in Water Year 1989 was an overage of 2,700 acre-feet. The accumulated overage since the beginning of the administrative period is 41,700 acre-feet.

Water Year	Annual Overage	Accumulated Overage
1987	15,400 af	15,400
1988	23,600	39,000
1989	2,700	41,700

Table 1. General Calculation of Annual Departures, Thousand Acre-Feet 6-23-90

	1987	1988	1989	
B.1.a. Index Inflows				
(1) Annual flood inflow				
(a) Gaged flow Pecos R bel Alamogordo Dam	196.7	163.2	136.9	
(b) Flood Inflow Alamogordo - Artesia	55.9	16.6	2.9	
(c) Flood Inflow Artesia - Carlsbad	31.2	-3.2	13.7	13.3 in PR (neg=0
(d) Flood Inflow Carlsbad - State Line	7.2	6.8	1.2	1.1 in PR. typo)
Total (annual flood inflow)	291.0	183.4	154.7	
(2) Index Inflow (3-year avg)			209.7	
B.1.b. 1947 Condition Delivery Obligation (Index Outflow)			98.7	
B.1.c. Average Historical (Gaged) Outflow				
Gaged Flow Pecos River at Red Bluff NM	163.5	59.3	35.1	
Gaged Flow Delaware River nr Red Bluff NM	6.4	3.2	1.9	
(1) Total Annual Historical Outflow	169.9	62.5	37.0	
(2) Average Historical Outflow (3-yr average)			89.8	
B.1.d. Annual Departure			-8.9	
C. Adjustments to Computed Departure				
1. Adjustments for Depletions above Alam Dam				
a. Depletions Due to Irrigation	-2.6	-5.1	-2.4	
b. Depl fr Operation of Santa Rosa Reservoir	-19.1	-19.6	2.8	2.7 in Prelim. Summer evap
c. Transfer of Water Use to Upstream of AD	0	0	0	
Recomputed Index Inflows				
(1) Annual flood inflow				
(a) Gaged flow Pecos R bel Alamogordo Dam	175	138.5	137.3	
(b) Flood Inflow Alamogordo - Artesia	55.9	16.6	2.9	
(c) Flood Inflow Artesia - Carlsbad	31.2	-3.2	13.7	
(d) Flood Inflow Carlsbad - State Line	7.2	6.8	1.2	
Total (annual flood inflow)	269.3	158.7	155.1	
Recomputed Index Inflow (3-year avg)			194.4	
Recomputed 1947 Condition Del Outflow (Index Outflow)			88.6	
Recomputed Annual Departures			1.2	
Credits to New Mexico				
C.2 Depletions Due to McMillan Dike			1.4	
C.3 Salvage Water Analysis			0	
C.4 Unappropriated Flood Waters			0	
C.5 Texas Water Stored in NM Reservoirs			0	
C.6 Beneficial C.U. Delaware River Water			0	
Final Calculated Departure, TAF			2.7	

Table 2. Determination of Flood Inflows, Alamogordo Dam to Artesia - 1989 (B.3)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Flow bel Alamog Dam	1.8	.9	3.2	44.9	55.4	10.5	5.1	5.2	4.6	5.4	.0	.0	136.9
FtSumner Irrig Div	1.4	.8	2.9	5.8	6.4	6.0	4.6	4.9	4.0	5.4	.1	.0	42.2
Ft Sumner ID Return	.9	.7	1.6	1.8	2.7	2.7	2.7	2.7	2.5	2.2	1.1	.9	22.4
Flow past FS IDist	1.3	.7	1.9	40.9	51.7	7.2	3.1	3.0	3.0	2.3	1.1	.9	117.0
Channel loss	.5	.3	.7	5.9	7.2	2.2	.3	1.6	.8	.8	.3	.3	20.9
Residual Flow	.8	.5	1.2	34.9	44.5	4.9	2.8	1.4	2.2	1.5	.8	.6	96.1
Base Inflow	2.6	2.4	2.5	1.7	1.6	1.4	.9	.7	.8	1.3	1.8	2.0	19.8
River Pump Divers	.4	.3	.5	2.1	1.7	2.2	1.0	.6	1.3	.9	.3	.2	11.4
Residual, Artesia	3.0	2.6	3.3	34.5	44.4	4.1	2.8	1.5	1.7	1.9	2.3	2.4	104.5
Pecos Flow Artesia	3.5	5.7	3.5	23.4	46.6	12.0	.8	1.0	4.4	1.5	2.6	2.4	107.5
Flood Inflow, AD-Art	.4	3.1	.3	-11.1	2.2	7.8	-1.9	-.5	2.7	-.5	.4	-.0	2.9

Table 3. Determination of Flood Inflows, Artesia to Carlsbad - 1989 (B.4)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Pecos R at Artesia	3.5	5.7	3.5	23.4	46.6	12.0	.8	1.0	4.4	1.5	2.6	2.4	107.5
Major John Springs	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	8.2
Carlsbad Springs	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-2.0
Total Inflow	4.0	6.2	4.0	23.9	47.1	12.5	1.4	1.6	4.9	2.0	3.2	2.9	113.7
Channel Losses	.4	.8	.4	4.7	9.7	2.2	.0	.0	.6	.0	.2	.1	19.1
Evap Loss, Av-McM-Br	1.0	1.0	2.4	1.7	3.0	3.5	2.4	1.1	.9	.8	.6	.4	18.7
Sto Change, Av-McM-Br	1.2	1.1	-2.7	2.8	18.8	-7.2	-13.3	-9.6	-3.7	-5.2	1.7	1.4	-14.6
Carls ID diversions	.0	1.9	5.5	14.5	13.3	15.6	13.5	12.2	8.7	9.4	.0	.0	94.6
93% CID diver	.0	1.8	5.2	13.4	12.4	14.5	12.6	11.3	8.1	8.7	.0	.0	88.0
Other depletions	.1	.1	.1	.1	.1	.1	.2	.2	.1	.1	.1	.1	1.4
Pecos R at Carlsbad	1.6	1.5	1.5	1.4	1.5	1.1	.9	1.0	1.1	1.1	1.1	1.2	14.8
Total Outflow	4.3	6.3	6.8	24.2	45.4	14.2	2.7	4.0	7.1	5.5	3.6	3.2	127.4
Flood Inflow	.3	.1	2.8	.3	-1.7	1.7	1.4	2.5	2.1	3.5	.5	.3	13.7 → 0.4 & 13.8

Table 4. Determination of Flood Inflows, Carlsbad to State Line

Pecos River at Red Bluff	1170 AF
Pecos River below Dark Canyon	-468
Delaware River	451
Dark Canyon Draw	0
	1153 AF

Table 5. Depletions Due to Irrigation Above Alamogordo Dam - 1989

	APR	MAY	JUN	JUL	AUG	SEPT	OCT	TOTAL
Precip Las Vegas FAA AP	.20	1.38	2.06	4.22	2.57	2.06	.92	
Eff prec Las Veg FAA AP	.20	1.30	1.89	3.42	2.27	1.89	.90	
Precip Pecos Ranger Sta	.13	1.00	.16	2.41	1.96	1.50	1.59	
Eff Precip Pecos RS	.12	.96	.15	2.14	1.79	1.40	1.48	
Precip Santa Rosa	.28	1.27	2.22	1.47	7.67	1.00	.51	
Eff Precip Santa Ro	.27	1.19	2.00	1.37	4.10	.95	.49	
Average eff precip, ft	.02	.10	.11	.19	.23	.12	.08	
consumptive use, ft	.19	.36	.36	.30	.27	.18	.11	1.77
CU less eff precip, ft	.17	.26	.25	.11	.04	.06	.03	.93

Acres (most recent inventory)	9057.
Streamflow depletion, AF	8411.
1947 depletion, AF	10804.
Difference, AF	2393.

Table 6. Depletions Due to Santa Rosa Reservoir Operations - 1989 (6-23-90)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Alamogor ga ht, avg	51.87	53.01	54.58	52.86	51.72	43.82	42.51	41.39	43.31	42.60	43.69	47.07	
Alacontent	29497	31801	35177	31491	29203	16604	15063	13826	15993	15166	16447	21149	
AlaArea	1967	2076	2225	2061	1953	1214	1138	1072	1185	1143	1206	1511	
Alaevap	4.78	5.50	8.24	11.23	14.25	13.19	14.80	10.77	9.11	8.28	7.71	3.58	111.44
.77Evap	3.68	4.24	6.34	8.65	10.97	10.16	11.40	8.29	7.01	6.38	5.94	2.76	85.81
AlaPrecip	.32	.59	.14	.26	.38	.95	.72	4.14	.60	.24	0	.36	8.70
NetEvap	3.36	3.65	6.20	8.39	10.59	9.21	10.68	4.15	6.41	6.14	5.94	2.40	77.11
AlaEvaploss	.55	.63	1.15	1.44	1.72	.93	1.01	.37	.63	.58	.60	.30	9.93
L S Rosa ga ht, avg	39.20	39.53	40.09	36.66	10.23	92.98	96.38	6.52	11.11	12.68	13.36	14.00	
SRcontent	81904	82971	84302	73998	20838	7463	9145	16933	21859	23781	24655	25503	
SRarea	3225	3253	3299	3007	1137	439	551	970	1183	1266	1304	1340	
SRevap	3.72	5.04	9.01	9.68	9.72	8.12	10.11	7.71	6.55	7.14	4.80	3.72	85.32
.77Evap	2.86	3.88	6.94	7.45	7.48	6.25	7.78	5.94	5.04	5.50	3.70	2.86	65.70
Lake SR precip	.24	.39	.24	.19	.38	1.47	1.67	3.87	1.01	.34	0	.31	10.11
NetEvap	2.62	3.49	6.70	7.26	7.10	4.78	6.11	2.07	4.03	5.16	3.70	2.55	55.59
SREvaploss	.71	.95	1.84	1.82	.67	.17	.28	.17	.40	.54	.40	.29	8.24
totalevaploss	1.26	1.58	2.99	3.26	2.40	1.11	1.29	.54	1.03	1.13	1.00	.59	18.17
sumcontents	111401	114772	119479	105489	50041	24067	24208	30759	37852	38947	41102	46652	
1947area	4088	4170	4290	3940	2246	1272	1282	1570	1854	1906	1960	2102	
1947loss	1.14	1.27	2.22	2.75	1.98	.98	1.14	.54	.99	.97	.97	.42	
current-1947	.11	.31	.77	.51	.41	.13	.15	-.01	.04	.15	.03	.17	
									annual	adjustment =		2.78	

ADJUSTMENT FOR EXCESS STORAGE IN SANTA ROSA RESERVOIR

	1988	1989
EndYear Sumner Sto	27446	23572
EndYear S R Sto	81454	25964
Sum	108900	49536
Sto Adjustment, AF		0
Adjustm Ex Evap, TAF		2.78
Total Adjustment,TAF		2.8

Table 7. Major Johnson Springs New Water

8200 AF/yr = 683 AF/mo

Table 8. Carlbad Springs New Water 1989

Pecos R bel DC, cfs	20.5
Dark Canyon, cfs	.0
Pecos R bel Lake Av, cfs	.0
Depletion, cfs	2.0
CID lag seep, cfs	9.1
Return flow, cfs	1.0
Lake Av seep lag, cfs	12.2
PR seepage, cfs	3.0
Carls new water, cfs	-2.8
Carls new wat, AF	-2012.7
Carls new wat monthly, AF	-167.7

Table 9. Carlsbad Main Canal Seepage lagged - 1989

1988	1Q	2Q	3Q	4Q
FLOWS, cfs			174.60	53.00
SEVEN %			12.22	3.71
LAG				

1989	1Q	2Q	3Q	4Q
FLOWS, cfs	41.87	240.20	188.50	51.24
SEVEN %	2.93	16.81	13.20	3.59
LAG	4.74	10.00	12.69	8.99

Average = 9.13 cfs

Table 10. Lake Avalon leakage lagged - 1989

1988	1Q	2Q	3Q	4Q
gage			16.42	14.27
flows, cfs			16.49	6.21
lag				

1989	1Q	2Q	3Q	4Q
gage	14.74	16.01	16.01	16.14
flows, cfs	8.46	14.53	14.53	15.15
lag	9.05	11.12	13.52	14.84
		Total		48.52

Average = 12.15 cfs

Table 11. Evaporation Loss at Lakes McMillan, Avalon and Brantley - 1989 6-23-90

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOT
McMillan gage ht, avg	20.53	20.90	19.60	13.10	14.27	16.11	13.10	13.10	13.10	13.10	13.10	13.10	
Avg area McMil	1716	1869	1380	0	5	279	0	0	0	0	0	0	
Avalon gage ht, avg	13.75	15.08	15.43	15.83	16.22	15.98	16.06	15.97	16.01	15.99	15.76	16.65	
Avg area Avalon	131	393	476	542	601	564	576	563	569	566	531	654	
Brantley gage ht, avg	45.55	45.55	46.09	45.53	53.09	54.94	50.30	44.60	40.75	34.98	34.20	35.37	
Avg Br area	1721	1721	1778	1719	2705	3012	2243	1620	1212	758	700	787	
Total area A+M+B	3568	3983	3634	2261	3311	3855	2819	2183	1781	1324	1231	1441	
Panevap Brantley	4.57	5.04	10.65	11.98	14.33	15.40	13.68	11.43	9.01	8.94	7.23	4.81	117.07
Lakeevap Brantley	3.52	3.88	8.20	9.22	11.03	11.86	10.53	8.80	6.94	6.88	5.57	3.70	90.14
precipBrantley	.15	1.00	.26	.05	.28	.97	.44	2.82	.75	.01	.00	.12	6.85
Netevap(in)	3.37	2.88	7.94	9.17	10.75	10.89	10.09	5.98	6.19	6.87	5.57	3.58	83.29
Totalloss A+M+B,TAF	1.0	1.0	2.4	1.7	3.0	3.5	2.4	1.1	.9	.8	.6	.4	18.7

Table 12. Change in storage, Lakes McMillan, Brantley and Avalon 1989 5-12-90
(Gage heights from last day of each month)

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Lake Avalon gage, ft	12.80	14.30	15.40	16.00	16.10	15.90	15.50	16.30	16.00	16.00	15.30	16.20	17.00	
Avalon storage, AF	109	288	662	975	1032	919	710	1152	975	975	616	1091	1608	
Av change stor, AF		179	374	313	57	-113	-209	442	-177	0	-359	475	517	1499
Lake McMill gage, ft	20.42	20.70	21.34	13.10	13.10	18.30	13.10							
Lake McMill stor, AF	4501	5024	6217	0	0	1657	0	0	0	0	0	0	0	
McMill change stor, AF		523	1193	-6217	0	1657	-1657	0	0	0	0	0	0	-4501
(A+M) change stor, AF		702	1567	-5904	57	1544	-1866	442	-177	0	-359	475	517	-3002
Brantley gage, feet	245.40	45.70	45.40	47.20	48.60	55.40	53.60	47.70	42.00	38.90	33.10	34.90	36.00	
Brantley storage, AF	19051	19567	19051	22292	25050	42276	36985	23253	13867	10191	5354	6587	7459	
Brant change stor, AF		516	-516	3241	2758	17226	-5291	-13732	-9386	-3676	-4837	1233	872	-11592
Total change stor, TAF		1.2	1.1	-2.7	2.8	18.8	-7.2	-13.3	-9.6	-3.7	-5.2	1.7	1.4	-14.6

Table 13a. Hydrograph Scalping: Pecos River bel Dark Canyon 1989

DAY	DISCH	BASEFL	DIFF	MONTH TOTAL (cfs-days/AF)	DAY	DISCH	BASEFL	DIFF	MONTH TOTAL	DAY	DISCH	BASEFL	DIFF	MONTH TOTAL
2.16	35	28	7		6.08	17	17	0		8.14	16	16	0	
2.17	32	27.9	0		6.09	17	16.9	.1		8.15	16	16.0	.0	
2.18	28	27.7	.3		6.10	23	16.8	6.2		8.16	16	15.9	.1	
2.19	29	27.6	1.4		6.11	21	16.7	4.3		8.17	16	15.9	.1	
2.20	29	27.4	0		6.12	22	16.6	5.4		8.18	16	15.8	.2	
2.21	28	27.3	.7		6.13	18	16.5	1.5		8.19	16	15.8	0	
2.22	27	27.1	0		6.14	18	16.4	1.6		8.20	16	15.7	0	
2.23	27	27	0	9	6.15	18	16.3	1.7		8.21	18	15.7	0	
			9.4	19	6.16	19	16.2	2.8		8.22	18	15.7	0	
3.19	22	22	0		6.17	20	16.1	3.9		8.23	17	15.6	1.4	
3.20	26	22	0		6.18	19	16	3		8.24	16	15.6	.4	
3.21	21	22	0		6.19	18	15.9	2.1		8.25	16	15.5	.5	
3.22	22	22	0		6.20	19	15.8	3.2		8.26	16	15.5	.5	
3.23	24	22	2		6.21	22	15.7	0		8.27	17	15.5	1.5	
3.24	23	22	1		6.22	23	15.6	0		8.28	19	15.4	3.6	
3.25	23	22	1		6.23	18	15.5	0		8.29	17	15.4	1.6	
3.26	22	22	0		6.24	18	15.4	0		8.30	16	15.3	.7	
3.27	22	22	0		6.25	18	15.3	2.7		8.31	17	15.3	1.7	37
3.28	22	22	0	4	6.26	20	15.2	4.8		9.01	17	15.2	1.8	74
			4	8	6.27	18	15.1	2.9		9.02	16	15.2	.8	
4.20	26	23	3		6.28	15	15	0	49	9.03	15	15.2	0	
4.21	25	22.7	2.3						98	9.04	15	15.1	0	
4.22	25	22.5	2.5		7.11	14	14	0		9.05	15	15.1	0	
4.23	25	22.2	2.8		7.12	14	13.9	.1		9.06	14	15.0	0	
4.24	29	21.9	7.1		7.13	16	13.7	2.3		9.07	15	15	0	
4.25	31	21.6	9.4		7.14	21	13.6	7.4						
4.26	30	21.4	8.6		7.15	18	13.5	4.5		9.15	19	19	0	
4.27	27	21.1	5.9		7.16	15	13.3	1.7		9.16	18	18.7	0	
4.28	20	20.8	0		7.17	14	13.2	.8		9.17	19	18.4	.6	
4.29	21	20.5	.5		7.18	14	13.1	.9		9.18	19	18.1	.9	
4.30	28	20.3	7.7	42	7.19	12	12.9	0		9.19	19	17.9	1.1	
5.01	31	20	11	83	7.20	13	12.8	.2		9.20	20	17.6	2.4	
					7.21	13	12.7	.3		9.21	19	17.3	1.7	
5.11	25	25	0		7.22	13	12.5	.5		9.22	17	17	0	7
5.12	26	24.4	1.6		7.23	15	12.4	2.6						13
5.13	26	23.9	2.1		7.24	12	12.3	0		10.21	17	17	0	
5.14	28	23.3	4.7		7.25	12	12.1	0		10.22	18	16.83	1.2	
5.15	28	22.7	5.3		7.26	12	12	0	22	10.23	16	16.67	0	
5.16	29	22.1	0						44	10.24	19	16.50	2.5	
5.17	22	21.6	0		8.03	12	12	0		10.25	20	16.33	3.7	
5.18	21	21		14	8.04	13	12.3	.7		10.26	21	16.17	4.8	
				27	8.05	14	12.7	1.3		10.27	19	16.00	3.0	
Added					8.06	14	13.0	1.0		10.28	19	15.83	3.2	
6.29	13	13	0		8.07	16	13.3	2.7		10.29	20	15.67	4.3	
6.30	16	13	3		8.08	19	13.7	5.3		10.30	17	15.50	1.5	
7.01	14	13	1		8.09	20	14.0	6.0		10.31	17	15.33	1.7	26
7.02	13	13	0		8.10	20	14.3	5.7		11.01	19	15.17	3.8	51
					8.11	17	14.7	2.3		11.02	15	15		
					8.12	15	15	0						

cfs-days 235.7
acre-ft 467.5

Table 13b. Hydrograph Scalping: Pecos River at Red Bluff 1989

DAY	DISCH	BASEFL	DIFF	MONTH TOTAL	DAY	DISCH	BASEFL	DIFF	MONTH TOTAL	DAY	DISCH	BASEFL	DIFF	MONTH TOTAL
2.16	95	92	3	(cfs-	6.08	24	24	0		8.14	31	31	0	
2.17	88	91.4	0	days/	6.09	25	23.9	1.1		8.15	32	31.2	.8	
2.18	97	90.9	6.1	AF)	6.10	27	23.8	3.2		8.16	41	31.4	9.6	
2.19	100	90.3	9.7		6.11	28	23.7	4.3		8.17	35	31.6	3.4	
2.20	89	89.7	0		6.12	32	23.6	8.4		8.18	32	31.8	.2	
2.21	90	89.1	.9		6.13	37	23.5	13.5		8.19	32	32.0	0	
2.22	98	88.6	9.4		6.14	33	23.4	9.6		8.20	31	32.2	0	
2.23	89	88	1	30	6.15	34	23.3	10.7		8.21	32	32.5	0	
				60	6.16	37	23.2	13.8		8.22	47	32.7	0	
3.19	43	43	0		6.17	37	23.1	13.9		8.23	37	32.9	4.1	
3.20	44	44.7	0		6.18	33	23	10		8.24	39	33.1	5.9	
3.21	45	46.3	0		6.19	28	22.9	5.1		8.25	43	33.3	9.7	
3.22	57	48.0	9.0		6.20	25	22.8	2.2		8.26	43	33.5	9.5	
3.23	70	49.7	20.3		6.21	22	22.7	0		8.27	37	33.7	3.3	
3.24	72	51.3	20.7		6.22	20	22.6	0		8.28	41	33.9	7.1	
3.25	66	53.0	13.0		6.23	22	22.5	0		8.29	46	34.1	11.9	
3.26	58	54.7	3.3		6.24	22	22.4	0		8.30	62	34.3	27.7	
3.27	58	56.3	1.7		6.25	26	22.3	3.7		8.31	53	34.5	18.5	114
3.28	58	58	0	68	6.26	25	22.2	2.8		9.01	44	34.7	9.3	226
				135	6.27	24	22.1	1.9		9.02	47	35.0	12.0	
4.20	38	38	0		6.28	22	22	0	109	9.03	41	35.2	5.8	
4.21	38	37.5	.5						217	9.04	41	35.4	5.6	
4.22	41	37.1	3.9		7.11	22	22	0		9.05	39	35.6	3.4	
4.23	38	36.6	1.4		7.12	27	22.3	4.7		9.06	37	35.8	1.2	
4.24	40	36.2	3.8		7.13	26	22.5	3.5		9.07	36	36	0	
4.25	42	35.7	6.3		7.14	25	22.8	2.2						
4.26	42	35.3	6.7		7.15	25	23.1	1.9		9.15	28	28	0	
4.27	47	34.8	12.2		7.16	26	23.3	2.7		9.16	37	29.4	7.6	
4.28	44	34.4	9.6		7.17	30	23.6	6.4		9.17	45	30.9	14.1	
4.29	39	33.9	5.1		7.18	32	23.9	8.1		9.18	43	32.3	10.7	
4.30	34	33.5	.5	50	7.19	31	24.1	6.9		9.19	41	33.7	7.3	
5.01	33	33	0	99	7.20	28	24.4	3.6		9.20	40	35.1	4.9	
					7.21	28	24.7	3.3		9.21	39	36.6	2.4	
5.11	31	31	0		7.22	29	24.9	4.1		9.22	38	38	0	84
5.12	33	30.7	2.3		7.23	28	25.2	2.8						167
5.13	37	30.4	6.6		7.24	27	25.5	1.5		10.21	34	34	0	
5.14	37	30.1	6.9		7.25	27	25.7	1.3		10.22	35	35.75		
5.15	32	29.9	2.1		7.26	26	26	0	84	10.23	38	37.5	.5	
5.16	28	29.6	0						167	10.24	41	39.3	1.8	
5.17	26	29.3	0		8.03	32	31	1		10.25	42	41.0	1	
5.18	29	29		18	8.04	30	30.3			10.26	45	42.8	2.3	
				35	8.05	31	29.7	1.3		10.27	45	44.5	.5	
Added					8.06	29	29.0	0		10.28	51	46.3	4.8	
6.29	21	21	0		8.07	28	28.3	0		10.29	56	48.0	8	
6.30	27	22	5		8.08	27	27.7	0		10.30	56	49.8	6.3	
7.01	28	23	5		8.09	27	27.0	0		10.31	56	51.5	4.5	30
7.02	31	24	7		8.10	26	26.3			11.01	56	53.3	2.8	59
7.03	37	25	12		8.11	26	25.7			11.02	55	55		
7.04	33	26	7		8.12	25	25							
7.05	27	27	0									cfs-days	589.7	
												acre-ft	1169.7	

Table 13c. Hydrograph Scalping: Delaware River 1989

DAY	DISCH	BASEFL	DIFF
5.10	19.0	1.5	17.5
5.11	29.0	1.5	27.5
5.12	9.6	1.5	8.1
5.13	3.5	1.5	2.0
5.14	1.9	1.5	.4
5.15	1.7	1.5	.2
5.16	1.6	1.5	.1
6.03	18.0	1.2	16.8
6.04	4.9	1.2	3.7
6.05	2.9	1.2	1.7
6.06	2.2	1.2	1.0
6.07	1.6	1.2	.4
6.08	1.2	1.2	.0
8.28	11.0	0	11.0
8.29	71.0	.1	70.9
8.30	17.0	.1	16.9
8.31	6.2	.2	6.0
9.01	6.8	.2	6.6
9.02	5.4	.3	5.1
9.03	4.1	.4	3.7
9.04	2.8	.4	2.4
9.05	1.7	.5	1.2
9.06	1.2	.5	.7
9.07	1.1	.6	.5
9.08	1.2	.7	.5
9.09	1.0	.7	.3
9.10	1.1	.8	.3
9.11	1.0	.9	.1
9.12	1.70	.9	.8
9.13	5	1.0	4.0
9.14	6.80	1.0	5.8
9.15	7	1.1	5.9
9.16	4.10	1.2	2.9
9.17	2.6	1.2	1.4
9.18	1.9	1.3	.6
9.19	1.7	1.3	.4
9.20	1.4	1.4	.0

cfs-days 227.4
acre-feet 451.0

Table 14. Data Required for River Master Manual Calculations, Water Year 1989 (6-23-90)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Streamflow gage records													
Pecos R b Sumner Dam, TAF	1.8	.9	3.2	44.9	55.4	10.5	5.1	5.2	4.6	5.4	.0	.0	136.9
Fort Sumner Main C, TAF	1.4	.8	2.9	5.8	6.4	6.0	4.6	4.9	4.0	5.4	.1	.0	42.2
Pecos R nr Artesia, TAF	3.5	5.7	3.5	23.4	46.6	12.0	.8	1.0	4.4	1.5	2.6	2.4	107.5
Pecos b Dark Canyon, TAF	1.6	1.5	1.5	1.4	1.5	1.1	.9	1.0	1.1	1.1	1.1	1.2	14.8
Dark Canyon at Csbad, TAF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Pecos bel Avalon Dam, TAF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Carlsbad Main Canl, TAF	.0	1.9	5.5	14.5	13.3	15.6	13.5	12.2	8.7	9.4	.0	.0	94.6
Pecos R at Red Bluff, TAF	4.5	4.6	3.6	2.5	2.0	1.6	1.7	2.2	2.2	2.5	3.7	4.1	35.1
Delaware R nr Red B, TAF	.3	.2	.2	.2	.2	.1	0	.2	.1	.1	.2	.2	1.9
Gage heights													
Avalon gage ht, end mo	14.30	15.40	16.00	16.10	15.90	15.50	16.30	16.00	16.00	15.30	16.20	17.00	
Avalon gage ht, avg	13.75	15.08	15.43	15.83	16.22	15.98	16.06	15.97	16.01	15.99	15.76	16.65	
McMillan gage ht, end mo	20.70	21.34	13.10	13.10	18.30	13.10	13.10	13.10	13.10	13.10	13.10	13.10	
McMillan gage ht, avg	20.53	20.90	19.60	13.10	14.27	16.11	13.10	13.10	13.10	13.10	13.10	13.10	
Brantley gage ht, end mo	45.70	45.40	47.20	48.60	55.40	53.60	47.70	42.00	38.90	33.10	34.90	36.00	
Brantley gage ht, avg	45.55	45.55	46.09	45.53	53.09	54.94	50.30	44.60	40.75	34.98	34.20	35.37	
Alamogordo gage ht, avg	51.87	53.01	54.58	52.86	51.72	43.82	42.51	41.39	43.31	42.60	43.69	47.07	
Lake St Rosa ga ht, avg	39.20	39.53	40.09	36.66	10.23	92.98	96.38	6.52	11.11	12.68	13.36	14.00	
Precipitation													
Precip Carlsbad, inches	.02	1.00	.43	.22	.20	.80	.05	1.27	1.61	.12	.00	.27	5.99
Precip Artesia, inches	.12	.92	.17	.00	.35	.96	.26	3.64	1.45	.00	.00	.08	7.95
Precip Brantley, inches	.15	1.00	.26	.05	.28	.97	.44	2.82	.75	.01	.00	.12	6.85
Precip LV FAAA AP, inches	.53	.16	.11	.20	1.38	2.06	4.22	2.57	2.06	.92	.00	.21	14.42
Precip Pecos Rang, inches	.55	.75	.85	.13	1.00	.16	2.41	1.96	1.50	1.59	.00	.90	11.80
Precip Santa Rosa, inches	.07	.18	.60	.28	1.27	2.22	1.47	7.67	1.00	.51	.00	.29	15.56
Precip Sumnr lake, inches	.32	.59	.14	.26	.38	.95	.72	4.14	.60	.24	.00	.36	8.70
Precip Lake SRosa, inches	.24	.39	.24	.19	.38	1.47	1.67	3.87	1.01	.34	.00	.31	10.11
Evaporation													
PanEvap Lake Sumn, inches	4.78	5.50	8.24	11.23	14.25	13.19	14.80	10.77	9.11	8.28	7.71	3.58	111.44
PanEvap Lk SRosa, inches	3.72	5.04	9.01	9.68	9.72	8.12	10.11	7.71	6.55	7.14	4.80	3.72	85.32
Pan Evap, Brantley, inches	4.57	5.04	10.65	11.98	14.33	15.40	13.68	11.43	9.01	8.94	7.23	4.81	117.07
Other reports													
Base Acme-Artesia, TAFc	2.6	2.4	2.5	1.7	1.6	1.4	.9	.7	.8	1.3	1.8	2.0	19.8
Pump depl Ac-Artesia, TAFc	.4	.3	.5	2.1	1.7	2.2	1.0	.6	1.3	.9	.3	.2	11.4
NM irrigation inv, acres													9057.
NM Transfer water use, TAF													0
NM salvaged water, TAF													0
Texas, water stored NM, TAF													0
Texas, use Del water, TAF													0

Response to States' Objections to Preliminary Report

This response is to the states' objections to the Preliminary Report and to New Mexico's "preliminary review" (dated June 18, 1990) of Texas' objections and Texas' response (dated June 25, 1990) to New Mexico's comments.

NEW MEXICO'S OBJECTIONS

All of New Mexico's objections relate to the scalping of flood flows. Those dealing with the Red Bluff and Carlsbad gages are dealt with in a joint response to the states' objections and presented later. New Mexico also objected to the scalping of the Delaware River flow (page 19, Objections). This objection has been noted and considered, but the difference between New Mexico's and the River Master's calculation is insignificant (443 versus 451 acre-feet or .008 TAF).

TEXAS' OBJECTIONS

I. Brantley Reservoir Bank Storage. This objection and No.II by Texas both deal with the effects of storage in Brantley Reservoir. In objection I, Texas proposes that a bank storage of 9292 acre-feet be used for Brantley Reservoir. The objection (page 2) refers to Manual section B.4.b.(3) which deals with calculation of Major Johnson Springs New Water and with B.4.i.(2) which deals with "other depletions".

In the objection text on pages 2-4 Texas presents reasons to adopt a bank storage "adjustment" of 9292 acre-feet. This apparently refers to Manual Section B.4.i.(2) which states "Add any depletions as determined by the USGS caused by Brantley Reservoir and due to loss of water to underground aquifers and to the bank storage." Section B.4.b.(3).(b) of the Manual instructs to estimate bank storage losses and gains along with gaged flows, reservoir evaporation and other quantities in order to estimate the Major Johnson Springs New Water, which is the subject of Texas' objection II.

Because the Manual does not provide the procedure to account for bank storage and USGS has not determined a bank storage I am unable to accept this objection at this time. The computation of bank storage is a complex task and requires technical procedures that have been reviewed by both states. The first time I saw Texas' proposed procedures was in the objections to the Preliminary Report which arrived two weeks before the final deadline for the Final Report.

I recognize that there is some bank storage and Texas is entitled to credit for it, but the consequences to Texas of deferring the credit seem minimal because the item is cumulative; that is, if we do not take note of the bank storage this year, it will still be there next year to be accounted, less any losses from bank storage. If any losses are to the Pecos River they should become part of the flood flow later; however, if the losses are to deep aquifers they could become actual losses from Texas' entitlement and this possibility needs to be investigated. To some extent the bank storage cancels out; it is used to compute inflow at Major Johnson Springs; then as a depletion which is an outflow. This apparent incongruity should receive examination in the motion process.

Following a strict interpretation, the Manual Section B.4.i.(2) states "Add any depletions determined by the USGS ..." and I have no information that USGS has determined depletions. This fact alone would cause me not to accept Texas' objection. The fact that the consequences of deferring the credit can be remedied later reinforces that decision; thus Texas' objection I is denied.

II. Major Johnson Springs New Water. Texas proposes that 3,990 acre-feet should be used as Major Johnson Springs New Water for water year 1989. It is important that we develop an accurate procedure to calculate this item, but two problems prevent the acceptance of Texas' proposal this year. First, Texas' procedure for estimating Major Johnson Springs New Water has not been reviewed other than briefly in the objections process, and New Mexico would have no opportunity to review it adequately if I accept Texas' objection. Second, the Manual Section B.4.b.(3).(b) instructs to "... compute the Major Johnson Springs new water by the water balance technique..." (emphasis added) including bank storage losses and gains along with gaged flows, reservoir evaporation and other quantities. Texas' proposal in the objection is to use only the change in bank storage as new water; this neglects the other items in a water balance technique.

I considered the question of how to calculate the Major Johnson Springs New Water last year, and in response to Texas' objection wrote:

> "III. This objection cannot be accepted this year but it needs to be acted upon as soon as the technical knowledge is available to determine how much water is lost to underground storage caverns and aquifers. Texas's suggestion that the calculated negative flood inflow should be set to zero and allocated to bank storage needs to be substantiated by a technical study. New Mexico is entitled to comment on the proposal. I note that at our March 20-21 meeting the issue of developing procedures for these calculations was discussed briefly, but not resolved. USGS has presented a proposal for monitoring of water levels and discharges in the Brantley area. From the minutes of the meeting of the Engineering Advisory Committee of the Pecos River Commission I note that the USGS proposal has gone to the Bureau of Reclamation and that the Bureau also reported that they are "...evaluating the loss of water to the bank storage..." However, procedures for calculating bank storage and for dealing with the "other depletions" provision of the Manual at B.4.i(2) need to be developed through the motion process. These must be supported by sufficient data and technical studies. B.4.i(2) presently instructs the River Master to include any other depletions "...as determined by USGS..." USGS apparently did not determine such depletions this year. Since USGS' proposal for a gaging program is to the Bureau, the States will apparently not control the scope of work or the pace of the study process. I consider that since the Bureau is evaluating water loss to bank storage through a program of measurement that the gages and piezometers called for under paragraph B.4.b.(3) of the Manual are in place, and no action is called for by the River Master at this time. I do not consider that the present Manual provisions in B.4.b(3) and B.4.i(2) are adequate to enable me to include loss of water to bank storage or underground aquifers in this year's accounting."

This position still holds. The technical knowledge to compute the Major Johnson Springs New Water and other depletions is not yet available, but New Mexico's Third Motion to Modify the Manual provides an opportunity to develop new provisions to account for the effect of Brantley Reservoir. Consideration of this motion will continue as soon as Texas files a response which is due no later than August 31, 1990. The exchange of comments on these matters that took place as part of the objections to the Preliminary Report will also aid in consideration of the motion.

Because the data and procedures to compute Major Johnson Springs New Water are still not available, I have no alternative other than to continue the use of 8200 acre-feet, as specified by the Manual at section B.4.b.(3). My rationale is that where B.4.b.(3).(b) and following states "Losses and gains to Brantley Reservoir bank storage by piezometric measurements...If the above data are not available..." I consider that the "above data" refers to groundwater level (piezometer) data and sufficient data on aquifer characteristics to enable a repeatable and credible result. I repeat that I consider that the gages and piezometers called for at the bottom of page 12 of the Manual have been installed and that what is needed is to modify the Manual with new accounting procedures that use the data available since Brantley Reservoir came on line.

What is the impact of this computation item being deferred? First, this is the last year under the current manual procedures that 8200 acre-feet can be used, so the impact of possible errors will be limited. Second, if the estimated quantity is too large the loss will be to Texas (if it is too small the loss will be to New Mexico) and it is not clear whether it can be recouped with procedures to be adopted later, because we do not know what the procedures will be. I do not have the data on how the 8200 acre-foot quantity was determined, but it apparently represents an average or compromise figure agreed to by the states and/or accepted by the Special Master; this being the case the one-time loss or gain to either state in using 8200 acre-feet will be limited. Finally, the fact that under current procedures bank storage cancels out tends to mitigate the effect of deferring the introduction of bank storage estimates.

The above reasons for using 8200 acre-feet this year as well as the need for a procedure to account for bank storage indicate the need for urgency in resolving New Mexico's Third Motion to Modify the Manual.

III. Flood Inflows Carlsbad to State Line.

This objection is discussed later in a joint response to both states about hydrograph scalping.

IV. Channel Losses Artesia to Carlsbad.

Objection accepted and channel losses set to zero.

V. McMillan Dike.

Texas proposes to apportion the credit for McMillan Dike according to the period when Lake McMillan stored water in 1989.

The River Master's Manual presents an equation to compute the credit for McMillan Dike, but lacks any discussion about how to handle the matter after Brantley Reservoir was placed on line. I understand from Special Master Charles Meyer's Reports to the Supreme Court that the McMillan Dike was constructed to impede leakage from McMillan Reservoir, and that New Mexico was to be extended credit for the stopped leakage. However, I lack any information about the location or elevation of the dike or the effects of constructing Brantley Reservoir.

On one side of this question I noted in the objections process both states' discussion about the Special Master's intentions concerning this item and I conclude that the item needs fuller consideration than it can receive at the last moment before the Final Report is issued. On the technical data side of the question, I lack an analysis of the actual effects of the dike. I note that the water surface elevation where McMillan's volume drops to zero is 3254.7 and the maximum water surface elevation of Brantley was 3255.4 during 1989; thus it appears that even after McMillan was breached that in part of the year there was water behind McMillan Dam, but not impounded by it. Also, I lack information about the elevation of the bottom of the McMillan Dike when it was constructed in 1954. It may be possible that the dike could still prevent leakage that would occur by gravity seepage through sediments down to elevations below the present day minimum of Lake McMillan. Since I lack data I cannot evaluate these questions.

This is apparently an item for further investigation, but I cannot accept the objection this year for the reasons given above. If Texas wants this item reexamined it will be necessary to present technical data through the motion process in advance of the objections to the Preliminary Report so that New Mexico can review Texas' proposals.

JOINT RESPONSE TO NEW MEXICO AND TEXAS
HYDROGRAPH SCALPING - CARLSBAD TO STATE LINE

Both New Mexico and Texas objected to the River Master's calculations for the scalped flood flows at the Red Bluff and Pecos River below Dark Canyon gages. With the exception of the dual objections about not presenting graphical forms of the hydrographs, however, the objections are different.

Both New Mexico and Texas objected to the lack of a graphical display of the hydrographs in the preliminary report. This objection is accepted. The tables presented do present the data from which hydrographs are plotted, but the actual graphs are useful in locating base flows and the beginning points for hydrograph rises. However, the graphs are not accurate enough to compute the scalped water volumes; this is done by everyone numerically. To facilitate future discussion about this point I attach the working graphs that were used to prepare the Preliminary Report. Graphs at the scale presented by New Mexico in her discussion (Objection, Figure 2) are not adequate, as New Mexico notes, to locate base flows and times of rise. Texas' monthly presentation of graphs is more adequate to study the hydrographs and I intend to use a scale of this magnitude in the future.

There were a few minor errors in the original daily hydrograph tables, and they have been corrected. New Mexico's and Texas' estimates of flood flows and comments relative to each event have been studied. A summary of the differences with the River Master, along with USGS' estimates, is shown on the table following. The table shows that New Mexico estimates less flood flow and Texas estimates more than the River Master in every non-zero month. There is not much difference between the River Master's estimates and those of USGS.

There is insufficient time and anyway I see little merit in presenting a lengthy discussion of each flood event and comparing New Mexico's and Texas' analyses with mine in detail. This would be mandatory in the event that large quantities of water were involved, but in this case my estimates lie between those of the two states in each case. The only significant difference is with Texas' estimates which are much larger than any of the other three estimates. My total estimates are only 0.3 TAF larger than New Mexico's and 0.1 TAF larger than USGS. They are 1.5 TAF less than Texas'.

New Mexico's discussion accompanying each flood event is useful in providing thinking and insight about the causes of operational rises and flood flows; however, the analysis is filled with terms such as "probably" and "maybe", indicating a lack of certainty on New Mexico's part about the exact responses of the basin. This, coupled with the small overall difference between my estimates and New Mexico's led me not to make small adjustments in response to some of New Mexico's objections.

It is a minor point but in referring to February (page 9, Objections) Texas states that the River Master used base flows larger than the stream flows. Base flows resulting from straight line interpolation occasionally rise above minor pertubations of streamflow; when this happens I set differences to zero to avoid the result of a negative flood flow. I consider this an acceptable procedure that recognizes the limited accuracy of streamflow measurements.

Specific responses to New Mexico's and Texas' comments follow.

Additional Specific Responses - New Mexico's Objections. New Mexico's objections are not numbered and I will try to respond by page number. All of them have been considered, but because they are not numbered it is not possible to respond to them one-by-one in all cases.

Page 3 - 7. Regarding precipitation data, they are shown on the attached graphs. They will be included in the future. I consider that the rainfall applying to the hydrograph scalping exercise is "rainfall occurring in the Carlsbad area" (see Review of Basic Data page 21-18, line 11). It is true that the RBD used Carlsbad precipitation gage data, but it was only available during part of the record interval. I use the three gages Carlsbad, Carlsbad Caverns and Carlsbad FAA Airport, all of which give indication of rainfall in the watershed area. I do not receive the Texas precipitation data records, but if Texas in her objections makes a case that Red Bluff rain that did not also appear in the Carlsbad gages is a factor, I will consider it. The reason is that the Red Bluff gage is as close to the headwaters of the Black River as is the Carlsbad gage.

Page 4, end of first paragraph. This discussion about base flow seems out of place and is not fully understood. It refers to a procedure for base flow estimation contained in the 1988 water year report.

Pages 7 - 20. These contain useful discussions of New Mexico's approach to hydrograph scalping. They have been noted and will be considered as procedures evolve in the future.

Additional Specific Responses - Texas' Objections.

Some of Texas' estimates cannot be accepted due to significant variations from my understanding of the River Master's Manual procedures.

I will respond in general to Texas' estimates by month. Refer to Texas' hydrographs to follow the discussion.

January. Texas shows a rainfall of 0.11 inch at Red Bluff on January 27th. The scalped quantity from the Red Bluff hydrograph is 65 AF. I cannot accept this quantity because the hydrograph begins to rise after January 25th but the rain was not recorded until the 27th.

February. Texas and the River Master differ on the initiation of the flood event and on the level of baseflow. Texas begins to scalp the hydrograph on February 12 but the rain only begins on the 15th; for this reason I cannot accept Texas' analysis here.

March. Texas continues the flood event that began on March 20 until April 9, and then longer, but the rain stopped on March 22. For this reason I terminated the analysis of the flood event much earlier, on March 28.

April. For the event beginning on April 20 Texas' analysis is about the same as mine.

May. Texas shows a flood event beginning on May 3 and states that the hydrograph clearly shows a flood, but there is no rain to justify it. Texas' analysis is about the same as mine from May 11 to 17, but Texas continues the flood after May 17 in spite of the absence of rain.

June. For the flood beginning about June 8 Texas and I are about in agreement. I left off a small flood beginning about June 28 and I accept Texas' objection about that.

July. For the flood of about July 11 - 26 Texas and I are about in agreement.

August. I believe that the base flow in the period August 13 - September 8 is about 6 cfs higher than Texas' estimate; it is a matter of judgement. My estimate is slightly lower than New Mexico's.

September. My estimate is about the same as Texas'; also in October.

Result Of Considering Objections. For the reasons given above I adopt the figure of 0.7 TAF for the difference between the floods at Red Bluff and below Dark Canyon. This is 0.1 TAF higher than in the Preliminary Report due to the correction of minor errors.

Comparison of River Master, New Hexico, Texas and USGS Hydrograph Scalping, Acre-Feet
Carlsbad to State Line

Pecos R @ Red Bluff

	RM	NM	TX	USGS	RM-NM	RM-TX	RM-GS
JAN	0	0	65	0	0	-65	0
FEB	60	40	337	69	20	-277	-9
MAR	135	117	351	93	18	-216	42
APR	99	0	318	0	99	-219	99
MAY	35	0	189	0	35	-154	35
JUN	217	16	289	179	201	-72	38
JUL	167	36	152	97	131	15	70
AUG	226	202	493	216	24	-267	10
SEP	167	81	486	125	86	-319	42
OCT	59	0	66	0	59	-7	59
NOV	6	0	6	0	6	0	6
DEC	0	0	0	0	0	0	0
	1171	492	2752	779	679	-1581	392

Pecos R bel Dark Canyon

	RM	NM	TX	USGS	RM-NM	RM-TX	RM-GS
JAN	0	0	0	0	0	0	0
FEB	19	22	22	22	-3	-3	-3
MAR	8	8	20	20	0	-12	-12
APR	83	0	114	0	83	-31	83
MAY	27	0	107	0	27	-80	27
JUN	98	14	61	63	84	37	35
JUL	44	2	34	2	42	10	42
AUG	74	19	72	22	55	2	52
SEP	13	56	183	87	-43	-170	-74
OCT	51	0	0	0	51	51	51
NOV	8	0	0	0	8	8	8
DEC	0	0	0	0	0	0	0
	425	121	613	216	304	-188	209

Difference (PR@RB - PRbDC)

	RM	NM	TX	USGS	RM-NM	RM-TX	RM-GS
JAN	0	0	65	0	0	-65	0
FEB	41	18	315	47	23	-274	-6
MAR	127	109	331	73	18	-204	54
APR	16	0	204	0	16	-188	16
MAY	8	0	82	0	8	-74	8
JUN	119	2	228	116	117	-109	3
JUL	123	34	118	95	89	5	28
AUG	152	183	421	194	-31	-269	-42
SEP	154	25	303	38	129	-149	116
OCT	8	0	66	0	8	-58	8
NOV	-2	0	6	0	-2	-8	-2
DEC	0	0	0	0	0	0	0
Total	746	371	2139	563	375	-1393	183

Overall differences, Scalped flood, AF

	PR@RB	PRbDC	Diff
RM Calc	1171	425	746
RM - NM	679	304	375
RM - TX	-1581	-188	-1393
RM - USGS	392	209	183

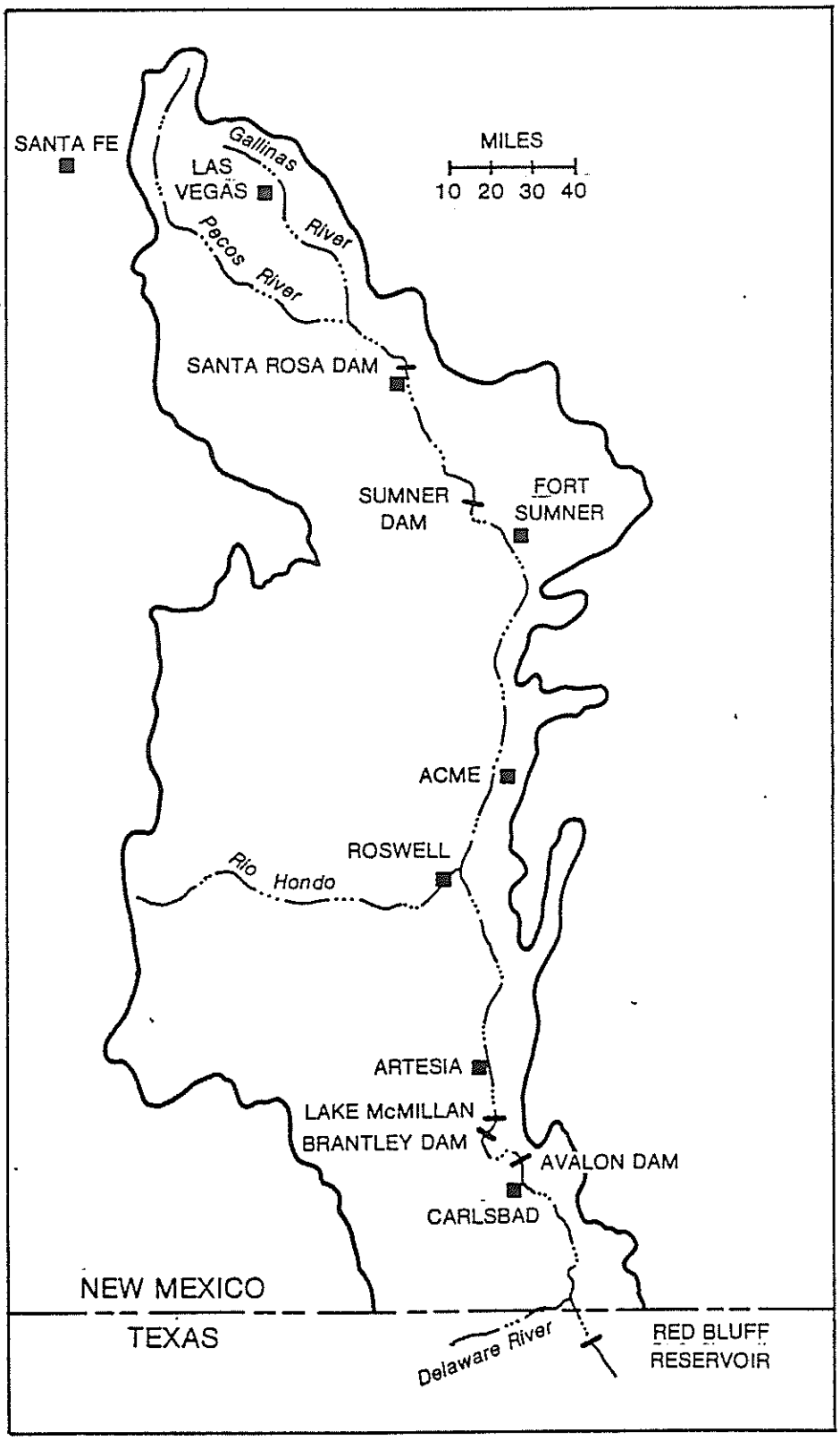
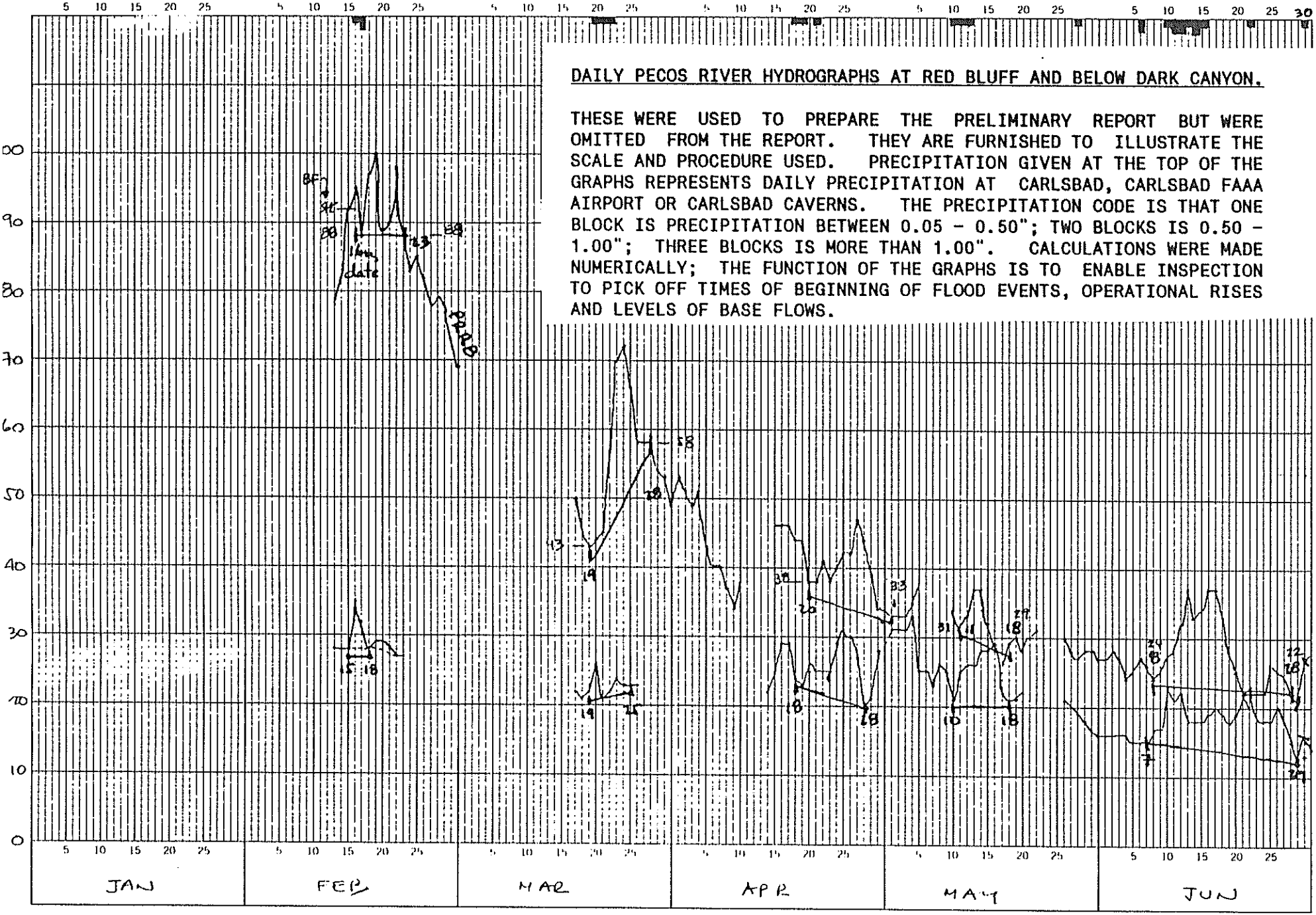
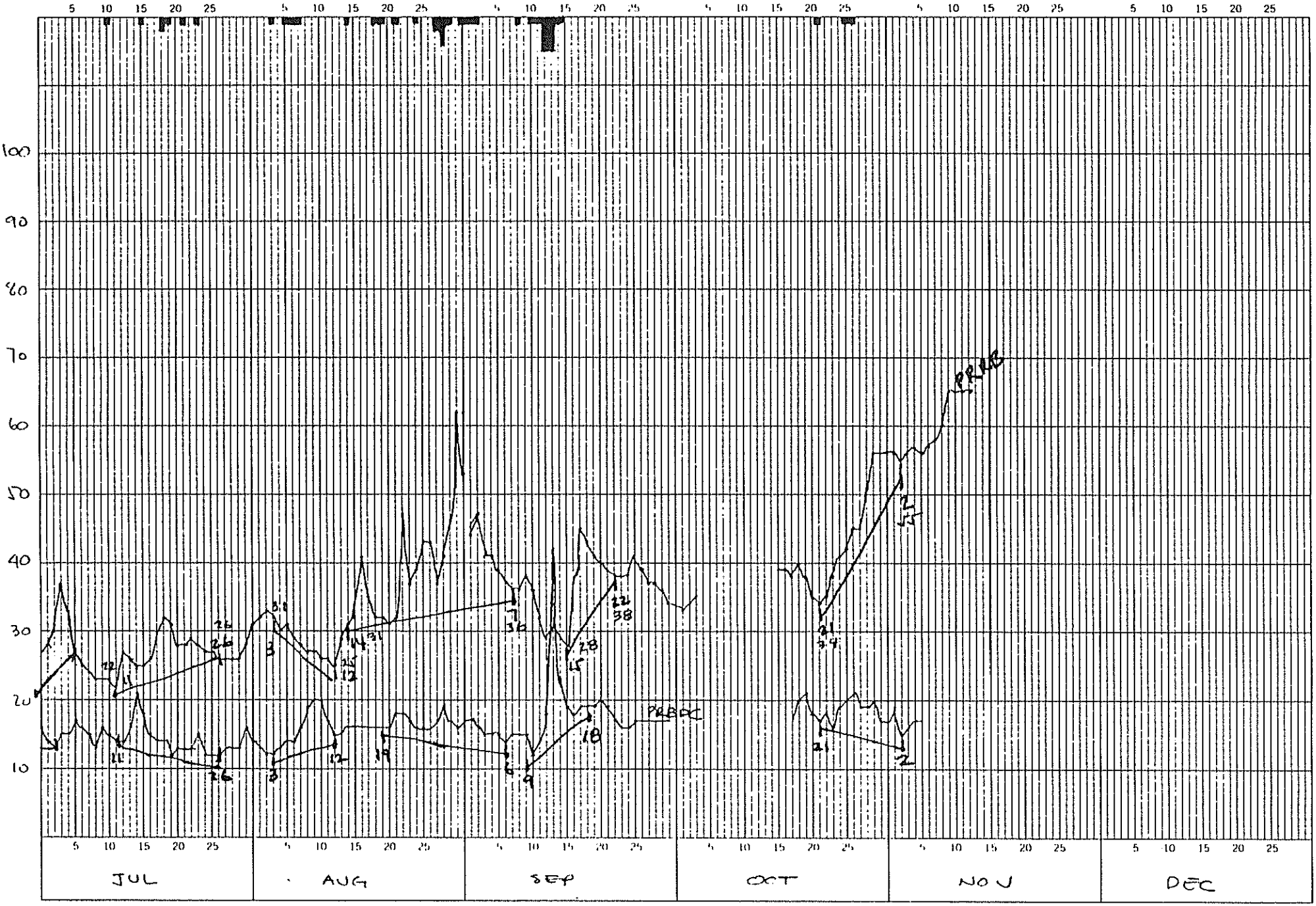


Figure 1. Map of Pecos Basin Showing Accounting Reaches (Adapted from USGS Report: Hydrologic Effects of Phreatophyte Control, 1988)


DAILY PECOS RIVER HYDROGRAPHS AT RED BLUFF AND BELOW DARK CANYON.
THESE WERE USED TO PREPARE THE PRELIMINARY REPORT BUT WERE OMITTED FROM THE REPORT. THEY ARE FURNISHED TO ILLUSTRATE THE SCALE AND PROCEDURE USED. PRECIPITATION GIVEN AT THE TOP OF THE GRAPHS REPRESENTS DAILY PRECIPITATION AT CARLSBAD, CARLSBAD FAAA AIRPORT OR CARLSBAD CAVERNS. THE PRECIPITATION CODE IS THAT ONE BLOCK IS PRECIPITATION BETWEEN 0.05 - 0.50"; TWO BLOCKS IS 0.50 - 1.00"; THREE BLOCKS IS MORE THAN 1.00". CALCULATIONS WERE MADE NUMERICALLY; THE FUNCTION OF THE GRAPHS IS TO ENABLE INSPECTION TO PICK OFF TIMES OF BEGINNING OF FLOOD EVENTS, OPERATIONAL RISES AND LEVELS OF BASE FLOWS.
JAN
FEB
MAR
APR
MAY
JUN


JUL
AUG
SEP
OCT
NOV
DEC