APPENDIX C

Pre-Reservoir River Channel Losses
for
Colorado River Storage Project Reservoirs

Table C-1. Pre-Reservoir River Channel Losses for Lake Powell

River Section	Section Length (mi) Reach	Cumulated	Average Elevation (ft)	Normal Water Surface Area (acres)	Evap Rate (ft)	Evap Loss (af)	Net Additions for High Water Period Area (acres)	Evap Rate (ft)	Evap Loss (af)	Total Annual Losses (Normal Plus High Water) Equiv. Lake Evap (af)	Turbulence Factor	Losses (af) Reach	Cumulated
Colorado River:													
			3138	= river elevation at Glen Canyon Dam									
2	15	14	3150	938	5.5	5159	274	2.8	754	5913	1.1	6504	6114
3	12	26	3170	898	5.5	4939	309	2.8	850	5789	1.1	6368	12481
4	10	36	3190	775	5.4	4185	181	2.7	489	4674	1.1	5141	17622
5	3	39	3200	249	5.4	1345	62	2.7	167	1512	1.1	1663	19285
6	12	51	3220	884	5.4	4774	392	2.7	1058	5832	1.1	6415	25701
7	6	57	3240	397	5.4	2144	250	2.7	675	2819	1.1	3101	28801
8	14	71	3250	266	5.3	1410	116	2.7	307	1717	1.1	1889	30690
9	12	83	3265	672	5.3	3562	124	2.7	329	3890	1.1	4279	34969
10	12	95	3280	576	5.3	3053	138	2.7	366	3419	1.1	3760	38730
11	16	111	3315	1430	5.3	7579	248	2.7	657	8236	1.2	9883	48613
12	14	125	3360	1165	5.3	6175	441	2.7	1169	7343	1.1	8077	56691
			3370	= dead storage									
13	6	131	3380	536	5.3	2841	124	2.7	329	3169	1.1	3486	60177
14	10	141	3390	726	5.2	3775	206	2.6	536	4311	1.1	4742	64919
15	6	147	3410	412	5.2	2142	204	2.6	530	2673	1.2	3207	68126
16	13	160	3435	1120	5.2	5824	460	2.6	1196	7020	1.1	7722	75848
17	14	174	3460	550	5.2	2860	235	2.6	611	3471	1.1	3818	79666
18	1	175	3485	19	5.2	99	13	2.6	34	133	1.3	172	79839
			3490	= inactive storage (minimum power pool)									
19	1	176	3500	18	5.1	92	10	2.6	26	117	1.5	176	80015
20	1	177	3510	22	5.1	112	11	2.6	28	140	1.2	168	80183
21	0	177	3520	11	5.1	56	5	2.6	13	69	1.5	103	80286
22	5	182	3530	159	5.1	811	58	2.6	148	959	1.1	1055	81341
23	6	188	3560	138	5.1	704	62	2.6	158	862	1.3	1120	82461
			3589	= average eoy live storage for 1963-1977 (11,065,400 af)									
			3624	= average eoy storage with full development									
24	7	194	3640	181	5.0	905	224	2.5	560	1465	1.4	2051	84369
			3700	= maximum storage (without surcharge)									
San Juan River:													
1	11	11	3290	307	5.3	1627	115	2.7	305	1932	1.2	2318	2318
2	1	12	3320	19	5.3	101	37	2.7	98	199	1.4	278	2596
3	0	12	3330	5	5.3	27	6	2.7	16	42	1.5	64	2660
4	8	20	3370	257	5.3	1362	121	2.7	321	1683	1.2	2019	4679
			3370	= dead storage									
5	1	21	3410	40	5.2	208	30	2.6	78	286	1.4	400	5080
6	0	21	3420	17	5.2	88	15	2.6	39	127	1.5	191	5271
7	2	23	3435	91	5.2	473	59	2.6	153	627	1.2	752	6023
8	7	30	3460	370	5.2	1924	265	2.6	689	2613	1.2	3136	9158
			3490	= inactive storage (minimum power pool)									
9	7	37	3500	310	5.1	1581	90	2.6	230	1811	1.2	2173	11331
10	4	41	3520	202	5.1	1030	104	2.6	265	1295	1.2	1554	12885
11	6	47	3550	284	5.1	1448	194	2.6	495	1943	1.2	2332	15217
			3589	= average eoy live storage for 1963-1977 (11,065,400 af)									
12	13	60	3600	1022	5.0	5110	720	2.5	1800	6910	1.2	8292	23509
			3624	= average eoy storage with full development									
13	8	68	3655	168	5.0	840	34	2.5	85	925	1.2	1110	24619
			3700	= maximum storage (without surcharge)									
14	7	70	3710	116	4.9	568	12	2.5	29	598	1.3	777	24860

Summary - Combined Colorado River and San Juan River:

3490	= inactive storage (minimum power pool)	89453
3589	= average end-of-year live storage for years of storage prior to 1978 (1963-1977)	100103.
3624	= average end-of-year live storage for the period 1906-2000 under full Upper Basin yield development	105363
3700	= maximum storage (without surcharge)	108988

Notes:

(1) Basic data on reaches and evaporation rates are from Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, Tables 3a-3b. An evaporation rate equal to 50 percent of the annual evaporation rate was applied to high water areas to account for river channel losses within the high water mark from water surface evaporation and riparian vegetation evapotranspiration during the April through July snowmelt runoff period. Losses reflect then-current (1948) conditions within the reservoir basin.

(2) For the Colorado River, section 1 and the lower mile of river section 2 are located below Glen Canyon Dam (river mile 16), and the mean elevation for the 1-mile section 25 is 3730 feet. Lake Powell inundates about 6 miles of the 7-mile section 24. For the San Juan River, the mean elevation for the 7-mile section 14 is 3710 feet, but Lake Powell inundates about 2 miles of section 14. The cumulated reach lengths and losses are adjusted to reflect the portions of Colorado River sections 2 and 24 and San Juan River section 14 inundated by the reservoir.

(3) Reservoir operational data from Upper Colorado River Commission annual reports.

(4) Average end-of-year live storage for the period 1963-1977 is about 11,065,400 af based on USBR data. The associated water surface elevation was 3589 feet as determined from the Lake Powell 1963 area-capacity table. Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff.

(5) Average end-of-year live storage for the period 1906-2000 under development of the full Upper Basin yield was estimated from the November 22, 2005, preliminary draft yield study spreadsheet prepared by NMISC and USBR assuming use of CRSP active storage plus other Upper Basin storage and a delivery to the Lower Basin of 8.23 maf per year. The spreadsheet shows a long-term average 15,661,400 af total active CRSP surface plus bank storage, or about 63 percent of CRSP active capacity including bank storage. Excluding 4 percent bank storage, the active surface water storage for all CRSP reservoirs would average about 15,059,000 af. Long-term average future active storage, excluding bank storage, is estimated at 3,626,400 af for the other CRSP reservoirs based on Tables C-2 through C-4 (70 percent of active capacity or 2,461,200 af for Flaming Gorge Reservoir; 500,200 af total for the Aspinall Unit; and 665,000 af for Navajo Reservoir). The long-term average active surface water storage in Lake Powell is thus estimated at about 11,432,600 af, or 56 percent of active capacity. The associated long-term average water surface elevation under full Upper Basin development is about 3624 feet based on the UCRC reservoir operational area-capacity data for Lake Powell. Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff.

(6) River channel losses associated with average storage amounts for years of storage prior to 1978 are not adjusted to reflect years of no storage during the 1953-1977 critical period.

Table C-2. Pre-Reservoir River Channel Losses for Flaming Gorge Reservoir

River Section	Section Length (mi) Reach	Section Length (mi) Cumulated	Average Elevation (ft)	Normal Water Surface Area (acres)	Normal Water Surface Evap Rate (ft)	Normal Water Surface Evap Loss (af)	Net Additions for High Water Period Area (acres)	Net Additions for High Water Period Evap Rate (ft)	Net Additions for High Water Period Evap Loss (af)	Total Annual Losses (Normal Plus High Water) Equiv. Lake Evap (af)	Total Annual Losses (Normal Plus High Water) Turbulence Factor	Losses (af) Reach	Losses (af) Cumulated
Green River:													
			5603	= river elevation at Flaming Gorge Dam									
61	5	4	5620	126	3.0	378	40	1.5	60	438	1.3	569	478
62	3	7	5670	79	3.0	237	53	1.5	80	317	1.4	443	921
			5740	= dead storage									
63	9	16	5750	215	2.9	624	151	1.5	219	842	1.4	1179	2101
64	2	18	5820	94	2.8	263	57	1.4	80	343	1.2	412	2512
65	0	18	5830	6	2.8	17	10	1.4	14	31	1.5	46	2559
66	12	30	5840	484	2.8	1355	1148	1.4	1607	2962	1.1	3259	5817
67	13	43	5860	533	2.8	1492	1817	1.4	2544	4036	1.1	4440	10257
			5871	= inactive storage (minimum power pool)									
68	7	50	5885	291	2.8	815	950	1.4	1330	2145	1.1	2359	12616
69	14	64	5915	574	2.8	1607	2631	1.4	3683	5291	1.2	6349	18965
70	1	65	5940	25	2.8	70	47	1.4	66	136	1.1	149	19114
71	17	82	5970	530	2.7	1431	1340	1.4	1809	3240	1.2	3888	23002
			5985	= average eoy live storage for 1962-1977 (2,169,000 af)									
			6003	= average eoy storage with full development									
72	11	90	6030	377	2.7	1018	845	1.4	1141	2159	1.2	2590	24868
			6040	= maximum storage (without surcharge)									

Summary - Green River:

5871	= inactive storage (minimum power pool)	9325
5985	= average end-of-year live storage for years of storage prior to 1978 (1962-1977)	21758
6003	= average end-of-year storage for the period 1906-2000 under full Upper Basin yield development	22769
6040	= maximum storage (without surcharge)	24868

Notes:

(1) Basic data on reaches and evaporation rates are from Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, Table 3c. An evaporation rate equal to 50 percent of the annual evaporation rate was applied to high water areas to account for river channel losses within the high water mark from water surface evaporation and riparian vegetation evapotranspiration during the April through July snowmelt runoff period. Losses reflect then-current (1948) conditions within the reservoir basin.

(2) For the Green River, section 60 (mean elevation 5545 feet) is located below Flaming Gorge Dam (river mile 408 above mouth), and the mean elevation for the 4-mile section 73 is 6060 feet. Flaming Gorge Reservoir inundates about 4 miles of the 5-mile section 61 and 8 miles of the 11-mile section 72. The cumulated reach lengths and losses are adjusted to reflect the portions of sections 61 and 72 inundated by the reservoir.

(3) Reservoir operational data from Upper Colorado River Commission annual reports.

(4) Average end-of-year live storage for the period 1962-1977 is about 2,169,000 af based on USBR data. The associated average water surface elevation was 5985 feet as determined from the UCRC reservoir operational area-capacity data. Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff.

(5) Average end-of-year live storage for the period 1906-2000 under development of the full Upper Basin yield was estimated, in part, from the November 22, 2005, preliminary draft yield study spreadsheet prepared by NMISC and USBR assuming use of CRSP active storage plus other Upper Basin storage and a delivery to the Lower Basin of 8.23 maf per year. The spreadsheet shows a long-term average 15,661,400 af total active CRSP surface plus bank storage, or about 63 percent of CRSP active capacity including bank storage. The USBR data for historic end-of-year storage in Flaming Gorge Reservoir for the period 1965-2004 indicates long-term averages of 2,878,100 af for live storage, or 2,645,100 af for active storage (75 percent of active capacity). The long-term average storage in the future may decline as Wyoming further develops her compact apportionment and as Flaming Gorge Dam operates to meet flow recommendations for endangered fish habitat. Assuming an average active storage in Flaming Gorge Reservoir of 70 percent of active capacity, the associated long-term water surface elevation under full development is about 6003 feet based on the UCRC reservoir operational area-capacity data for the reservoir. Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff.

(6) River channel losses associated with average storage amounts for years of storage prior to 1978 are not adjusted to reflect years of no storage during the 1953-1977 critical period.

Table C-3. Pre-Reservoir River Channel Losses for the Aspinall Unit

Basic data on reaches and evaporation rates in the Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, did not include specific data for stream reaches of the Gunnison River inundated by the Aspinall Unit to indicate pre-reservoir river channel losses using the approach followed in Tables A-1 and A-2. The 1948 Engineering Advisory Committee report to the Upper Colorado River Basin Compact Commission included an estimate of the average river channel loss rate for the period 1914-1945 for the Gunnison River from the Tomichi Creek confluence to its mouth (see page 46). The river channel loss rate was developed using the same methodology used by the CWCB in its 1948 Evaporation Study. The channel loss rate includes river channel losses from the normal water surface and losses within the high water mark from water surface evaporation and riparian vegetation evapotranspiration during the April through July snowmelt runoff period.

	Miles of River		River Channel Losses		
	Inundated	Cumulated	Rate (af/mile)	Amount (af)	Cumulated (af)
Crystal Reservoir:					
6534 = river elevation at dam		0			
6670 = dead storage	4	4	122	488	488
6700 = inactive storage (minimum power pool)	1	5	122	122	610
6719 = average eoy live storage for 1977 (7,700 af)	1	6	122	122	732
6751 = average eoy storage with full development	1	7	122	122	854
6755 = maximum storage (without surcharge)	0	7	122	0	854
Morrow Point Reservoir:					
6775 = river elevation at dam		0			-
6808 = dead storage	1	1	122	122	122
7100 = inactive storage (minimum power pool)	8	9	122	976	1098
7146 = average eoy live storage for 1968-77 (106,900 af)	1	10	122	122	1220
7151 = average eoy storage with full development	0	10	122	0	1220
7160 = maximum storage (without surcharge)	1	11	122	122	1342
Blue Mesa Reservoir:					
7160 = river elevation at dam		0			
7358 = dead storage	14	14	122	1708	1708
7393 = inactive storage (minimum power pool)	1	15	122	122	1830
7468 = average eoy live storage for 1966-77 (462,600 af)	5	20	122	610	2440
7478 = average eoy storage with full development	1	21	122	122	2562
7519 = maximum storage (without surcharge)	3	24	122	366	2928

Summary - Combined Aspinall Unit Reservoirs:

inactive storage (minimum power pool)	3538
average end-of-year live storage for years of storage prior to 1978	4392
average end-of-year live storage for the period 1906-2000 under full Upper Basin yield development	4636
maximum storage (without surcharge)	5124

Notes:

(1) Reservoir operational data from Upper Colorado River Commission annual reports.

(2) Average end-of-year live storage for Blue Mesa Reservoir for the period 1966-1977 was 462,600 af from USBR data, which amounted to 381,600 af of active storage or 51 percent of active capacity. Average end-of-water-year live storage for Morrow Point Reservoir for the period 1968-1977 was 106,900 af from USBR data, which amounted to 32,100 af of active storage or 76 percent of active capacity. End-of-year live storage in Crystal Reservoir for 1977 was 7,700 af from USBR data, which amounted to 3,700 af of active storage or 28 percent of active capacity. The associated water surface elevations were determined from the UCRC reservoir operational area-capacity data. Average actual storage may be greater than average end-of-year storage due to dam operations during spring runoff.

(3) Average end-of-year live storage for the period 1906-2000 under development of the full Upper Basin yield was estimated, in part, from the November 22, 2005, preliminary draft yield study spreadsheet prepared by NMISC and USBR assuming use of CRSP active storage plus other Upper Basin storage and a delivery to the Lower Basin of 8.23 maf per year. The spreadsheet shows a long-term average 15,661,400 af total active CRSP surface plus bank storage, or about 63 percent of CRSP active capacity including bank storage. The USBR data for historic end-of-year storage in Blue Mesa Reservoir for the period 1968-2004 indicates long-term averages of 533,500 af for live storage, or 452,700 af for active storage (60 percent of active capacity). The long-term average storage in Blue Mesa Reservoir in the future may decline as Colorado further develops her compact apportionment and as the reservoir is operated to meet flow recommendations for endangered fish habitat. Assuming an average active storage in Blue Mesa Reservoir of 60 percent of active capacity, the associated long-term water surface elevation under full development is about 7478 feet based on the UCRC reservoir operational area-capacity data for the reservoir. The USBR data for historic end-of-year storage in Morrow Point Reservoir for the period 1968-2004 indicates long-term averages of 110,600 af for live storage, or 35,800 af for active storage (85 percent of active capacity). Assuming this reflects future power generation operations at Morrow Point Reservoir, with a rare drawdown for purposes of dam maintenance, the associated long-term water surface elevation under future conditions is about 7151 feet based on the UCRC reservoir operational data. The USBR data for historic end-of-year storage in Crystal Reservoir for the period 1978-2004 indicates long-term averages of 15,700 af for live storage, or 11,700 af of active storage (90 percent of active capacity). Assuming this reflects future power generation operations at Crystal Reservoir, the associated long-term water surface elevation under future conditions is about 6751 feet based on the UCRC reservoir operational data. Average actual storage in Blue Mesa Reservoir may be greater than average end-of-year storage due to dam operations during spring runoff.

(4) River mileage inundated by Navajo Reservoir at the indicated water surface elevations is interpolated from Colorado River Storage Project, Hearings on H.R. 4449, H.R. 4443 and H.R. 4463, January 1954, River Profile showing Main Stem Developments, page 108. The mileage is approximate.

(5) River channel losses associated with average storage amounts for years of storage prior to 1978 are not adjusted to reflect years of no storage during the 1953-1977 critical period.

Table C-4. Pre-Reservoir River Channel Losses for Navajo Reservoir

Basic data on reaches and evaporation rates in the Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, Table 3b, are insufficient within the stream reaches inundated by Navajo Reservoir to indicate pre-reservoir river channel losses using the approach followed in Tables A-1 and A-2. The 25-mile river section 36 has an average elevation of 5700 feet (20 feet below the river elevation at Navajo Dam), and the 12-mile river section 37 has an average elevation of 5900 feet (between the elevations of the dead and inactive pools). Section 37 is the last section shown in Table 3b of the 1948 CWCB report, and does not include inundated areas of the reservoir basin located above the San Juan River at Rosa, New Mexico, gage.

The 1948 Engineering Advisory Committee report to the Upper Colorado River Basin Compact Commission included estimates of average river channel loss rates for the period 1914-1945 for the reach of the San Juan River between Rosa and Blanco, New Mexico, and for the reach of the Pine River between Ignacio, Colorado, and its confluence with the San Juan River (see page 48). The river channel loss rates were developed using the same methodology used by the CWCB in its 1948 Evaporation Study and a turbulence factor of 1.3 (see Memorandum from the Hydrology Division, Bureau of Reclamation, to the Engineering Advisory Committee dated November 12, 1947). The channel loss rates include river channel losses from the normal water surface and losses within the high water mark from water surface evaporation and riparian vegetation evapotranspiration during the April through July snowmelt runoff period.

	Miles of River		River Channel Losses		
	Inundated	Cumulated	Rate (af/mile)	Amount (af)	Cumulated (af)
San Juan River:					
5720 = river elevation at Navajo Dam		0			
5775 = dead storage	7	7	426	2982	2982
5990 = inactive storage (required for NIIP)	21	28	426	8946	11928
6006 = average eoy live storage for 1962-77 (791,100 af)	1	29	426	426	12354
6059 = average eoy storage with full development	3	32	426	1278	13632
6085 = maximum storage (without surcharge)	3	35	426	1278	14910
Pine River:					
5720 = river elevation at Navajo Dam		0			
5775 = dead storage	1	1	371	371	371
5990 = inactive storage (required for NIIP)	8	9	371	2968	3339
6006 = average eoy live storage for 1962-77 (791,100 af)	1	10	371	371	3710
6059 = average eoy storage with full development	3	13	371	1113	4823
6085 = maximum storage (without surcharge)	1	14	371	371	5194

Summary - Combined San Juan River and Pine River:

5990 = inactive storage (required to operate NIIP)	15267
6006 = average end-of-year live storage for years of storage prior to 1978 (1962-1977)	16064
6059 = average end-of-year live storage for the period 1906-2000 under full New Mexico development	18455
6085 = maximum storage (without surcharge)	20104

Notes:

(1) Reservoir operational data from Upper Colorado River Commission annual reports. Inactive storage at elevation 5990 feet is required for the Navajo Indian Irrigation Project intake.

(2) Average end-of-year live storage for the period 1962-1977 is from USBR data. The associated water surface elevation was determined from the Navajo Reservoir area-capacity table dated 1981. Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff.

(3) Average end-of-year live storage for Navajo Reservoir for the period 1906-2000 under development of the full Upper Basin yield was estimated from the Navajo-Gallup Water Supply Project Biological Assessment. The Biological Assessment, using the Bureau of Reclamation's San Juan River Basin hydrology model, evaluated the monthly reservoir contents in Navajo Reservoir for the period 1929-2000 with the reservoir operated both to meet downstream flow recommendations for endangered fish habitat and to supply water to the full Navajo Indian Irrigation Project, the proposed Navajo-Gallup Project and other uses with New Mexico at development of her full compact apportionment. Based on the model results, the long-term average end-of-year storage in Navajo Reservoir would be about 1,325,000 af of live storage and 665,000 af of active storage (64 percent of active capacity). Average actual storage is greater than average end-of-year storage due to dam operations during spring runoff. The long-term average end-of-year water surface elevation would be about 6057 feet, and the long-term average end-of-month water surface elevation would be about 6059 feet (see the Biological Assessment at Table A18, page 31).

(4) River mileage inundated by Navajo Reservoir at the indicated water surface elevations is from Survey of Vegetation in the Navajo Reservoir Basin, University of Utah, Department of Anthropology, Anthropological Papers No. 51, June 1961, Appendix E-2, Navajo Reservoir Basin River Mileage Table, pages 93-96.

(5) River channel losses associated with average storage amounts for years of storage prior to 1978 are not adjusted to reflect years of no storage during the 1953-1977 critical period.

APPENDIX D

Incremental River Channel Evaporation Loss

Table D-1. Gaging Station River Channel and Stream Flow Basic Data

Gaging Station	Flow at Base of River Banks (cfs)	Water Surface Width at Base of River Banks (cfs)	Change in Water Surface Width (in ft) per Unit Change in Flow (in cfs) below River Banks	on River Banks	1914-1945 Period April-July	August-March	Average Flow (cfs) 1985-2004 Period April-July	August-March	Period of Record April-July	August-March
Green River:										
Green River near Green River, WY	1000	250	0.2000	0.0028	3730	740	2360	940	2950	970
Green River near Greendale, UT	1600	150	0.1125	0.0056	4420	900	2260	1620	2700	1700
Little Snake River near Slater, CO	50	60	1.2000	0.0060			520	40	600	40
Little Snake River near Lily, CO	200	85	0.4250	0.0033	1670	140	1180	140	1430	130
Yampa River below Craig, CO	400	170	0.3250	0.0075			2990	320	2990	320
Yampa River near Maybell, CO	800	220	0.1875	0.0032	4100	380	3560	400	3900	370
Yampa River near Deerlodge Park, CO	1000	300	0.3000	0.0020			4410	550	4950	600
Green River near Jensen, UT	3000	315	0.0517	0.0034			6920	3140	8130	2280
Duchesne River at Myton, UT	200	80	0.5000	0.0040	1180	320	380	190	860	260
Duchesne River near Randlett, UT	200	100	0.5000	0.0063	1660	520	580	280	900	350
White River near Colorado State Line, UT	400	120	0.1200	0.0032					1540	470
White River near Watson, UT	500	105	0.1700	0.0095	1280	480	1140	440	1200	440
White River at Mouth near Ouray, UT	800	110	0.0475	0.0029					1520	500
Price River at Woodside, UT	40	33	0.8250	0.0160					190	80
Price River above Heiner, UT	40	45	0.9750	0.0125	290	50	200	50	230	40
Green River at Green River, UT	3000	310	0.0117	0.0012	13820	2720	8730	3120	12270	3030
San Juan River:										
San Juan River near Carracas, CO	200	140	0.7000	0.0115	2950	500	1210	310	1270	280
Piedra River near Arboles, CO	200	95	0.4000	0.0062			850	180	860	160
Pine River near Ignacio, CO	100	55	0.4700	0.0080	780	140				
Pine River at La Boca, CO	100	75	0.5300	0.0063			370	180	380	160
San Juan River near Archuleta, NM	900	200	0.0875	0.0036	3650	680	1710	830	1670	880
Animas River near Cedar Hill, NM	400	135	0.3333	0.0063	2250	410	1850	460	1930	400
Animas River at Farmington, NM	400	135	0.1667	0.0014	2220	450	1680	430	1840	380
San Juan River at Farmington, NM	1200	190	0.0850	0.0032	6210	1260	3000	1280	3800	1160
La Plata River at CO-NM State Line	40	25	0.6250	0.0031	80	20	60	20	70	20
La Plata River near Farmington, NM	20	25	1.1500	0.0704			40	20	50	20
San Juan River at Shiprock, NM	1200	205	0.0333	0.0025	6290	1490	3100	1260	3720	1210
Mancos River near Towaoc, CO	40	30	0.7500	0.0138	130	30	80	30	100	30
San Juan River at Four Corners, CO	1200	230	0.0792	0.0087			3320	1350	3520	1410
McElmo Creek above Trail Canyon near Cortez, CO	30	25	0.8333	0.0181					60	50
McElmo Creek near Colorado-Utah State Line, CO	40	25	0.6250	0.0069			50	60	50	50
San Juan River near Bluff, UT	1500	170	0.0433	0.0021	6240	1590	3190	1450	4100	1440
Colorado River:										
Colorado River below Glenwood Springs, CO	4000	295	0.0250	0.0014	6460	1070	5690	1870	6170	1900
Colorado River near Cameo, CO	2000	320	0.1500	0.0018	8960	1640	6590	2120	7510	1970
Gunnison River at Delta, CO	3600	220	0.0195	0.0024			2900	1330	3080	1410
Gunnison River near Grand Junction, CO	3400	190	0.0077	0.0018	6100	1120	3730	1810	4910	1370
Colorado River near Colorado-Utah State Line	4000	400	0.1400	0.0007			10140	3980	10920	3700
Dolores River at Dolores, CO	300	100	0.2800	0.0048			980	130	1050	120
Dolores River near Cisco, CO	200	115	0.4500	0.0034			1640	260	1860	240
Colorado River near Cisco, UT	6000	440	0.0050	0.0005	18810	3390	11270	4120	14350	3650
San Rafael River near Green River, UT	60	50	0.8333	0.0220			130	50	260	70
Colorado River at Lee Ferry, AZ	8000	410	0.0017	0.0004	40080	8430	15140	13790	24640	10200
Total										

Notes:

(1) Water surface width versus flow relationships derived from USGS gage rating measurements from 1985-2005. Flows and widths at the base of the river channel banks are determined from distinct breaks in the width versus flow relationships as plotted. The water surface widths at the base of the channel banks may vary over time with channel conditions. The river cross-sections at the gaging station locations tend to be relatively stable. White River near Colorado State Line is based on 1980-1985 data. For the White River near Watson, river surface width at low flows varies substantially and averages the width at high flows (channel more entrenched at moderate flows). Pine River near Ignacio is based on data for water years 2000-2004.

(2) Average flows for the 1914-1945 period are from the 1948 Engineering Advisory Committee report (except for Green River near Greendale and San Juan River near Carracas which were not available). Average flows for 1914-1945 for Green River near Linwood, UT, are shown in this table for Green River near Greendale and for the San Juan River near Rosa, NM, are shown in this table for San Juan River near Carracas only for the purpose of comparing the relative amounts of runoff in the Green River near Flaming Gorge Reservoir and in the San Juan River near Navajo Reservoir during the snowmelt runoff period and the remainder of the year as between the pre-reservoir and post-reservoir periods. Average flows for the 1914-1945 period for the San Juan River at Archuleta are estimated from the San Juan River at Blanco, NM, plus 200 cfs average diversion bypassing the gage in the Citizens Ditch during April-October. Average flows for 1985-2004 and for the period of record are from USGS gage data. Flow data for White River near Colorado-Utah State Line are available for water years 1977-1985 only, and for White River at Mouth near Ouray are available for 1974-1986 only. Data for the Price River near Heiner are available for water years 1991-2003, and for the Price River at Woodside are not available for water years 1993-2000. Data for McElmo Creek near Cortez available for water years 1994-2004.

Table D-2. Reductions in Stream Flow from the Critical Period under Full Compact Development

River Reach	Colorado – Depletions above Reach (af): Critical Period	Colorado – Depletions above Reach (af): Full Use	Colorado – Depletions above Reach (af): Increase	Colorado – Distribution of Depletions Increase to Types of Use (af): Evap and Exports	Colorado – Distribution of Depletions Increase to Types of Use (af): Irrigation	Colorado – Distribution of Depletions Increase to Types of Use (af): M&I	Colorado – Flow Reduction at Head of Reach (af): April-July	Colorado – Flow Reduction at Head of Reach (af): August-March	New Mexico – Depletions above Reach: Critical Period	New Mexico – Depletions above Reach: Full Use	New Mexico – Depletions above Reach: Increase	New Mexico – Distribution of Depletions Increase to Types of Use (af): Evap and Exports	New Mexico – Distribution of Depletions Increase to Types of Use (af): Irrigation	New Mexico – Distribution of Depletions Increase to Types of Use (af): M&I	New Mexico – Flow Reduction at Head of Reach (af): April-July	New Mexico – Flow Reduction at Head of Reach (af): August-March
Green River:																
Above Green River, WY	0	0	0						0	0	0					
Green River, WY, to Linwood, UT	0	0	0						0	0	0					
Linwood, UT, to Yampa River confluence	0	0	0						0	0	0					
Little Snake River: Above WY-CO State Line	0	0	0						0	0	0					
Little Snake River: WY-CO State Line to Lily, CO	11238	108448	97210	5000	72210	20000	136044	-38834	0	0	0					
Yampa River: Above Craig, CO	0	0	0						0	0	0					
Yampa River: Craig, CO, to Green River confluence	76772	93432	16660	5000	6660	5000	21812	-5152	0	0	0					
Yampa River to Brush Creek confluence	93020	207998	114978	10000	79978	25000	159407	-44429	0	0	0					
Brush Creek to Ashley Creek confluence	93020	207998	114978	10000	79978	25000	159407	-44429	0	0	0					
Ashley Creek to Duchesne River confluence	93020	207998	114978	10000	79978	25000	159407	-44429	0	0	0					
Duchesne River to White River confluence	93020	207998	114978	10000	79978	25000	159407	-44429	0	0	0					
White River: Above Watson, UT	0	0	0						0	0	0					
White River: Watson, UT, to Green River confluence	42380	72474	30094	2000	23094	5000	41819	-11725	0	0	0					
White River to Price River confluence	135400	280472	145072	12000	103072	30000	201225	-56154	0	0	0					
Price River: Above Heiner, UT	0	0	0						0	0	0					
Price River: Heiner, UT, to Green River confluence	0	0	0						0	0	0					
Price River to Green River, UT	135400	280472	145072	12000	103072	30000	201225	-56154	0	0	0					
Green River, UT, to Colorado River confluence	135400	280472	145072	12000	103072	30000	201225	-56154	0	0	0					
San Juan River:																
Above Rosa, NM	0	0	0						0	0	0					
Pine River: Abeve Ignacio, CO	0	0	0						0	0	0					
Pine River: Ignacio, CO, to San Juan River conf.	62005	77000	14995	200	13795	1000	21011	-6016	0	0	0					
Rosa, NM, to Blanco, NM	15185	19000	3815	200	2615	1000	5359	-1544	23800	107700	83900	82500	0	1400	83204	697
Navajo Reservoir depletions (Evap., direct diversions	0	0	0						0	0	0					
Animas River: Above Cedar Hill, NM	0	0	0						0	0	0					
Animas River: Cedar Hill, NM, to Farmington, NM	43656	94300	50644	5000	6144	39500	72752	-22109	0	100	100	0	0	100	100	0
Blanco, NM, to Farmington, NM	77189	96000	18811	400	16411	2000	26370	-7559	39600	420700	381100	98600	275600	8900	514928	-16018
La Plata River: Above CO-NM State Line	0	0	0						0	0	0					
La Plata River: CO-NM State Line to Farmington	19825	27000	7175	500	6175	500	9894	-2719	0	0	0					
Farmington, NM, to Shiprock, NM	140670	217300	76630	5900	28730	42000	109017	-32387	108300	509300	401000	98800	275600	26600	538649	-9257
Chaco River	0	0	0						0	0	0					
Shiprock, NM, to Mancos River confluence	140670	217300	76630	5900	28730	42000	109017	-32387	158000	633100	475100	98800	282800	93500	511537	-36439
Mancos River: Above Towaoc, CO	0	0	0						0	0	0					
Mancos River: Towaoc, CO, to San Juan River conf.	13919	51960	38041	2000	31041	5000	52944	-14904	0	0	0					
Mancos River to McElmo Creek confluence	154590	269260	114670	7900	59770	47000	161961	-47291	158000	633100	475100	98800	282800	93500	511537	-36439
McElmo Creek: Above Cortez, CO	0	0	0						0	0	0					
McElmo Creek: Cortez, CO, to San Juan River conf.	-69240	-11800	57440	1000	51440	5000	80503	-23063	0	0	0					
McElmo Creek to Chinle Creek confluence	85350	257460	172110	8900	111210	52000	242464	-70354	158000	633100	475100	98800	282800	93500	511537	-36439
Chinle Creek to Bluff, UT	85350	271590	186240	8900	125340	52000	262246	-76006	158000	633100	475100	98800	282800	93500	511537	-36439
Bluff, UT, to Colorado River confluence	85350	271590	186240	8900	125340	52000	262246	-76006	158000	633100	475100	98800	282800	93500	511537	-36439
per Colorado River Main Stem:																
bove Glenwood Springs, CO	0	0	0						0	0	0					
Glenwood Springs, CO, to Cameo, CO	566779	938360	371581	300000	51581	20000	402163	-30582	0	0	0					
Gunnison River: Above Delta, CO	0	0	0						0	0	0					
Gunnison River: Delta, CO, to Grand Junction, CO	458486	627776	169290	100000	39290	30000	199931	-30641	0	0	0					
Dolores River: Above Dolores, CO	0	0	0						0	0	0					
Dolores River: Dolores, CO, to Colorado River conf.	129769	161140	31371	31371	0	0	31371	0	0	0	0					
Cameo, CO, to Cisco, UT	1322396	2068698	746302	436371	254931	55000	875637	-129335	0	0	0					
Cisco, UT, to Green River confluence	1531950	2361463	829513	441371	313142	75000	992083	-162569	0	0	0					
Colorado River:																
Green River confluence to San Juan River confluence	1667350	2641935	974585	453371	416214	105000	1193308	-218723	0	0	0					
San Juan River confluence to Glen Canyon Dam	1752700	2913525	1160825	462271	541554	157000	N/A	N/A	158000	633100	475100	98800	282800	93500	N/A	N/A
Glen Canyon Dam to Lee Ferry, AZ	1752700	2913525	1160825	462271	541554	157000	N/A	N/A	158000	633100	475100	98800	282800	93500	N/A	N/A

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Table D-2. Reductions in Stream Flow from the Critical Period under Full Compact Development (continued)

River Reach	Utah: Depletions above Reach (af)			Utah: Distribution of Depletions Increase to Types of Use (af)			Utah: Flow Reduction at Head of Reach (af)		Wyoming: Depletions above Reach			Wyoming: Distribution of Depletions Increase to Types of Use (af)			Wyoming: Flow Reduction at Head of Reach (af)	
	Critical Period	Full Use	Increase	Evap and Exports	Irrigation	M&I	April-July	August-March	Critical Period	Full Use	Increase	Evap and Exports	Irrigation	M&I	April-July	August-March
Green River:																
Above Green River, WY	0	0	0						0	0	0					
Green River, WY, to Linwood, UT	0	0	0						190327	446121	255794	50000	185794	20000	340062	-84268
Linwood, UT, to Yampa River confluence	11151	31048	19897	5000	9897	5000	26343	-6446	284890	733026	448136	50000	328136	70000	614216	-166079
Little Snake River: Above WY-CO State Line	0	0	0						0	0	0					
Little Snake River: WY-CO State Line to Lily, CO	0	0	0						15310	55174	39864	10000	19864	10000	52784	-12921
Yampa River: Above Craig, CO	0	0	0						0	0	0					
Yampa River: Craig, CO, to Green River confluence	0	0	0						0	0	0					
Yampa River to Brush Creek confluence	11151	31048	19897	5000	9897	5000	26343	-6446	300200	788200	488000	60000	348000	80000	667000	-179000
Brush Creek to Ashley Creek confluence	11151	31048	19897	5000	9897	5000	26343	-6446	300200	788200	488000	60000	348000	80000	667000	-179000
Ashley Creek to Duchesne River confluence	70623	122123	51500	5000	31500	15000	71562	-20062	300200	788200	488000	60000	348000	80000	667000	-179000
Duchesne River to White River confluence	488166	848648	360482	50000	265482	45000	489062	-128580	300200	788200	488000	60000	348000	80000	667000	-179000
White River: Above Watson, UT	0	0	0						0	0	0					
White River: Watson, UT, to Green River confluence	0	2070	2070	0	2070	0	2898	-828	0	0	0					
White River to Price River confluence	488166	850718	362552	50000	267552	45000	491960	-129408	300200	788200	488000	60000	348000	80000	667000	-179000
Price River: Above Heiner, UT	0	0	0						0	0	0					
Price River: Heiner, UT, to Green River confluence	56375	65201	8827	2000	827	6000	12142	-3316	0	0	0					
Price River to Green River, UT	544541	938688	394147	52000	291147	51000	535978	-141831	300200	788200	488000	60000	348000	80000	667000	-179000
Green River, UT, to Colorado River confluence	550116	954212	404096	52000	292096	60000	550784	-146688	300200	788200	488000	60000	348000	80000	667000	-179000
San Juan River:																
Above Rosa, NM	0	0	0						0	0	0					
Pine River: Above Ignacio, CO	0	0	0						0	0	0					
Pine River: Ignacio, CO, to San Juan River conf.	0	0	0						0	0	0					
Rosa, NM, to Blanco, NM	0	0	0						0	0	0					
Navajo Reservoir depletions (Evap., direct diversions)	0	0	0						0	0	0					
Animas River: Above Cedar Hill, NM	0	0	0						0	0	0					
Animas River: Cedar Hill, NM, to Farmington, NM	0	0	0						0	0	0					
Blanco, NM, to Farmington, NM	0	0	0						0	0	0					
La Plata River: Above CO-NM State Line	0	0	0						0	0	0					
La Plata River: CO-NM State Line to Farmington	0	0	0						0	0	0					
Farmington, NM, to Shiprock, NM	0	0	0						0	0	0					
Chaco River	0	0	0						0	0	0					
Shiprock, NM, to Mancos River confluence	0	0	0						0	0	0					
Mancos River: Above Towaoc, CO	0	0	0						0	0	0					
Mancos River: Towaoc, CO, to San Juan River conf.	0	0	0						0	0	0					
Mancos River to McElmo Creek confluence	0	0	0						0	0	0					
McElmo Creek: Above Cortez, CO	0	0	0						0	0	0					
McElmo Creek: Cortez, CO, to San Juan River conf.	0	0	0						0	0	0					
McElmo Creek to Chinle Creek confluence	0	0	0						0	0	0					
Chinle Creek to Bluff, UT	8045	16721	8676	2000	2676	4000	11737	-3060	0	0	0					
Bluff, UT, to Colorado River confluence	8045	41721	33676	2000	6676	25000	48784	-15108	0	0	0					
Upper Colorado River Main Stem:																
Above Glenwood Springs, CO	0	0	0						0	0	0					
Glenwood Springs, CO, to Cameo, CO	0	0	0						0	0	0					
Gunnison River: Above Delta, CO	0	0	0						0	0	0					
Gunnison River: Delta, CO, to Grand Junction, CO	0	0	0						0	0	0					
Dolores River: Above Dolores, CO	0	0	0						0	0	0					
Dolores River: Dolores, CO, to Colorado River conf.	0	0	0						0	0	0					
Cameo, CO, to Cisco, UT	0	0	0						0	0	0					
Cisco, UT, to Green River confluence	0	0	0						0	0	0					
Colorado River:																
Green River confluence to San Juan River confluence	631500	1065020	433520	58000	287520	90000	593303	-159783	300200	788200	488000	60000	348000	80000	667000	-179000
San Juan River confluence to Glen Canyon Dam	686490	1200900	514410	58000	356410	100000	N/A	N/A	300200	788200	488000				N/A	N/A
Glen Canyon Dam to Lee Ferry, AZ	686600	1294900	608300	58000	356410	193890	N/A	N/A	300200	788200	488000				N/A	N/A

Table D-2. Reductions in Stream Flow from the Critical Period under Full Compact Development (continued)

River Reach	Upper Division States Shared CRSP Evaporation: Depletions above Reach (af): Critical Period (af)	Full Use (af)	Increase (af)	Distribution of Depletions Increase to Types of Use (af): Evap and Exports	Irrigation	M&I	Flow Reduction at Head of Reach (af): April-July	August-March	Arizona: Depletions above Reach: Critical Period (af)	Full Use (af)	Increase (af)	Distribution of Depletions Increase to Types of Use (af): Evap and Exports	Irrigation	M&I	Flow Reduction at Head of Reach (af): April-July	August-March
Green River:																
Above Green River, WY	0	0	0						0	0	0					
Green River, WY, to Linwood, UT	0	0	0						0	0	0					
Linwood, UT, to Yampa River confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Little Snake River: Above WY-CO State Line	0	0	0						0	0	0					
Little Snake River: WY-CO State Line to Lily, CO	0	0	0						0	0	0					
Yampa River: Above Craig, CO	0	0	0						0	0	0					
Yampa River: Craig, CO, to Green River confluence	0	0	0						0	0	0					
Yampa River to Brush Creek confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Brush Creek to Ashley Creek confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Ashley Creek to Duchesne River confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Duchesne River to White River confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
White River: Above Watson, UT	0	0	0						0	0	0					
White River: Watson, UT, to Green River confluence	0	0	0						0	0	0					
White River to Price River confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Price River: Above Heiner, UT	0	0	0						0	0	0					
Price River: Heiner, UT, to Green River confluence	0	0	0						0	0	0					
Price River to Green River, UT	37850	68000	30150	30150	0	0	30150	0	0	0	0					
Green River, UT, to Colorado River confluence	37850	68000	30150	30150	0	0	30150	0	0	0	0					
San Juan River:																
Above Rosa, NM	0	0	0						0	0	0					
Pine River: Above Ignacio, CO	0	0	0						0	0	0					
Pine River: Ignacio, CO, to San Juan River conf.	0	0	0						0	0	0					
Rosa, NM, to Blanco, NM	0	0	0						0	0	0					
Navajo Reservoir depletions (Evap., direct diversions)	0	0	0						0	0	0					
Animas River: Above Cedar Hill, NM	0	0	0						0	0	0					
Animas River: Cedar Hill, NM, to Farmington, NM	0	0	0						0	0	0					
Blanco, NM, to Farmington, NM	0	0	0						0	200	200	200	0	0	6600	-3184
La Plata River: Above CO-NM State Line	0	0	0						0	0	0					
La Plata River: CO-NM State Line to Farmington	0	0	0						0	0	0					
Farmington, NM, to Shiprock, NM	0	0	0						0	200	200	200	0	0	6600	-3184
Chaco River	0	0	0						0	0	0					
Shiprock, NM, to Mancos River confluence	0	0	0						0	6600	6600	200	0	6400	6600	0
Mancos River: Above Towaoc, CO	0	0	0						0	0	0					
Mancos River: Towaoc, CO, to San Juan River conf.	0	0	0						0	0	0					
Mancos River to McElmo Creek confluence	0	0	0						0	6600	6600	200	0	6400	6600	0
McElmo Creek: Above Cortez, CO	0	0	0						0	0	0					
McElmo Creek: Cortez, CO, to San Juan River conf.	0	0	0						0	0	0					
McElmo Creek to Chinle Creek confluence	0	0	0						0	6600	6600	200	0	6400	6600	0
Chinle Creek to Bluff, UT	0	0	0						200	7100	6900	200	0	6700	6751	149
Bluff, UT, to Colorado River confluence	0	0	0						10000	16000	6000	200	-900	6700	6211	-211
Upper Colorado River Main Stem:																
Above Glenwood Springs, CO	0	0	0						0	0	0					
Glenwood Springs, CO, to Cameo, CO	0	0	0						0	0	0					
Gunnison River: Above Delta, CO	0	0	0						0	0	0					
Gunnison River: Delta, CO, to Grand Junction, CO	3540	9000	5460	5460	0	0	5460	0	0	0	0					
Dolores River: Above Dolores, CO	0	0	0						0	0	0					
Dolores River: Dolores, CO, to Colorado River conf.	0	0	0						0	0	0					
Cameo, CO, to Cisco, UT	3540	9000	5460	5460	0	0	5460	0	0	0	0					
Cisco, UT, to Green River confluence	3540	9000	5460	5460	0	0	5460	0	0	0	0					
Colorado River:																
Green River confluence to San Juan River confluence	41390	77000	35610	35610	0	0	35610	0	0	0	0					
San Juan River confluence to Glen Canyon Dam	41390	77000	35610	35610	0	0	N/A	N/A	10200	19000	8800	200	-900	9500	N/A	N/A
Glen Canyon Dam to Lee Ferry, AZ	221240	522000	300760	300760	0	0	N/A	N/A	13400	50000	36600	200	-900	37300	N/A	N/A

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Table D-2. Reductions in Stream Flow from the Critical Period under Full Compact Development
(continued)

.es:

(1) Depletions in af for the 1953-1977 critical period and under conditions of full compact development are from Tables B-2 and B-3, respectively.

(2) Increases in reservoir evaporation and exports after the critical period are assumed to deplete flows during the April-July snowmelt runoff period only, with depletions from exports being supplied from reservoir storage either directly or by exchange. No return flows from evaporation and exports occur during the year. Increases in irrigation depletions may include a combination of new uses throughout the irrigation season and supplemental uses after the snowmelt runoff season. Increased irrigation depletions are assumed to be met from reservoir storage, with the diversion demand stored during the April-July snowmelt runoff season. Diversions are then satisfied from reservoir storage from April-October, with 60 percent of the demand during April-July and 40 percent of the demand during August-October. Irrigation return flows are assumed to be 50 percent of diversions except where noted otherwise. For increases in municipal and industrial depletions, which also are assumed to be met from reservoir water stored during the April-July runoff period, the diversion demand is assumed to be year-round with the demand during April-September being 3 times the demand during October-March unless noted otherwise. Return flows from municipal and industrial uses are assumed to be 50 percent unless otherwise noted.

(3) For Colorado, the increases in depletions after the critical period are assumed to be distributed as shown (the Colorado depletions through 1977 shown in Table A-1 and during 1996-2000 shown in Table A-3 were considered). Also considered were the Dolores Project and the Animas-La Plata Project uses. Diversions and return flows were assumed to occur within the same reach. Storage is assumed to be supplied by local storage or local diversions to offstream storage (that is, no carriage of storage water from upstream to downstream river reaches, including from the Aspinall Unit).

(4) For New Mexico, the increases in depletions after the critical period are distributed to types of use based on the April 2005 New Mexico schedule of anticipate depletions, with adjustments, as follows:
   (a) the increase in depletions above Navajo Reservoir is due primarily to increases in San Juan-Chama Project (SJCP) exports from 22,700 af/yr for the critical period (see Table A-4, note 8) to 105,200 af/yr future average, which is supplied by direct flow diversions during the snowmelt runoff period and by exchange with Navajo Reservoir storage;
   (b) the increase in depletions from the Animas River above Cedar Hill is due to New Mexico's share of Ridges Basin Reservoir evaporation under the Animas-La Plata Project (ALP);
   (c) the increase in depletions from the San Juan River above Blanco is due to the SJCP as described in (a) above, plus: increasing average Navajo Reservoir evaporation from 11,400 af/yr during the critical period (see the November 22, 2005, draft Upper Basin Yield Study, Historic Storage and Evaporation at Colorado River Storage Project Reservoirs) to 27,500 af/yr future average (see Table B-3, note 5); increasing the average Navajo Indian Irrigation Project (NIIP) depletion from approximately 2,000 af/yr for the critical period to 270,000 af/yr assuming full use of the NIIP without fallowing; increasing average depletions on the Hammond Irrigation Project (HIP) from about 2,800 af/yr during the critical period (see Table A-1, note 8) to about 10,400 af/yr adjusted for application of the modified Blaney-Criddle method; 5,000 af/yr of depletion associated with the eastern pipeline of the Navajo-Gallup Water Supply Project (NGWSP); and minor other depletions by the Jicarilla Apache Nation;
   (d) the increase in depletions above Farmington is due to the uses described in (a), (b) and (c) above, plus: 13,500 af/yr of municipal and domestic depletion from the Animas River under the ALP; and about 6,300 af/yr of municipal use increases by the City of Farmington supplied through storage in Farmington Lake (lake evaporation increase of about 200 af/yr over the critical period average); and
   (e) the increase in depletions above Shiprock is due to the uses described in (a)-(d) above, plus: increasing the depletions at the Four Corners Power Plant and San Juan Generating Station from about 16,500 af/yr averaged over the critical period (see Table A-1, note 8) to 55,200 af/yr future average; 24,500 af/yr of depletion associated with New Mexico depletions under the San Juan River diversion pipeline of the NGWSP; 7,200 af/yr of depletion associated with rehabilitation of the Fruitland and Hogback Irrigation Projects; and minor other Navajo Nation uses.

   Of these increases in depletions, all are from reservoir storage except that 39,000 af/yr of use at the power plants, 7,200 af/yr of irrigation use associated with rehabilitation of the Fruitland and Hogback Projects, and minor Navajo and Jicarilla uses are from the direct flow. Uniform demand distributions and no return flows are assumed for the power plant uses. Return flows from NIIP are assumed to be 25 percent, with half occurring during April-July, and return flows from the NGWSP are 1700 af. Flow reductions at head of reach account for conveyance of storage water in the San Juan River for downstream contract deliveries and for returns of diversions from upstream reaches.

(5) For Utah, the increases in depletions after the critical period are assumed to be distributed as shown (the Utah depletions through 1977 shown in Table A-1 and during 1996-2000 shown in Table A-3 were considered). Diversions and return flows were assumed to occur within the same reach. Storage is assumed to be supplied by local mainstream Green River diversions to offstream storage or by tributary storage, except that the St. George Pipeline is supplied from Lake Powell (that is, no carriage of storage water from Flaming Gorge Reservoir to downstream uses is assumed).

(6) For Wyoming, the increases in depletions after the critical period are assumed to be distributed as shown (the Wyoming depletions through 1977 shown in Table A-1 and during 1996-2000 shown in Table A-3 were considered). Diversions and return flows were assumed to occur within the same reach.

(7) For Arizona, the increases in depletions after the critical period are distributed to types of use as follows:
   (a) the increase in depletions from the San Juan River above Blanco is due to the State of Arizona's share of Navajo Reservoir evaporation chargeable against the Navajo Nation's NGWSP uses in Arizona (see Table B-3, note 5);
   (b) the increase in depletions from the San Juan River above Shiprock is due to the use described in (a) above, plus 6,400 af/yr of depletion associated with Arizona depletions under the San Juan River diversion pipeline of the NGWSP;
   (c) the increase in depletions from the Colorado River above Glen Canyon Dam is due to the uses described in (a) and (b) above, plus: about 26,000 af/yr of depletion for power generation uses at the Page Power Plant; and about 3,000 af/yr of depletion for the City of Page and minor Navajo Nation uses. Diversions for the Page Power Plant and the City of Page are from Lake Powell.

   Of these increases in depletions, all are from reservoir storage and are assumed to be full depletions without return flow. Flow reductions at head of reaches on the San Juan River reflect storage and carriage of water from Navajo Reservoir to the NGWSP diversion point on the river above Shiprock.

(8) Effects on flow between Glen Canyon Dam and Lee Ferry are not segregated between the snowmelt runoff period and the remainder of the year due to reregulation at Lake Powell.

Table D-3. Incremental Changes in Channel Losses from the Critical Period under Full Compact Development

Colorado

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	(ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	(ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	1662	0.0016	2.7	21.9	50	-63	0.0250	-1.6	-13.1	-30
Colorado River, Cameo to Gunnison River	29	4.20	4.79	1662	0.0018	3.0	10.5	25	-63	0.0250	-1.6	-5.6	-13
Gunnison River, Delta to mouth	57	4.20	4.79	826	0.0021	1.7	12.0	29	-64	0.0140	-0.9	-6.1	-15
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	3619	0.0010	3.6	16.7	41	-268	0.1400	-37.6	-173.0	-424
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	3619	0.0006	2.2	10.0	25	-268	0.0700	-18.8	-86.5	-217
Dolores River, McPhee Dam to mouth	183	4.20	4.79	130	0.0040	0.5	11.5	28	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	4100	0.0005	2.0	24.3	65	-268	0.0050	-1.3	-15.9	-43
Colorado River, Green River to Lake Powell	25	5.00	5.70	4931	0.0005	2.5	7.5	21	-454	0.0050	-2.3	-6.9	-20
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.1000	0.0	0.0	0
Yampa River, Craig to Little Snake River	88	3.00	3.42	90	0.0054	0.5	5.2	9	-11	0.2600	-2.8	-29.6	-51
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	562	0.0033	1.9	17.3	30	-81	0.4250	-34.2	-319.6	-547
Yampa River, Little Snake River to mouth	51	3.30	3.76	652	0.0045	2.9	18.1	34	-91	0.2500	-22.8	-141.0	-265
Green River, Yampa River to Jensen	28	3.70	4.22	659	0.0040	2.6	8.9	19	-92	0.0600	-5.5	-18.8	-40
Green River, Jensen to Duchesne River	69	3.80	4.33	659	0.0030	2.0	16.5	36	-92	0.0500	-4.6	-38.5	-83
Duchesne River, Randlett to mouth	16	4.00	4.56	0	0.0060	0.0	0.0	0	0	0.5000	0.0	0.0	0
Green River, Duchesne River to White River	1	3.90	4.45	659	0.0030	2.0	0.2	1	-92	0.0300	-2.8	-0.3	-1
White River, Piceance River to Watson	77	3.60	4.10	173	0.0030	0.5	4.8	10	-24	0.1200	-2.9	-27.2	-56
White River, Watson to mouth	66	3.80	4.33	173	0.0060	1.0	8.3	18	-24	0.1100	-2.7	-21.4	-46
Green River, White River to Price River	109	4.10	4.67	832	0.0020	1.7	22.0	51	-117	0.0200	-2.3	-30.8	-72
Price River, Heiner to mouth	112	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.9750	0.0	0.0	0
Green River, Price River to Green River	18	4.50	5.13	832	0.0012	1.0	2.2	6	-117	0.0117	-1.4	-3.0	-8
Green River, Green River to mouth	117	4.70	5.36	832	0.0012	1.0	14.2	38	-117	0.0117	-1.4	-19.3	-52
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	109	0.0034	0.4	2.1	4	-16	0.0860	-1.3	-7.7	-16
Animas River, Cedar Hill to mouth	33	3.60	4.10	301	0.0040	1.2	4.8	10	-46	0.2500	-11.5	-45.9	-94
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	41	0.0400	1.6	5.0	10	-6	0.9000	-5.1	-15.4	-32
San Juan River, Farmington to Shiprock	37	3.90	4.45	451	0.0028	1.3	5.7	13	-67	0.0590	-4.0	-17.8	-40
San Juan River, Shiprock to Mancos River	26	4.10	4.67	451	0.0056	2.5	8.0	19	-67	0.0560	-3.8	-11.9	-28
Mancos River, Towaoc to mouth	25	4.00	4.56	219	0.0138	3.0	9.1	21	-31	0.7500	-23.2	-70.3	-160
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	669	0.0060	4.0	12.2	29	-98	0.0600	-5.9	-17.8	-43
McElmo Creek, Cortez to mouth	45	4.10	4.67	333	0.0125	4.2	22.7	53	-48	0.7290	-34.9	-190.3	-445
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	1002	0.0040	4.0	26.2	69	-146	0.0500	-7.3	-47.8	-125
San Juan River, Bluff to Lake Powell	52	4.90	5.59	1084	0.0021	2.3	14.3	40	-158	0.0433	-6.8	-43.0	-120
Total								802					-3083

New Mexico

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	(ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	(ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	0	0.0016	0.0	0.0	0	0	0.0250	0.0	0.0	0
Colorado River, Cameo to Gunnison River	29	4.20	4.79	0	0.0018	0.0	0.0	0	0	0.0250	0.0	0.0	0
Gunnison River, Delta to mouth	57	4.20	4.79	0	0.0021	0.0	0.0	0	0	0.0140	0.0	0.0	0
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	0	0.0010	0.0	0.0	0	0	0.1400	0.0	0.0	0
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	0	0.0006	0.0	0.0	0	0	0.0700	0.0	0.0	0
Dolores River, McPhee Dam to mouth	183	4.20	4.79	0	0.0040	0.0	0.0	0	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Colorado River, Green River to Lake Powell	25	5.00	5.70	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.1000	0.0	0.0	0
Yampa River, Craig to Little Snake River	88	3.00	3.42	0	0.0054	0.0	0.0	0	0	0.2600	0.0	0.0	0
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	0	0.0033	0.0	0.0	0	0	0.4250	0.0	0.0	0
Yampa River, Little Snake River to mouth	51	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.2500	0.0	0.0	0
Green River, Yampa River to Jensen	28	3.70	4.22	0	0.0040	0.0	0.0	0	0	0.0600	0.0	0.0	0
Green River, Jensen to Duchesne River	69	3.80	4.33	0	0.0030	0.0	0.0	0	0	0.0500	0.0	0.0	0
Duchesne River, Randlett to mouth	16	4.00	4.56	0	0.0060	0.0	0.0	0	0	0.5000	0.0	0.0	0
Green River, Duchesne River to White River	1	3.90	4.45	0	0.0030	0.0	0.0	0	0	0.0300	0.0	0.0	0
White River, Piceance River to Watson	77	3.60	4.10	0	0.0030	0.0	0.0	0	0	0.1200	0.0	0.0	0
White River, Watson to mouth	66	3.80	4.33	0	0.0060	0.0	0.0	0	0	0.1100	0.0	0.0	0
Green River, White River to Price River	109	4.10	4.67	0	0.0020	0.0	0.0	0	0	0.0200	0.0	0.0	0
Price River, Heiner to mouth	112	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.9750	0.0	0.0	0
Green River, Price River to Green River	18	4.50	5.13	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
Green River, Green River to mouth	117	4.70	5.36	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	2128	0.0034	7.2	41.2	85	-33	0.0860	-2.9	-16.3	-33
Animas River, Cedar Hill to mouth	33	3.60	4.10	0	0.0040	0.0	0.0	0	0	0.2500	0.0	0.0	0
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	0	0.0400	0.0	0.0	0	0	0.9000	0.0	0.0	0
San Juan River, Farmington to Shiprock	37	3.90	4.45	2226	0.0028	6.2	28.0	62	-19	0.0590	-1.1	-5.1	-11
San Juan River, Shiprock to Mancos River	26	4.10	4.67	2114	0.0056	11.8	37.3	87	-76	0.0560	-4.2	-13.3	-31
Mancos River, Towaoc to mouth	25	4.00	4.56	0	0.0138	0.0	0.0	0	0	0.7500	0.0	0.0	0
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	2114	0.0060	12.7	38.4	92	-76	0.0600	-4.5	-13.7	-33
McElmo Creek, Cortez to mouth	45	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.7290	0.0	0.0	0
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	2114	0.0040	8.5	55.3	145	-76	0.0500	-3.8	-24.7	-65
San Juan River, Bluff to Lake Powell	52	4.90	5.59	2114	0.0021	4.4	28.0	78	-76	0.0433	-3.3	-20.6	-58
Total								549					-231

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Table D-3. Incremental Changes in Channel Losses from the Critical Period under Full Compact Development (continued)

Utah

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	0	0.0016	0.0	0.0	0	0	0.0250	0.0	0.0	0
Colorado River, Cameo to Gunnison River	29	4.20	4.79	0	0.0018	0.0	0.0	0	0	0.0250	0.0	0.0	0
Gunnison River, Delta to mouth	57	4.20	4.79	0	0.0021	0.0	0.0	0	0	0.0140	0.0	0.0	0
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	0	0.0010	0.0	0.0	0	0	0.1400	0.0	0.0	0
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	0	0.0008	0.0	0.0	0	0	0.0700	0.0	0.0	0
Dolores River, McPhee Dam to mouth	183	4.20	4.79	0	0.0040	0.0	0.0	0	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Colorado River, Green River to Lake Powell	25	5.00	5.70	2452	0.0005	1.2	3.7	11	-332	0.0050	-1.7	-5.0	-14
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	109	0.0045	0.5	3.9	7	-13	0.1000	-1.3	-10.7	-20
Yampa River, Craig to Little Snake River	88	3.00	3.42	0	0.0054	0.0	0.0	0	0	0.2600	0.0	0.0	0
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	0	0.0033	0.0	0.0	0	0	0.4250	0.0	0.0	0
Yampa River, Little Snake River to mouth	51	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.2500	0.0	0.0	0
Green River, Yampa River to Jensen	28	3.70	4.22	109	0.0040	0.4	1.5	3	-13	0.0600	-0.8	-2.7	-6
Green River, Jensen to Duchesne River	69	3.80	4.33	296	0.0030	0.9	7.4	16	-42	0.0500	-2.1	-17.4	-38
Duchesne River, Randlett to mouth	16	4.00	4.56	1725	0.0060	10.4	20.1	46	-225	0.5000	-112.6	-218.3	-498
Green River, Duchesne River to White River	1	3.90	4.45	2021	0.0030	6.1	0.7	2	-267	0.0300	-8.0	-1.0	-2
White River, Piceance River to Watson	77	3.60	4.10	0	0.0030	0.0	0.0	0	0	0.1200	0.0	0.0	0
White River, Watson to mouth	66	3.80	4.33	12	0.0060	0.1	0.6	1	-2	0.1100	-0.2	-1.5	-3
Green River, White River to Price River	109	4.10	4.67	2033	0.0020	4.1	53.7	126	-268	0.0200	-5.4	-70.9	-166
Price River, Heiner to mouth	112	4.10	4.67	50	0.0125	0.6	8.5	20	-7	0.9750	-6.7	-91.1	-213
Green River, Price River to Green River	18	4.50	5.13	2215	0.0012	2.7	5.8	15	-294	0.0117	-3.4	-7.5	-19
Green River, Green River to mouth	117	4.70	5.36	2276	0.0012	2.7	38.7	104	-304	0.0117	-3.6	-50.5	-135
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	0	0.0034	0.0	0.0	0	0	0.0860	0.0	0.0	0
Animas River, Cedar Hill to mouth	33	3.60	4.10	0	0.0040	0.0	0.0	0	0	0.2500	0.0	0.0	0
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	0	0.0400	0.0	0.0	0	0	0.9000	0.0	0.0	0
San Juan River, Farmington to Shiprock	37	3.90	4.45	0	0.0028	0.0	0.0	0	0	0.0590	0.0	0.0	0
San Juan River, Shiprock to Mancos River	26	4.10	4.67	0	0.0056	0.0	0.0	0	0	0.0560	0.0	0.0	0
Mancos River, Towaoc to mouth	25	4.00	4.56	0	0.0138	0.0	0.0	0	0	0.7500	0.0	0.0	0
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	0	0.0060	0.0	0.0	0	0	0.0600	0.0	0.0	0
McElmo Creek, Cortez to mouth	45	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.7290	0.0	0.0	0
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	0	0.0040	0.0	0.0	0	0	0.0500	0.0	0.0	0
San Juan River, Bluff to Lake Powell	52	4.90	5.59	202	0.0021	0.4	2.7	7	-31	0.0433	-1.4	-8.6	-24
Total								357					-1138

Wyoming

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	0	0.0016	0.0	0.0	0	0	0.0250	0.0	0.0	0
Colorado River, Cameo to Gunnison River	29	4.20	4.79	0	0.0018	0.0	0.0	0	0	0.0250	0.0	0.0	0
Gunnison River, Delta to mouth	57	4.20	4.79	0	0.0021	0.0	0.0	0	0	0.0140	0.0	0.0	0
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	0	0.0010	0.0	0.0	0	0	0.1400	0.0	0.0	0
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	0	0.0008	0.0	0.0	0	0	0.0700	0.0	0.0	0
Dolores River, McPhee Dam to mouth	183	4.20	4.79	0	0.0040	0.0	0.0	0	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Colorado River, Green River to Lake Powell	25	5.00	5.70	2756	0.0005	1.4	4.2	12	-371	0.0050	-1.9	-5.6	-16
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	2538	0.0045	11.4	91.4	172	-345	0.1000	-34.5	-275.7	-519
Yampa River, Craig to Little Snake River	88	3.00	3.42	0	0.0054	0.0	0.0	0	0	0.2600	0.0	0.0	0
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	218	0.0033	0.7	6.7	11	-27	0.4250	-11.4	-106.3	-182
Yampa River, Little Snake River to mouth	51	3.30	3.76	218	0.0045	1.0	6.1	11	-27	0.2500	-6.7	-41.4	-78
Green River, Yampa River to Jensen	28	3.70	4.22	2756	0.0040	11.0	37.4	79	-371	0.0600	-22.3	-75.6	-159
Green River, Jensen to Duchesne River	69	3.80	4.33	0	0.0030	0.0	0.0	0	0	0.0500	0.0	0.0	0
Duchesne River, Randlett to mouth	16	4.00	4.56	0	0.0060	0.0	0.0	0	0	0.5000	0.0	0.0	0
Green River, Duchesne River to White River	1	3.90	4.45	0	0.0030	0.0	0.0	0	0	0.0300	0.0	0.0	0
White River, Piceance River to Watson	77	3.60	4.10	0	0.0030	0.0	0.0	0	0	0.1200	0.0	0.0	0
White River, Watson to mouth	66	3.80	4.33	0	0.0060	0.0	0.0	0	0	0.1100	0.0	0.0	0
Green River, White River to Price River	109	4.10	4.67	0	0.0020	0.0	0.0	0	0	0.0200	0.0	0.0	0
Price River, Heiner to mouth	112	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.9750	0.0	0.0	0
Green River, Price River to Green River	18	4.50	5.13	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
Green River, Green River to mouth	117	4.70	5.36	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	0	0.0034	0.0	0.0	0	0	0.0860	0.0	0.0	0
Animas River, Cedar Hill to mouth	33	3.60	4.10	0	0.0040	0.0	0.0	0	0	0.2500	0.0	0.0	0
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	0	0.0400	0.0	0.0	0	0	0.9000	0.0	0.0	0
San Juan River, Farmington to Shiprock	37	3.90	4.45	0	0.0028	0.0	0.0	0	0	0.0590	0.0	0.0	0
San Juan River, Shiprock to Mancos River	26	4.10	4.67	0	0.0056	0.0	0.0	0	0	0.0560	0.0	0.0	0
Mancos River, Towaoc to mouth	25	4.00	4.56	0	0.0138	0.0	0.0	0	0	0.7500	0.0	0.0	0
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	0	0.0060	0.0	0.0	0	0	0.0600	0.0	0.0	0
McElmo Creek, Cortez to mouth	45	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.7290	0.0	0.0	0
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	0	0.0040	0.0	0.0	0	0	0.0500	0.0	0.0	0
San Juan River, Bluff to Lake Powell	52	4.90	5.59	0	0.0021	0.0	0.0	0	0	0.0433	0.0	0.0	0
Total								286					-954

Table D-3. Incremental Changes in Channel Losses from the Critical Period under Full Compact Development (continued)

Arizona

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	0	0.0016	0.0	0.0	0	0	0.0250	0.0	0.0	0
Colorado River, Cameo to Gunnison River	29	4.20	4.79	0	0.0018	0.0	0.0	0	0	0.0250	0.0	0.0	0
Gunnison River, Delta to mouth	57	4.20	4.79	0	0.0021	0.0	0.0	0	0	0.0140	0.0	0.0	0
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	0	0.0010	0.0	0.0	0	0	0.1400	0.0	0.0	0
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	0	0.0006	0.0	0.0	0	0	0.0700	0.0	0.0	0
Dolores River, McPhee Dam to mouth	183	4.20	4.79	0	0.0040	0.0	0.0	0	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Colorado River, Green River to Lake Powell	25	5.00	5.70	0	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.1000	0.0	0.0	0
Yampa River, Craig to Little Snake River	88	3.00	3.42	0	0.0054	0.0	0.0	0	0	0.2600	0.0	0.0	0
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	0	0.0033	0.0	0.0	0	0	0.4250	0.0	0.0	0
Yampa River, Little Snake River to mouth	51	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.2500	0.0	0.0	0
Green River, Yampa River to Jensen	28	3.70	4.22	0	0.0040	0.0	0.0	0	0	0.0600	0.0	0.0	0
Green River, Jensen to Duchesne River	69	3.80	4.33	0	0.0030	0.0	0.0	0	0	0.0500	0.0	0.0	0
Duchesne River, Randlett to mouth	16	4.00	4.56	0	0.0060	0.0	0.0	0	0	0.5000	0.0	0.0	0
Green River, Duchesne River to White River	1	3.90	4.45	0	0.0030	0.0	0.0	0	0	0.0300	0.0	0.0	0
White River, Piceance River to Watson	77	3.60	4.10	0	0.0030	0.0	0.0	0	0	0.1200	0.0	0.0	0
White River, Watson to mouth	66	3.80	4.33	0	0.0060	0.0	0.0	0	0	0.1100	0.0	0.0	0
Green River, White River to Price River	109	4.10	4.67	0	0.0020	0.0	0.0	0	0	0.0200	0.0	0.0	0
Price River, Heiner to mouth	112	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.9750	0.0	0.0	0
Green River, Price River to Green River	18	4.50	5.13	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
Green River, Green River to mouth	117	4.70	5.36	0	0.0012	0.0	0.0	0	0	0.0117	0.0	0.0	0
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	27	0.0034	0.1	0.5	1	-7	0.0860	-0.6	-3.2	-7
Animas River, Cedar Hill to mouth	33	3.60	4.10	0	0.0040	0.0	0.0	0	0	0.2500	0.0	0.0	0
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	0	0.0400	0.0	0.0	0	0	0.9000	0.0	0.0	0
San Juan River, Farmington to Shiprock	37	3.90	4.45	27	0.0028	0.1	0.3	1	-7	0.0590	-0.4	-1.7	-4
San Juan River, Shiprock to Mancos River	26	4.10	4.67	27	0.0056	0.2	0.5	1	0	0.0560	0.0	0.0	0
Mancos River, Towaoc to mouth	25	4.00	4.56	0	0.0138	0.0	0.0	0	0	0.7500	0.0	0.0	0
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	27	0.0060	0.2	0.5	1	0	0.0600	0.0	0.0	0
McElmo Creek, Cortez to mouth	45	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.7290	0.0	0.0	0
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	27	0.0040	0.1	0.7	2	0	0.0500	0.0	0.0	0
San Juan River, Bluff to Lake Powell	52	4.90	5.59	26	0.0021	0.1	0.3	1	0	0.0433	0.0	-0.1	0
Total								7					-11

Upper Division States Shared CRSP Evaporation

River Segment	River Miles (mi)	Lake Evap Rate (ft)	River Evap Rate (ft)	April - July Snowmelt Runoff Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)	August - March Base Flow Period: Flow Reduction (cfs)	River Surface Width Reduction (ft/cfs)	River Surface Width Reduction (ft)	Surface Area Reduction (ac)	Channel Evap Loss Reduction (af)
Colorado River:													
Colorado River, Glenwood Springs to Cameo	68	4.00	4.56	0	0.0016	0.0	0.0	0	0	0.0250	0.0	0.0	0
Colorado River, Cameo to Gunnison River	29	4.20	4.79	0	0.0018	0.0	0.0	0	0	0.0250	0.0	0.0	0
Gunnison River, Delta to mouth	57	4.20	4.79	23	0.0021	0.0	0.3	1	0	0.0140	0.0	0.0	0
Colorado River, Gunnison River to CO-UT State Line	38	4.30	4.90	23	0.0010	0.0	0.1	0	0	0.1400	0.0	0.0	0
Colorado River, CO-UT State Line to Dolores River	38	4.40	5.02	23	0.0006	0.0	0.1	0	0	0.0700	0.0	0.0	0
Dolores River, McPhee Dam to mouth	183	4.20	4.79	0	0.0040	0.0	0.0	0	0	0.3500	0.0	0.0	0
Colorado River, Dolores River to Green River	98	4.70	5.36	23	0.0005	0.0	0.1	0	0	0.0050	0.0	0.0	0
Colorado River, Green River to Lake Powell	25	5.00	5.70	23	0.0005	0.0	0.0	0	0	0.0050	0.0	0.0	0
Green River:													
Green River, Flaming Gorge Dam to Yampa River	66	3.30	3.76	125	0.0045	0.6	4.5	8	0	0.1000	0.0	0.0	0
Yampa River, Craig to Little Snake River	88	3.00	3.42	0	0.0054	0.0	0.0	0	0	0.2600	0.0	0.0	0
Little Snake River, CO-WY State Line to mouth	77	3.00	3.42	0	0.0033	0.0	0.0	0	0	0.4250	0.0	0.0	0
Yampa River, Little Snake River to mouth	51	3.30	3.76	0	0.0045	0.0	0.0	0	0	0.2500	0.0	0.0	0
Green River, Yampa River to Jensen	28	3.70	4.22	125	0.0040	0.5	1.7	4	0	0.0600	0.0	0.0	0
Green River, Jensen to Duchesne River	69	3.80	4.33	125	0.0030	0.4	3.1	7	0	0.0500	0.0	0.0	0
Duchesne River, Randlett to mouth	16	4.00	4.56	0	0.0060	0.0	0.0	0	0	0.5000	0.0	0.0	0
Green River, Duchesne River to White River	1	3.90	4.45	125	0.0030	0.4	0.0	0	0	0.0300	0.0	0.0	0
White River, Piceance River to Watson	77	3.60	4.10	0	0.0030	0.0	0.0	0	0	0.1200	0.0	0.0	0
White River, Watson to mouth	66	3.80	4.33	0	0.0060	0.0	0.0	0	0	0.1100	0.0	0.0	0
Green River, White River to Price River	109	4.10	4.67	125	0.0020	0.2	3.3	8	0	0.0200	0.0	0.0	0
Price River, Heiner to mouth	112	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.9750	0.0	0.0	0
Green River, Price River to Green River	18	4.50	5.13	125	0.0012	0.1	0.3	1	0	0.0117	0.0	0.0	0
Green River, Green River to mouth	117	4.70	5.36	125	0.0012	0.1	2.1	6	0	0.0117	0.0	0.0	0
San Juan River:													
San Juan River, Navajo Dam to Farmington	47	3.60	4.10	0	0.0034	0.0	0.0	0	0	0.0860	0.0	0.0	0
Animas River, Cedar Hill to mouth	33	3.60	4.10	0	0.0040	0.0	0.0	0	0	0.2500	0.0	0.0	0
La Plata River, CO-NM State Line to mouth	25	3.60	4.10	0	0.0400	0.0	0.0	0	0	0.9000	0.0	0.0	0
San Juan River, Farmington to Shiprock	37	3.90	4.45	0	0.0028	0.0	0.0	0	0	0.0590	0.0	0.0	0
San Juan River, Shiprock to Mancos River	26	4.10	4.67	0	0.0056	0.0	0.0	0	0	0.0560	0.0	0.0	0
Mancos River, Towaoc to mouth	25	4.00	4.56	0	0.0138	0.0	0.0	0	0	0.7500	0.0	0.0	0
San Juan River, Mancos River to McElmo Creek	25	4.20	4.79	0	0.0060	0.0	0.0	0	0	0.0600	0.0	0.0	0
McElmo Creek, Cortez to mouth	45	4.10	4.67	0	0.0125	0.0	0.0	0	0	0.7290	0.0	0.0	0
San Juan River, McElmo Creek to Bluff	54	4.60	5.24	0	0.0040	0.0	0.0	0	0	0.0500	0.0	0.0	0
San Juan River, Bluff to Lake Powell	52	4.90	5.59	0	0.0021	0.0	0.0	0	0	0.0433	0.0	0.0	0
Total								35					0

Table D-3. Incremental Changes in Channel Losses from the Critical Period under Full Compact Development (continued)

(1) River miles for the river segments immediately above Lake Powell are based on the average end-of-year live storage under full development conditions of 3624 feet (see Table C-1, note 5), at which Lake Powell inundates about 191 miles of the Colorado River and about 58 miles of the San Juan River. River mile data from Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, Tables 3a-3c, from USGS gage station data, and from stream system GIS coverage.

(2) Annual lake water surface evaporation rates are the same rates used by the 1948 Engineering Advisory Committee report, with one-half of the annual evaporation assumed to occur during April-July and one-half assumed to occur during August-March (see Evaporation Study of Upper Colorado River and Tributaries, Colorado Water Conservation Board, 1948, Tables 3a, 3b and 3c for evaporation rates for Colorado River, Green River and San Juan River mainstream segments. Evaporation rates for tributary segments are assumed based on proximity to mainstream segments. The evaporation rates from the river water surface are assumed to equal about 1.14 times the lake evaporation rates (see Table B-4, note 3). The difference is attributed to the ratio of a pan coefficient of 0.8 commonly used for estimating free water surface evaporation from shallow water bodies to a pan coefficient of 0.7 commonly used for estimating evaporation from large lakes (the 1948 EAC report used a pan coefficient of 0.69 for estimating lake evaporation rates). The evaporation rates shown in this table are annual rates, and the lake evaporation rates are not reduced for salvage of water losses within reservoir basins due to inundation.

(3) Flow reductions in cfs are based on the volumetric flow reductions under full development conditions (see Table D-2), distributed uniformly during the indicated period. Negative values for the August-March base flow period indicate increases in flow.

(4) River surface width reductions, or increases if negative, are based on average relationships of width to flow for gaging stations located within the indicated river segments and on average flows after the critical period (see Table D-1), and on flows anticipated after the indicated flow reductions or increases.

(5) For Colorado, flow reductions for the Colorado River at Cameo are applied at the confluence of the Colorado River and the Gunnison River.

(6) For Utah, total depletions in the Jensen to Duchesne River reach of the Green River, including the Duchesne River drainage, were assumed to have a cumulative effect on tributary channel losses as determined by applying the total depletions to the Duchesne River reach below Randlett.

(7) No salvage is computed for the Green River drainage above Flaming Gorge Reservoir, the Gunnison River above Delta, or the San Juan River drainage above Navajo Reservoir.

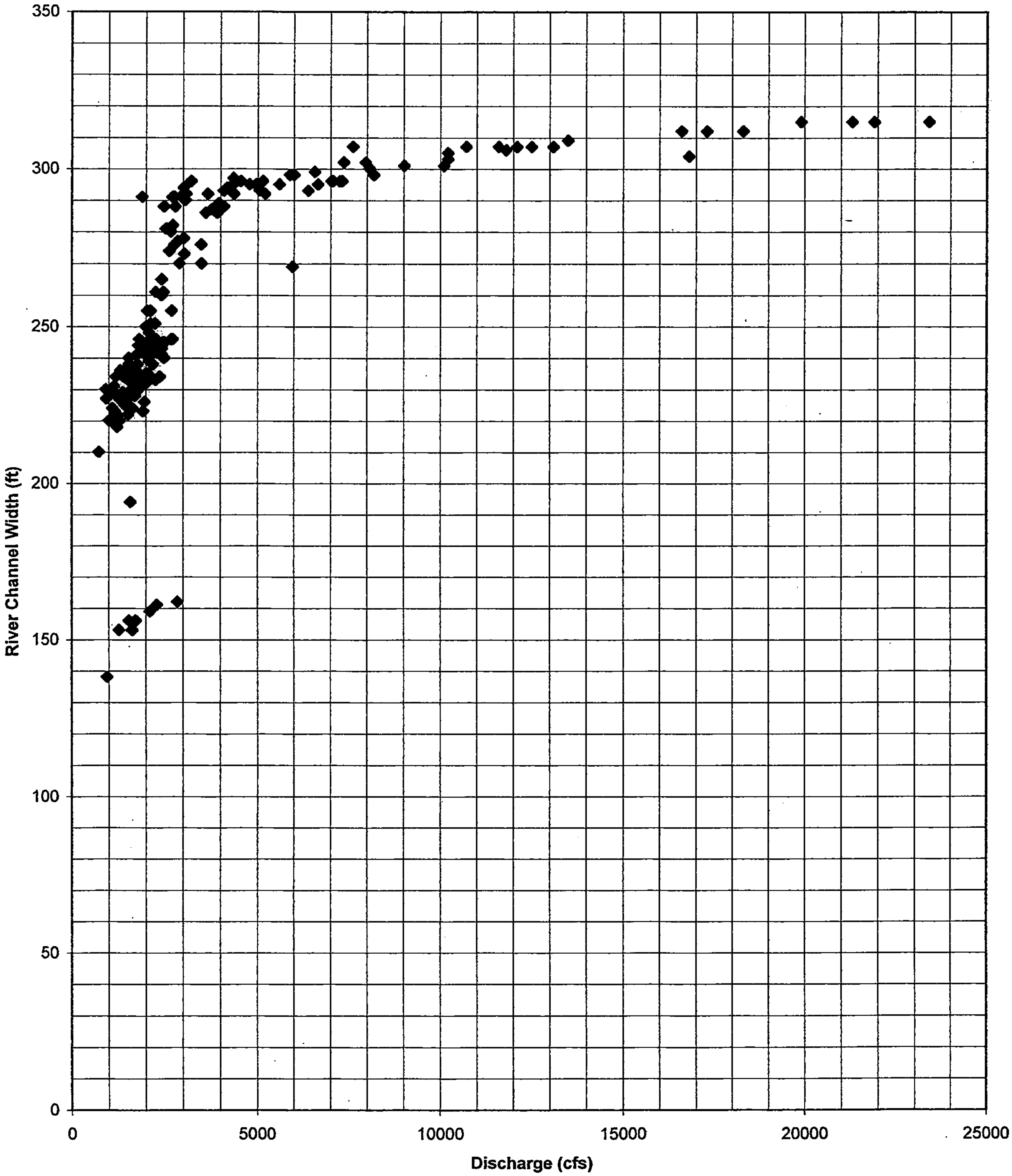
(8) Total salvage for each state includes the annual net reduction in river surface evaporation losses resulting from the reductions in runoff period stream flows and the increases in base flows assumed to occur as a result of development after the critical period. Salvage of downstream river surface evaporation losses resulting from CRSP reservoir evaporation is distributed by state in accordance with the Upper Colorado River Basin Compact Article III(a) apportionment percentages.

State	Reduction in Losses by Shared CRSP Evap (% share)	Reduction in Losses by Shared CRSP Evap (af)	Net Reduction in Losses by States' Uses (af)	Total Salvage by Use (af)
Arizona	0.00	0	-4	-4
Colorado	51.75	18	-2281	-2263
New Mexico	11.25	4	318	322
Utah	23.00	8	-781	-773
Wyoming	14.00	5	-668	-663
Upper Basin	100.00	35	-3416	-3381

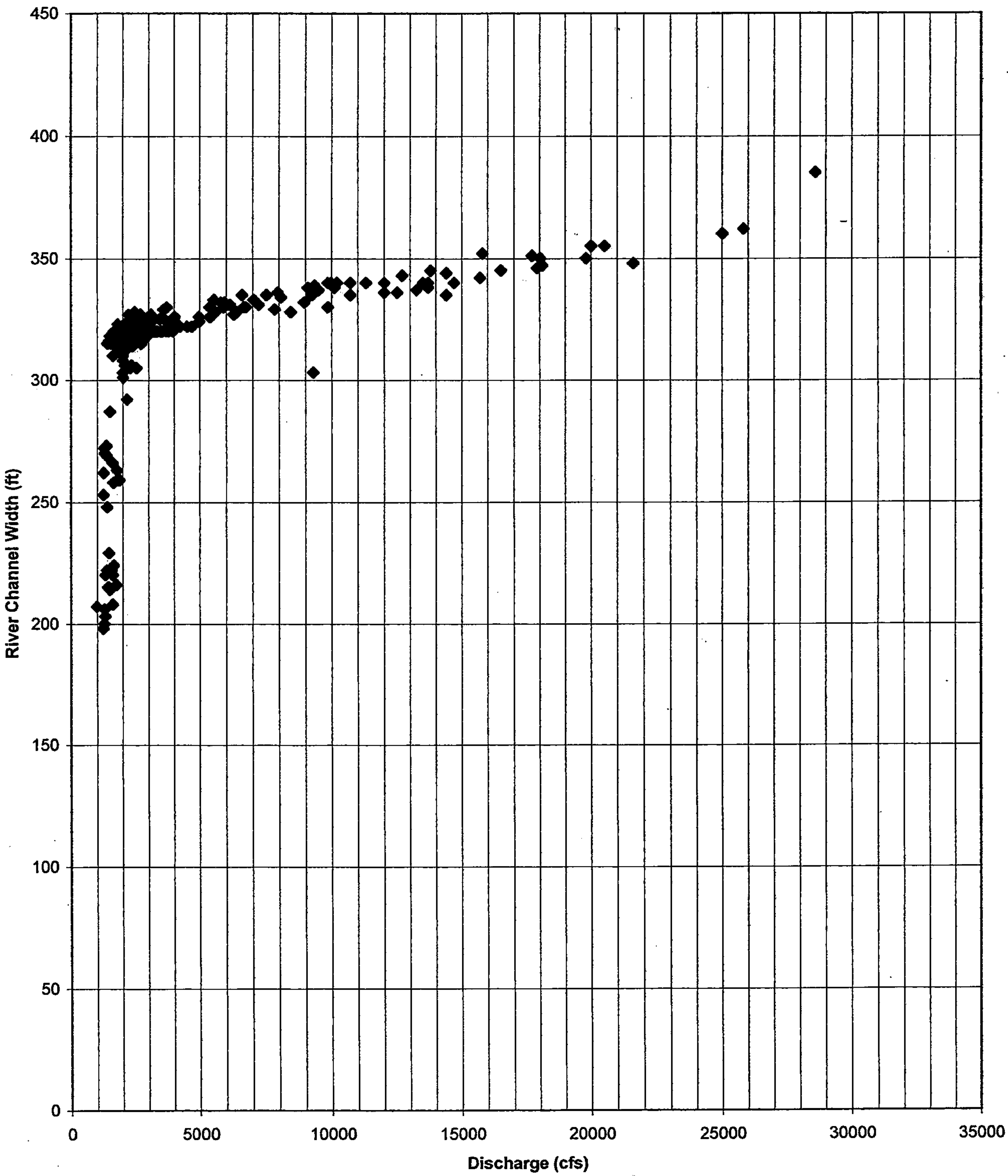
APPENDIX E

Gaging Station Flow Rating Measurements

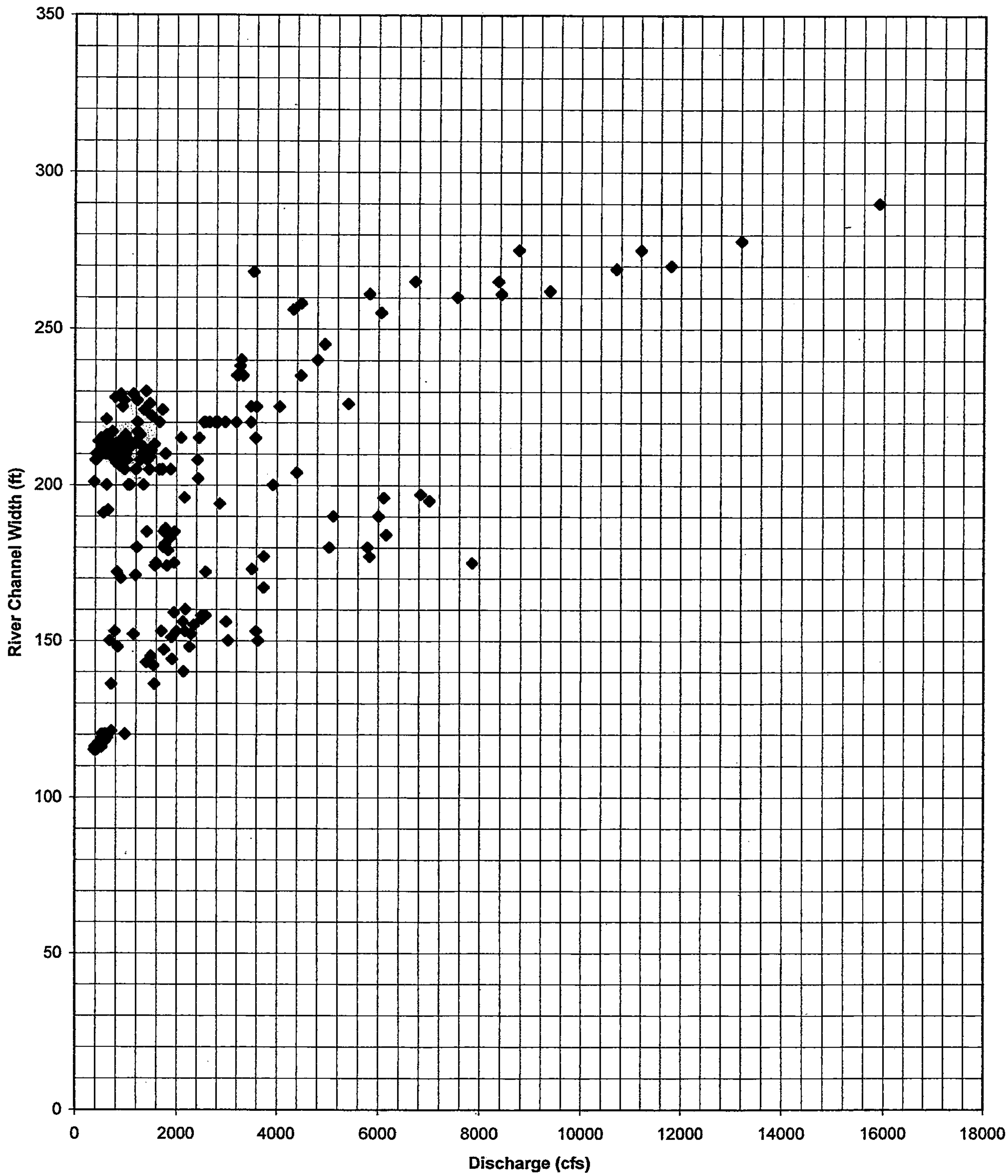
COLORADO RIVER BELOW GLENWOOD SPRINGS, CO
FLOW RATING MEASUREMENTS (1985-2005)



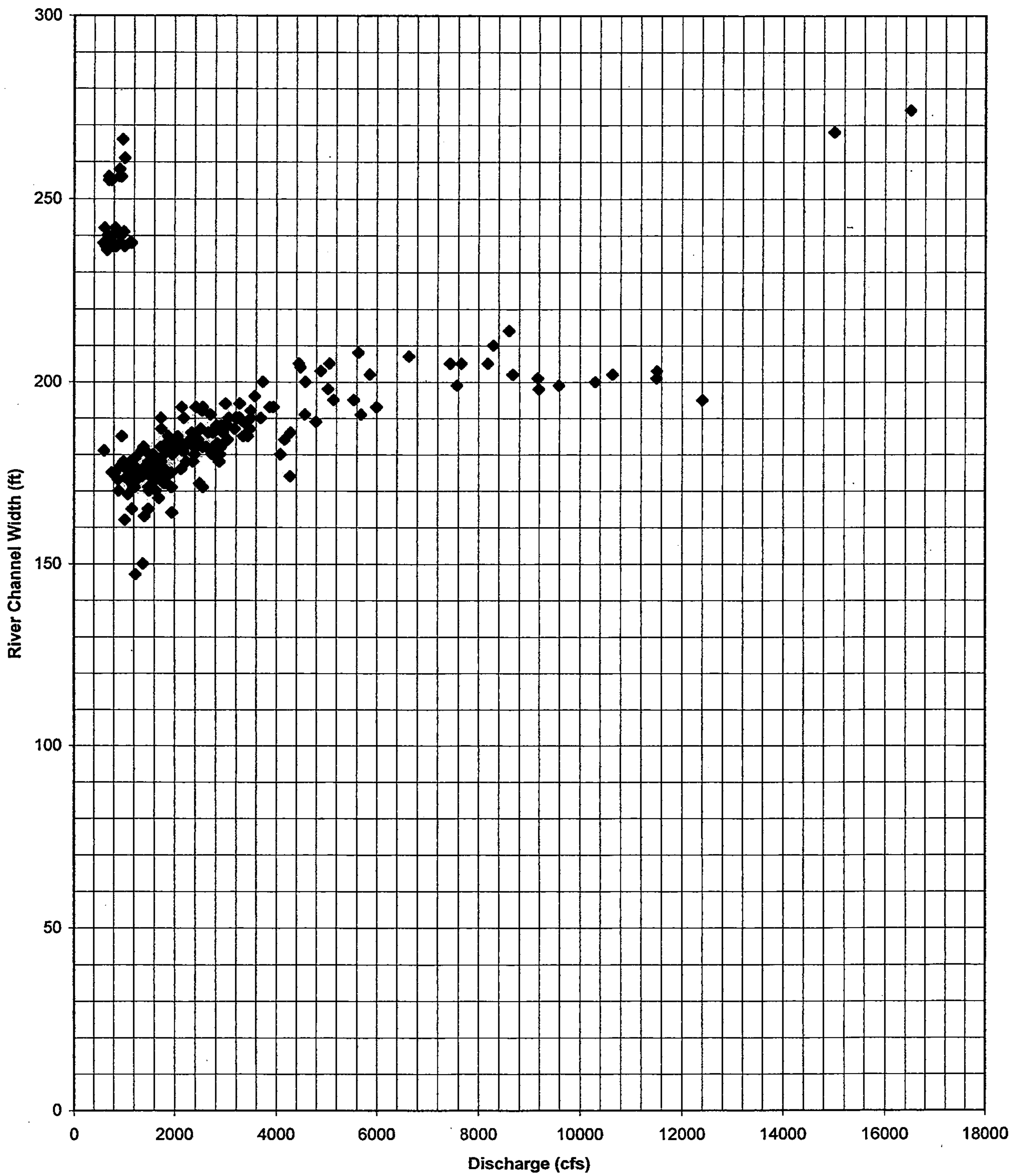
COLORADO RIVER NEAR CAMEO, CO
FLOW RATING MEASUREMENTS (1985-2005)



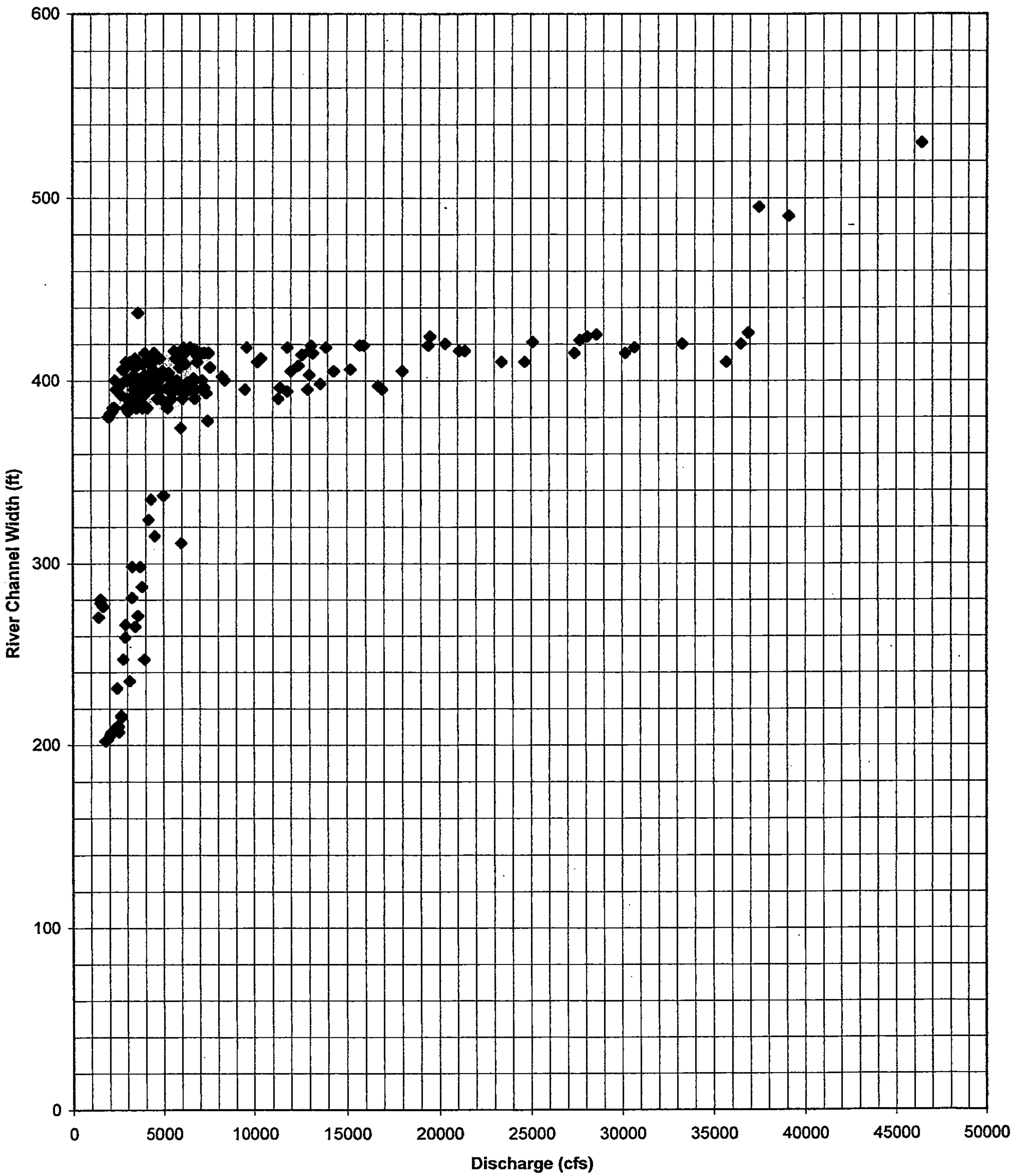
GUNNISON RIVER AT DELTA, CO
FLOW RATING MEASUREMENTS (1985-2005)



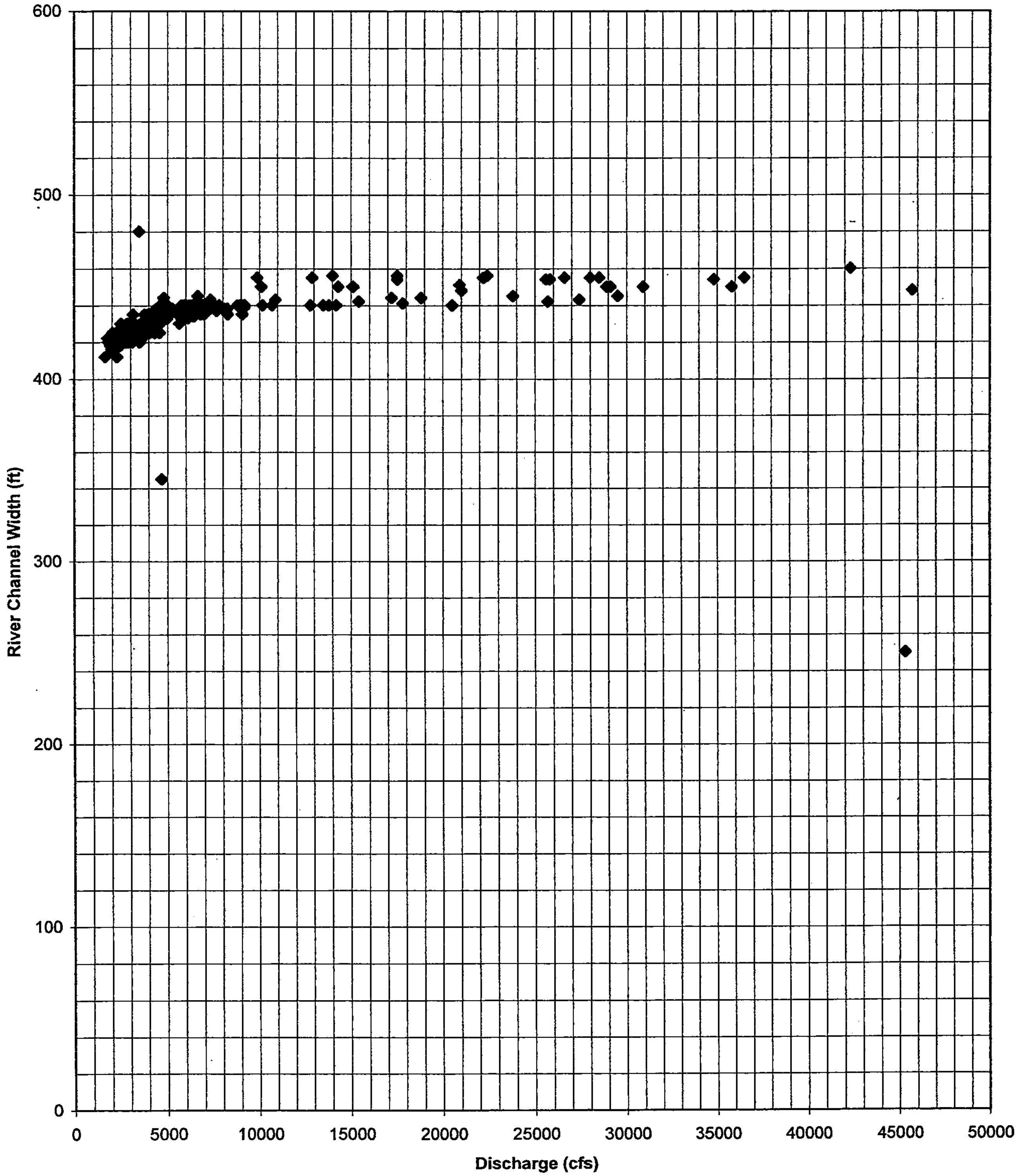
GUNNISON RIVER NEAR GRAND JUNCTION, CO
FLOW RATING MEASUREMENTS (1985-2005)



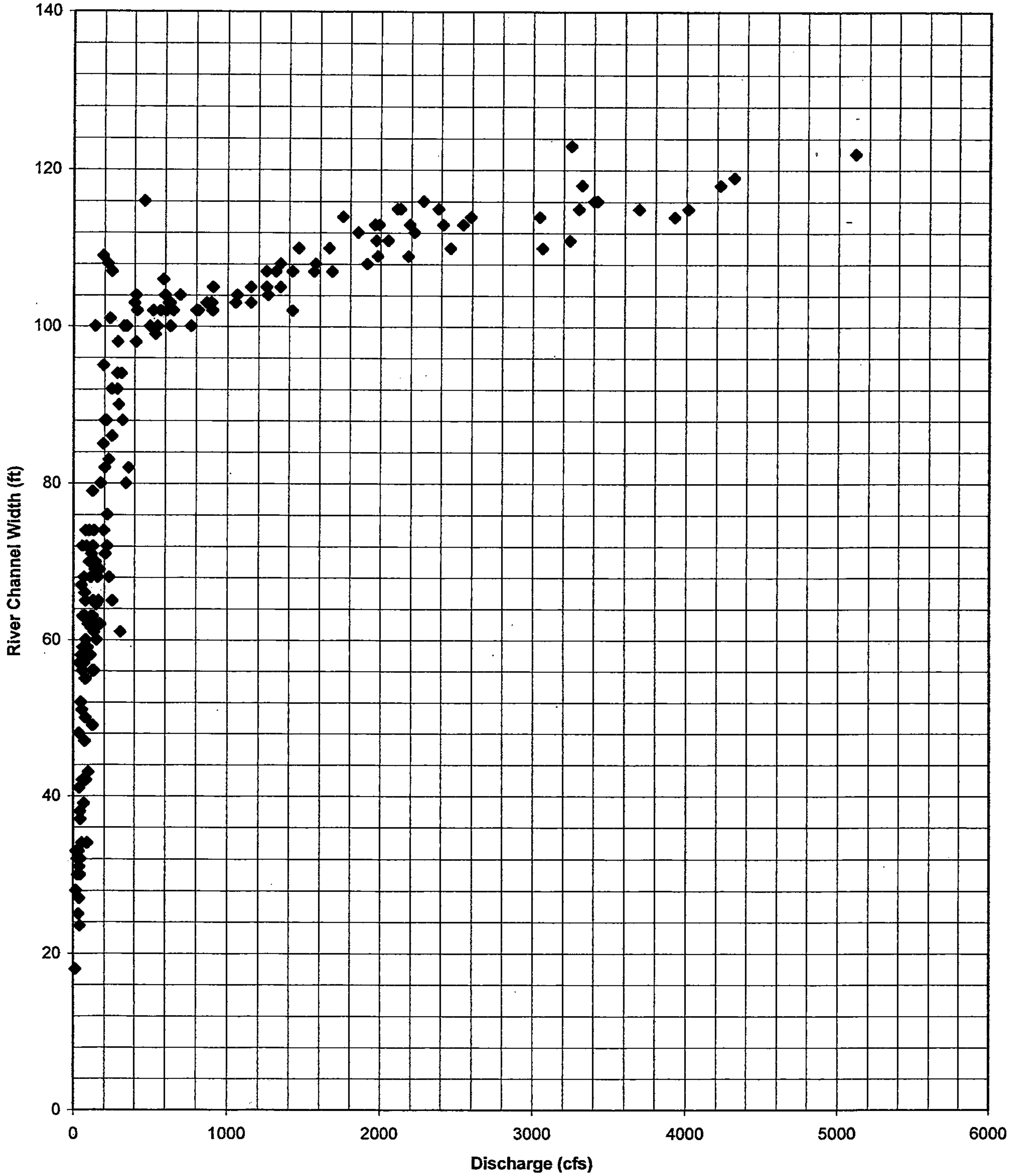
COLORADO RIVER NEAR COLORADO-UTAH STATE LINE, CO
FLOW RATING MEASUREMENTS (1985-2005)



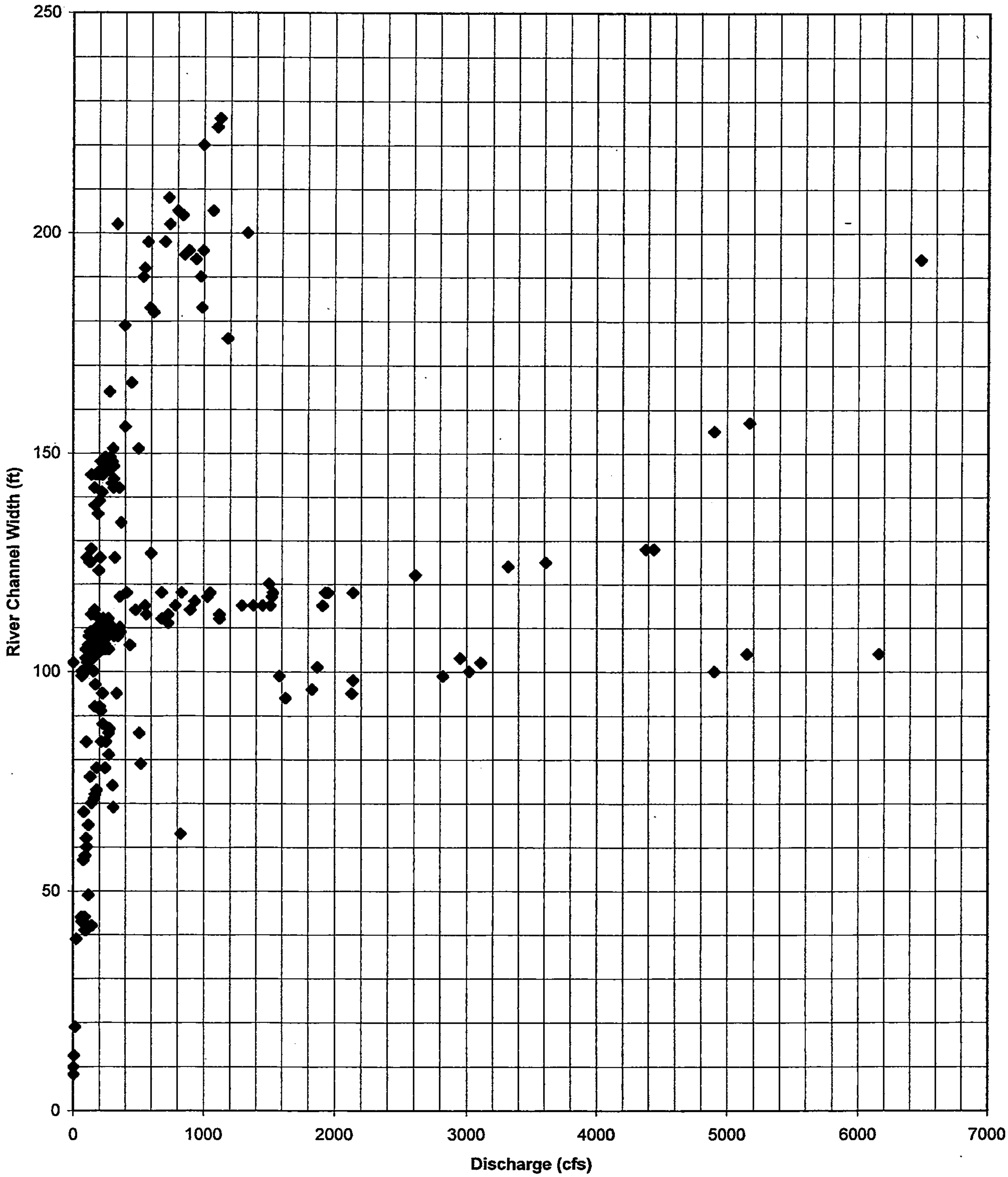
COLORADO RIVER NEAR CISCO, UT
FLOW RATING MEASUREMENTS (1985-2005)

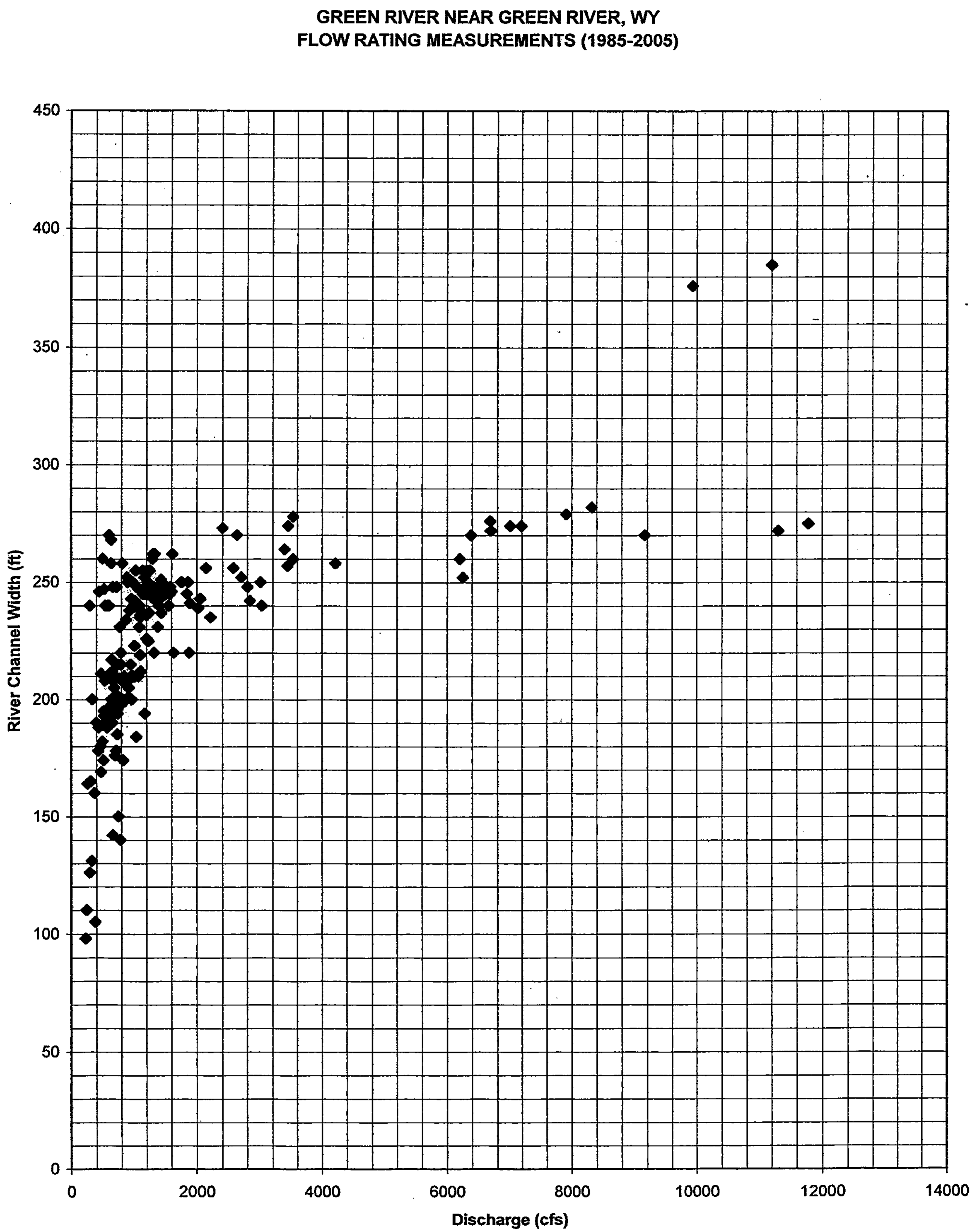


DOLORES RIVER AT DOLORES, CO
FLOW RATING MEASUREMENTS (1985-2005)

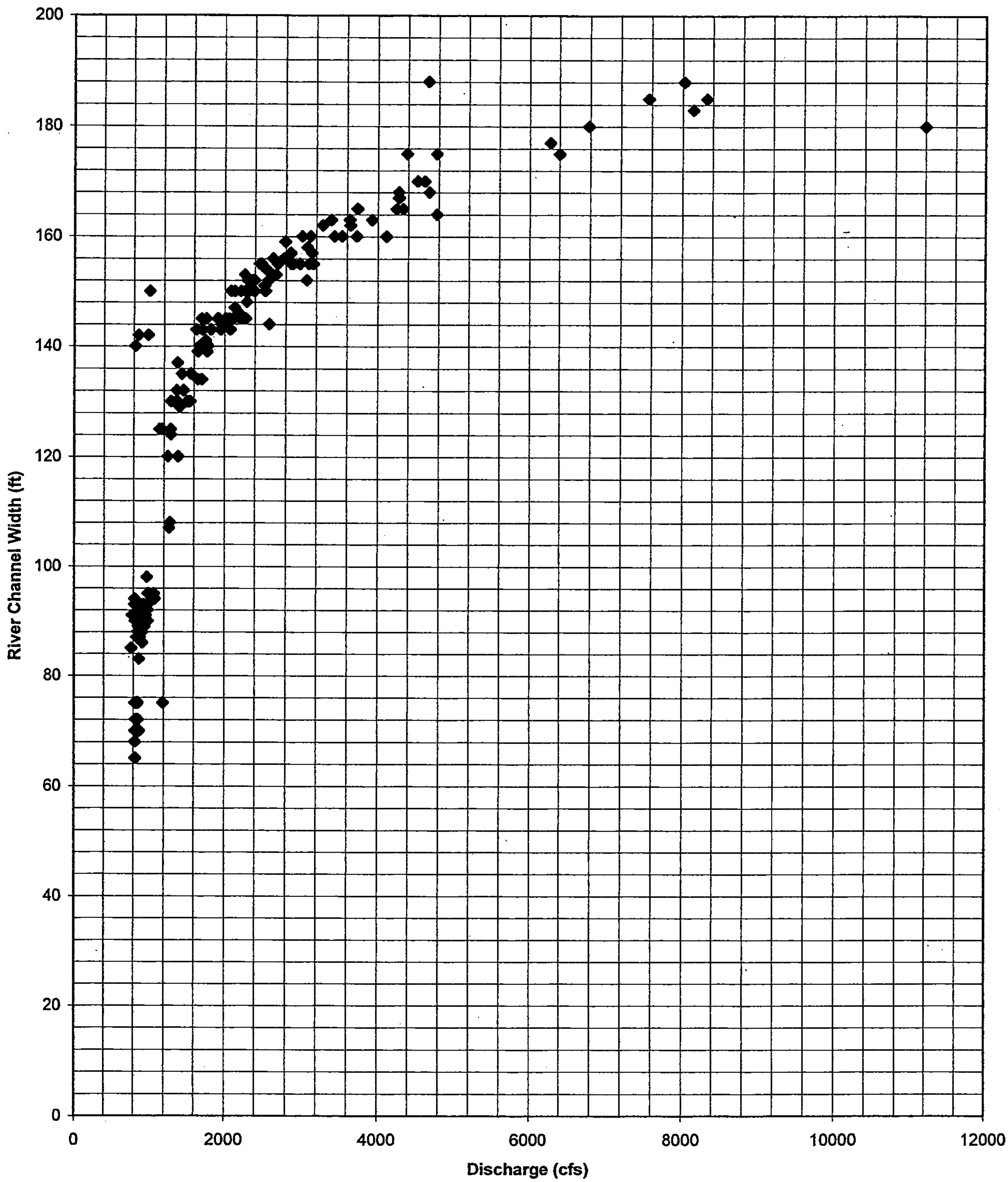


DOLORES RIVER NEAR CISCO, UT
FLOW RATING MEASUREMENTS (1985-2005)



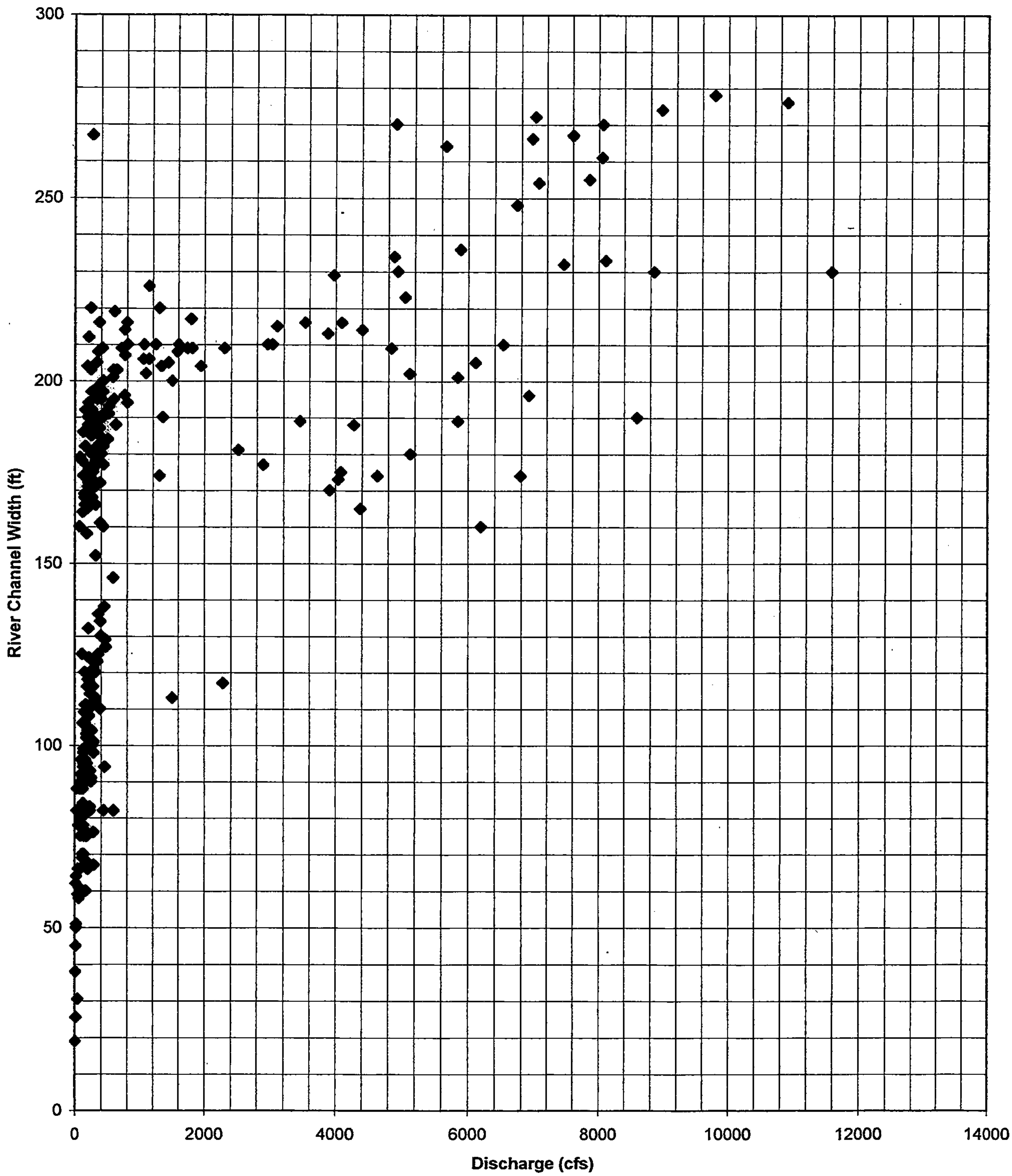

GREEN RIVER NEAR GREEN RIVER, WY
FLOW RATING MEASUREMENTS (1985-2005)
River Channel Width (ft)
450
400
350
300
250
200
150
100
50
0
0
2000
4000
6000
8000
10000
12000
14000
Discharge (cfs)

GREEN RIVER NEAR GREENDALE, UT
FLOW RATING MEASUREMENTS (1985-2005)

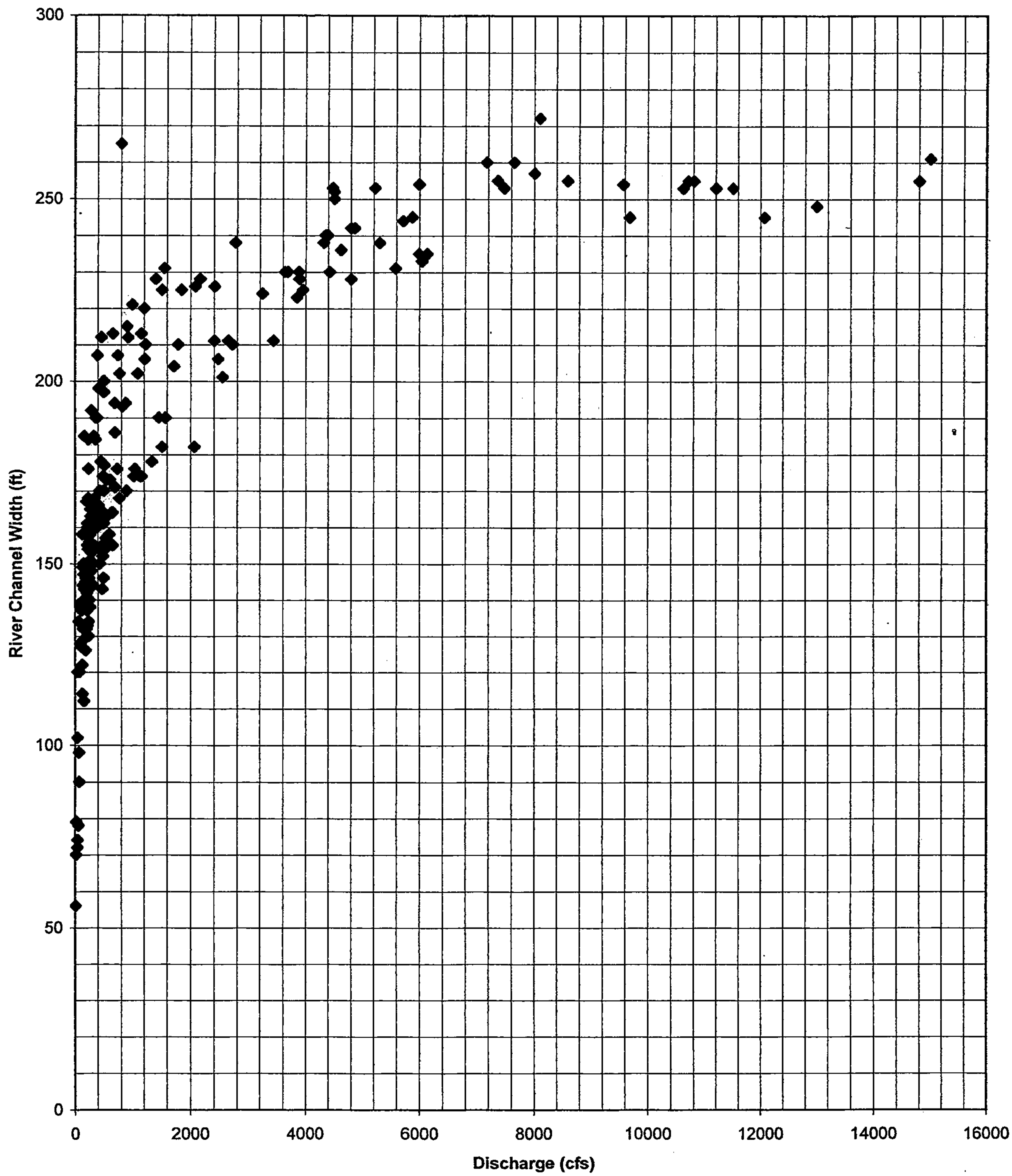


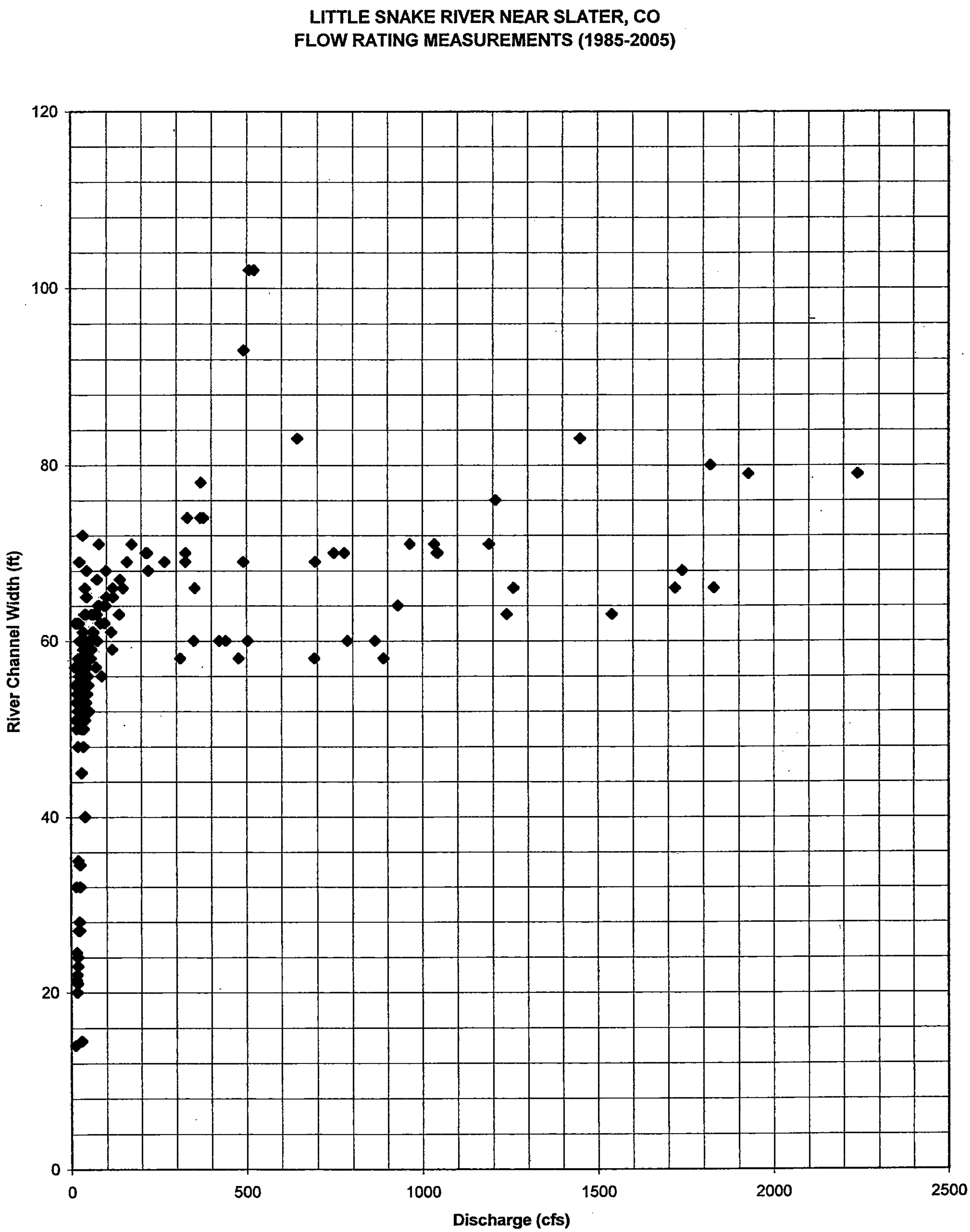
OSE-0457

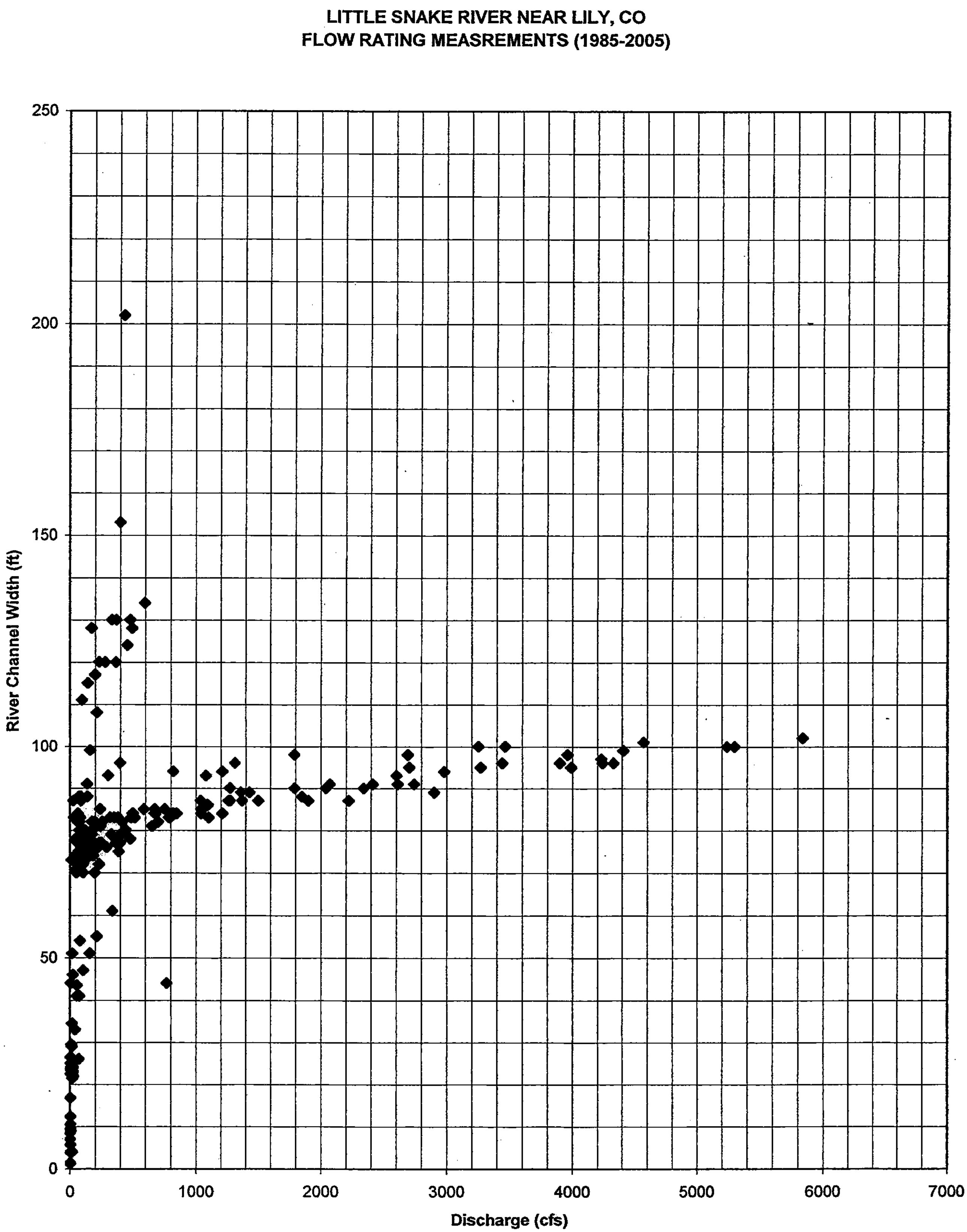
YAMPA RIVER BELOW CRAIG, CO
FLOW RATING MEASUREMENTS (1985-2005)



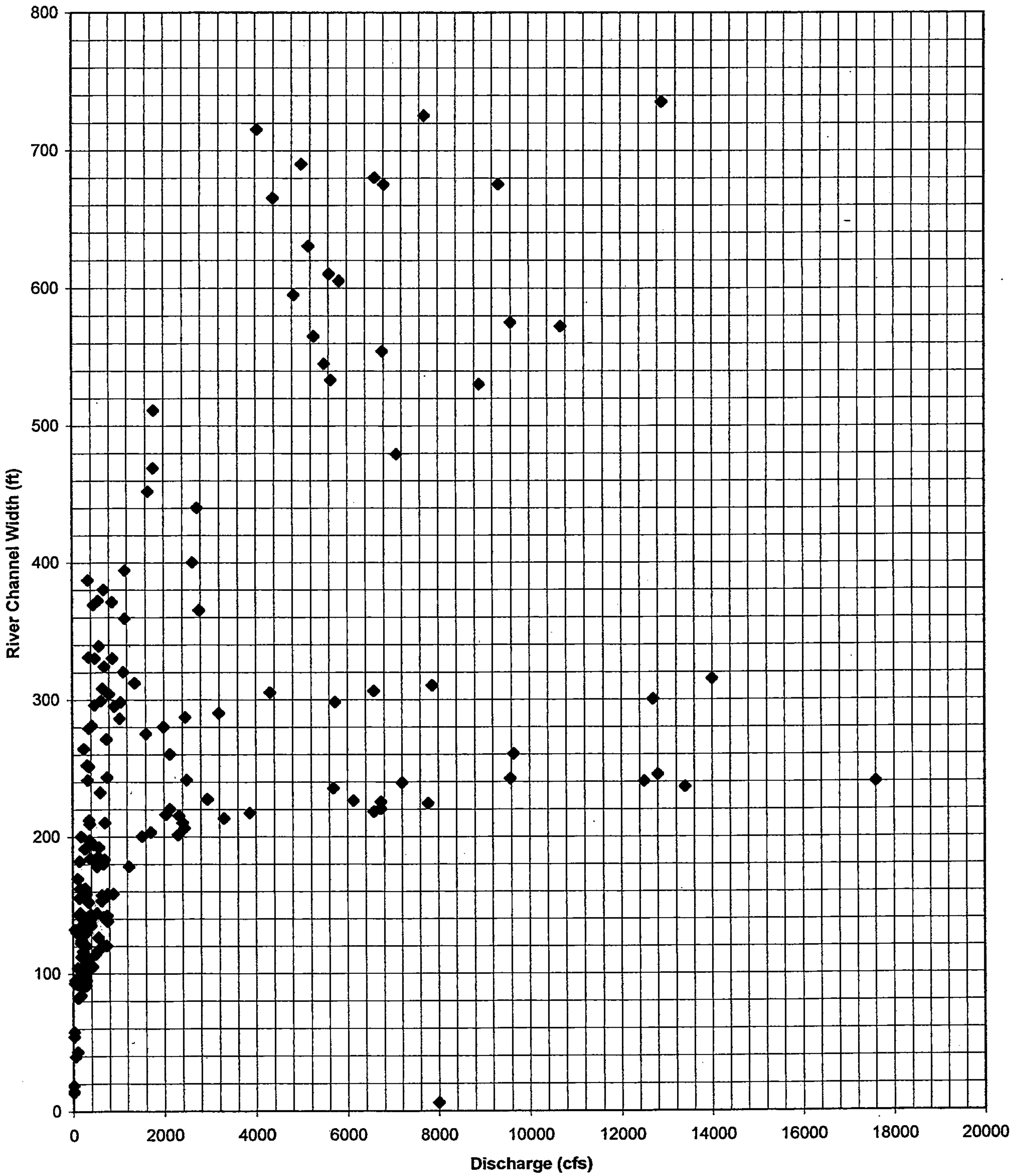
YAMPA RIVER NEAR MAYBELL, CO
FLOW RATING MEASUREMENTS (1985-2005)



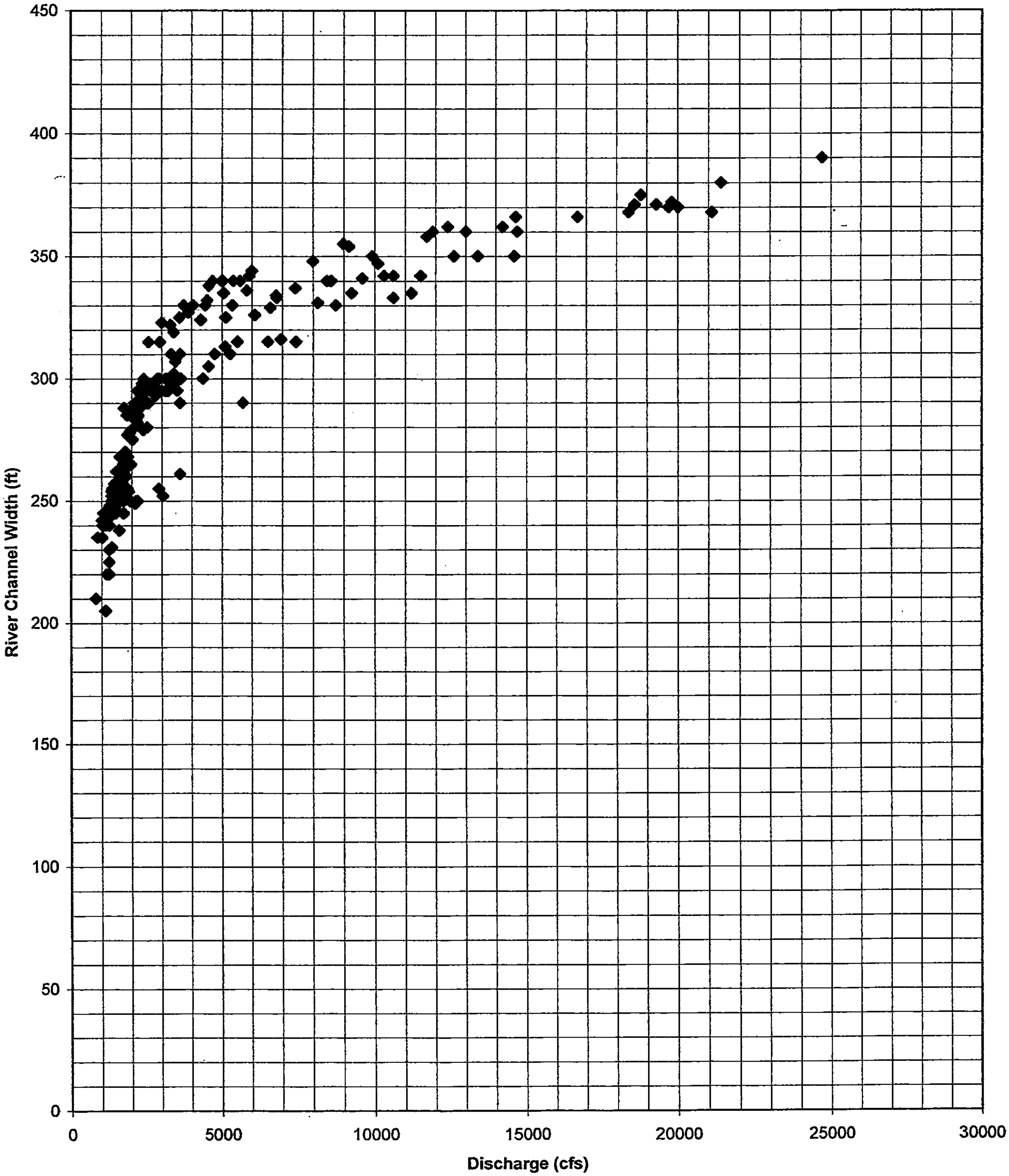

LITTLE SNAKE RIVER NEAR SLATER, CO
FLOW RATING MEASUREMENTS (1985-2005)
River Channel Width (ft)
Discharge (cfs)
0
20
40
60
80
100
120
0
500
1000
1500
2000
2500


LITTLE SNAKE RIVER NEAR LILY, CO
FLOW RATING MEASREMENTS (1985-2005)
River Channel Width (ft)
Discharge (cfs)
250
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
7000

YAMPA RIVER AT DEERLODGE PARK, CO
FLOW RATING MEASUREMENTS (1985-2005)

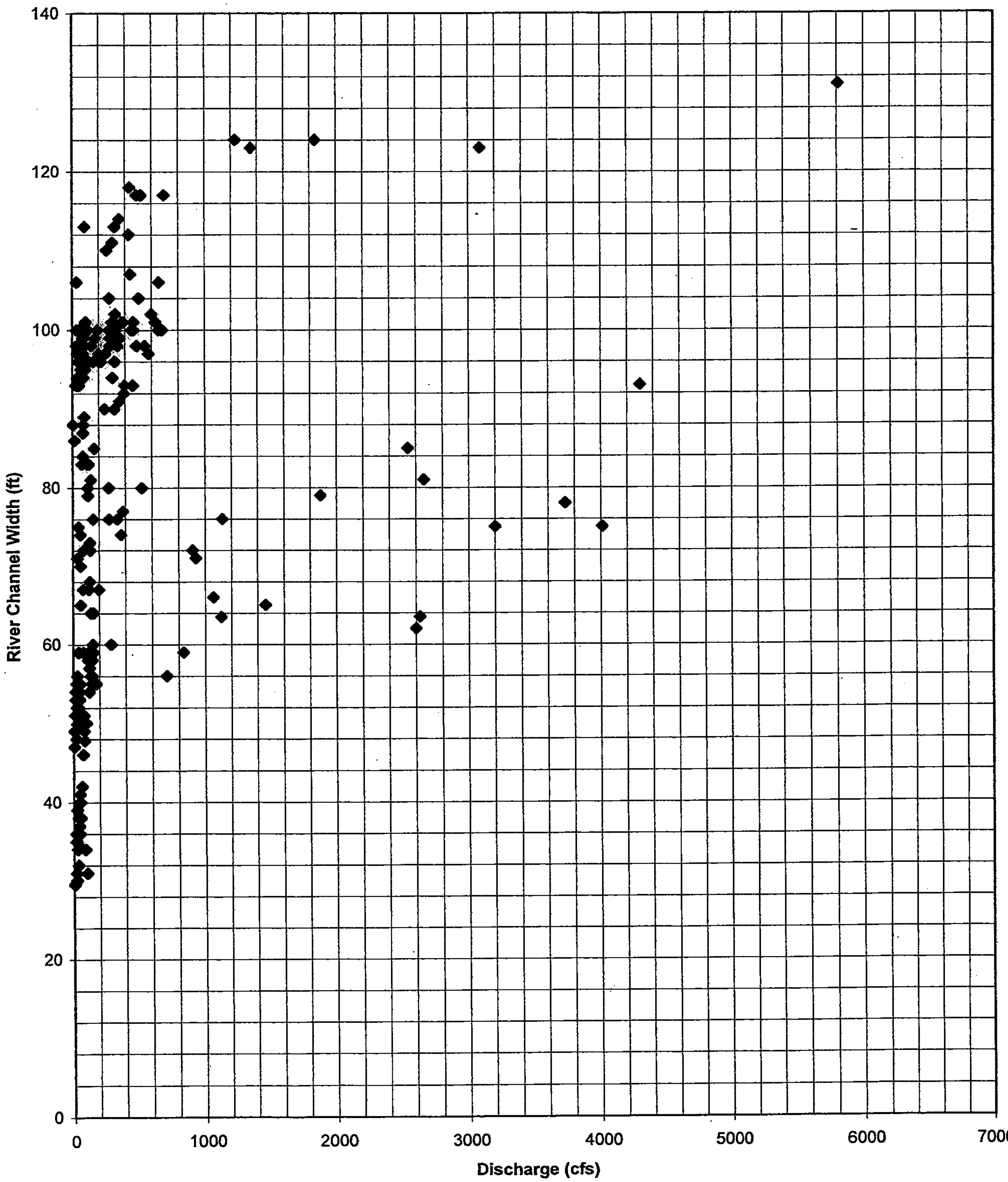


GREEN RIVER NEAR JENSEN, UT
FLOW RATING MEASUREMENTS (1985-2005)

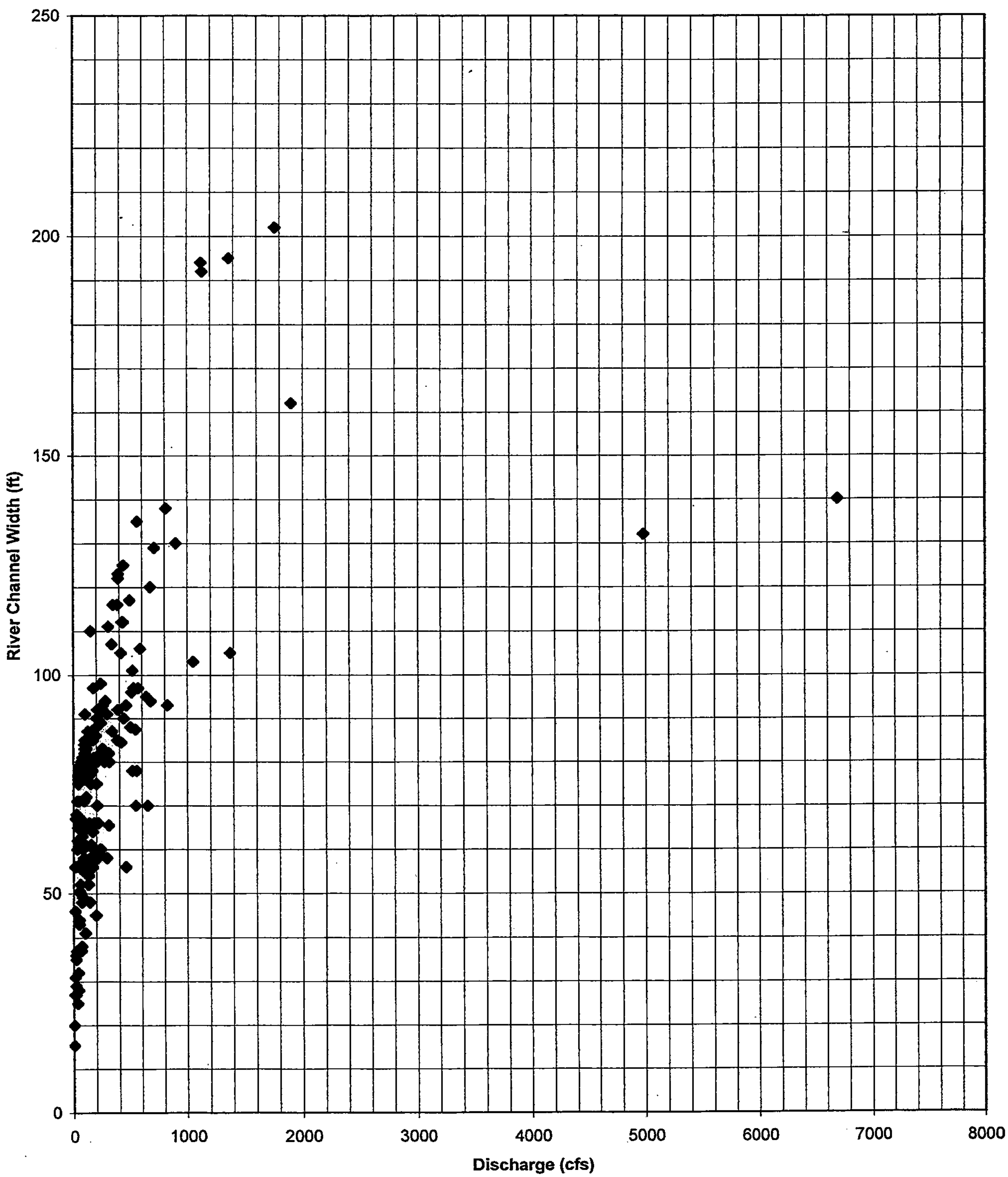


OCE-0463

DUCHESNE RIVER AT MYTON, UT
FLOW RATING MEASUREMENTS (1985-2005)

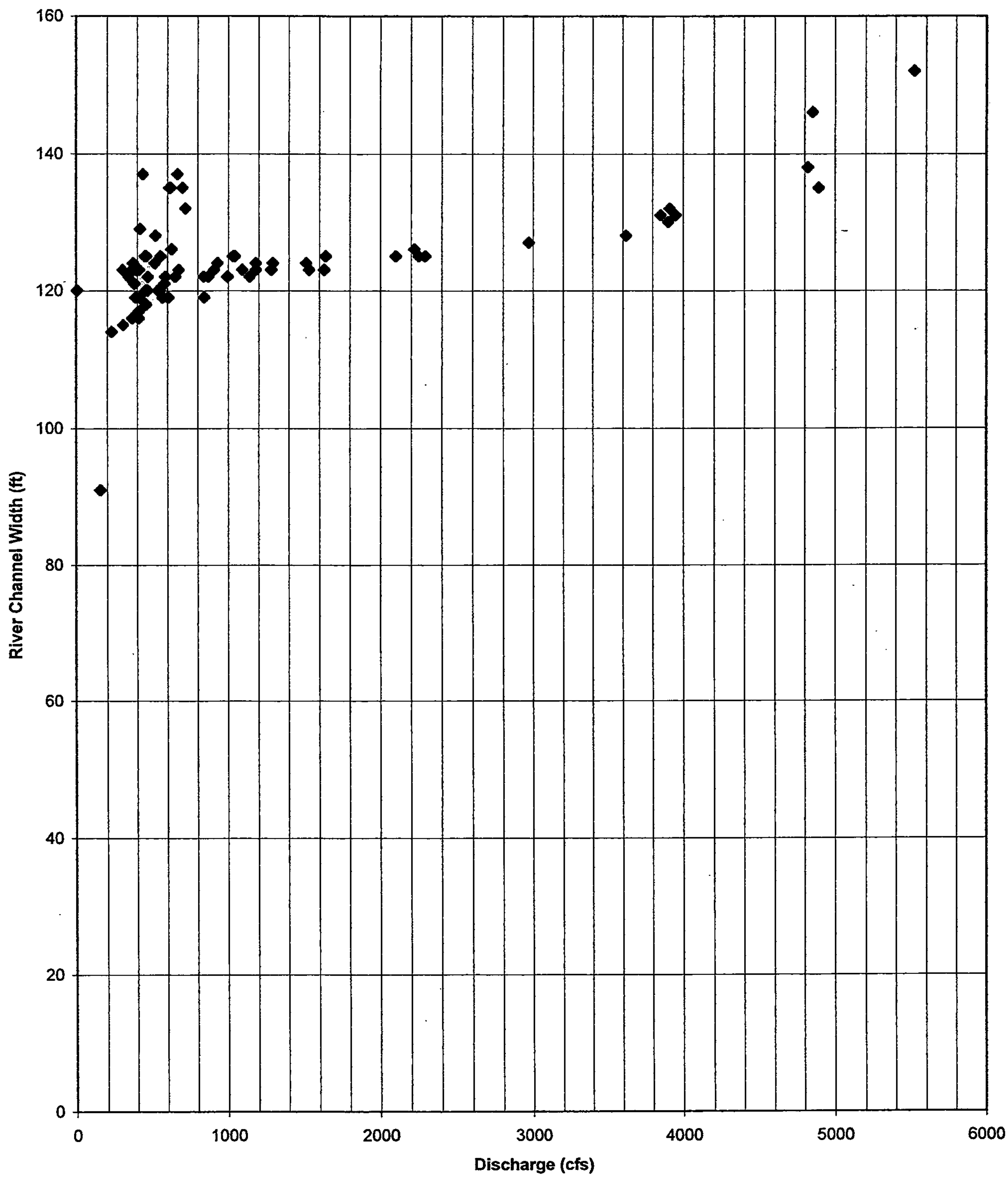


DUCHESNE RIVER NEAR RANDLETT, UT
FLOW RATING MEASUREMENTS (1985-2005)



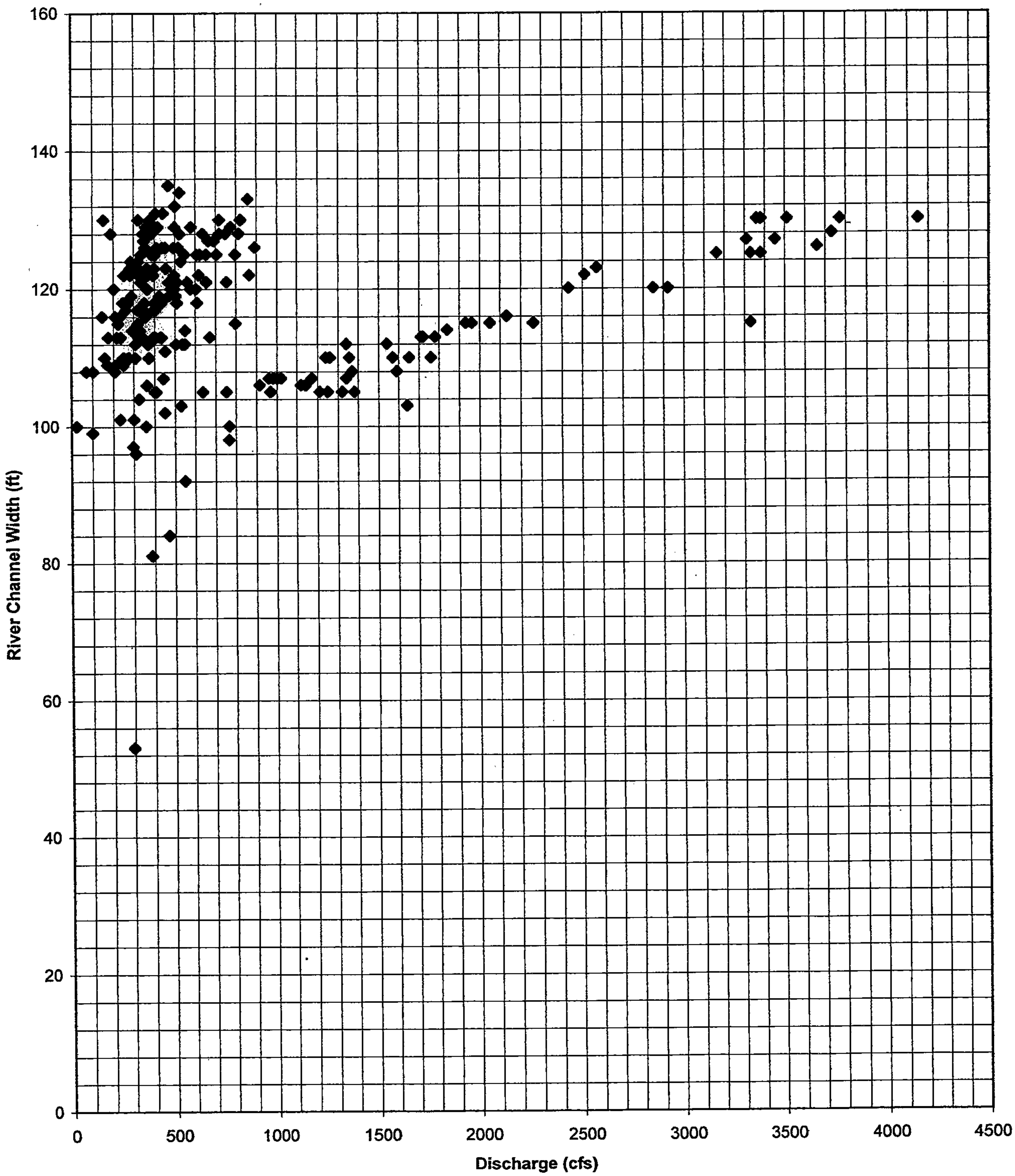
OSE-0465

WHITE RIVER NEAR COLORADO STATE LINE, UT
FLOW RATING MEASUREMENTS (1980-1985)

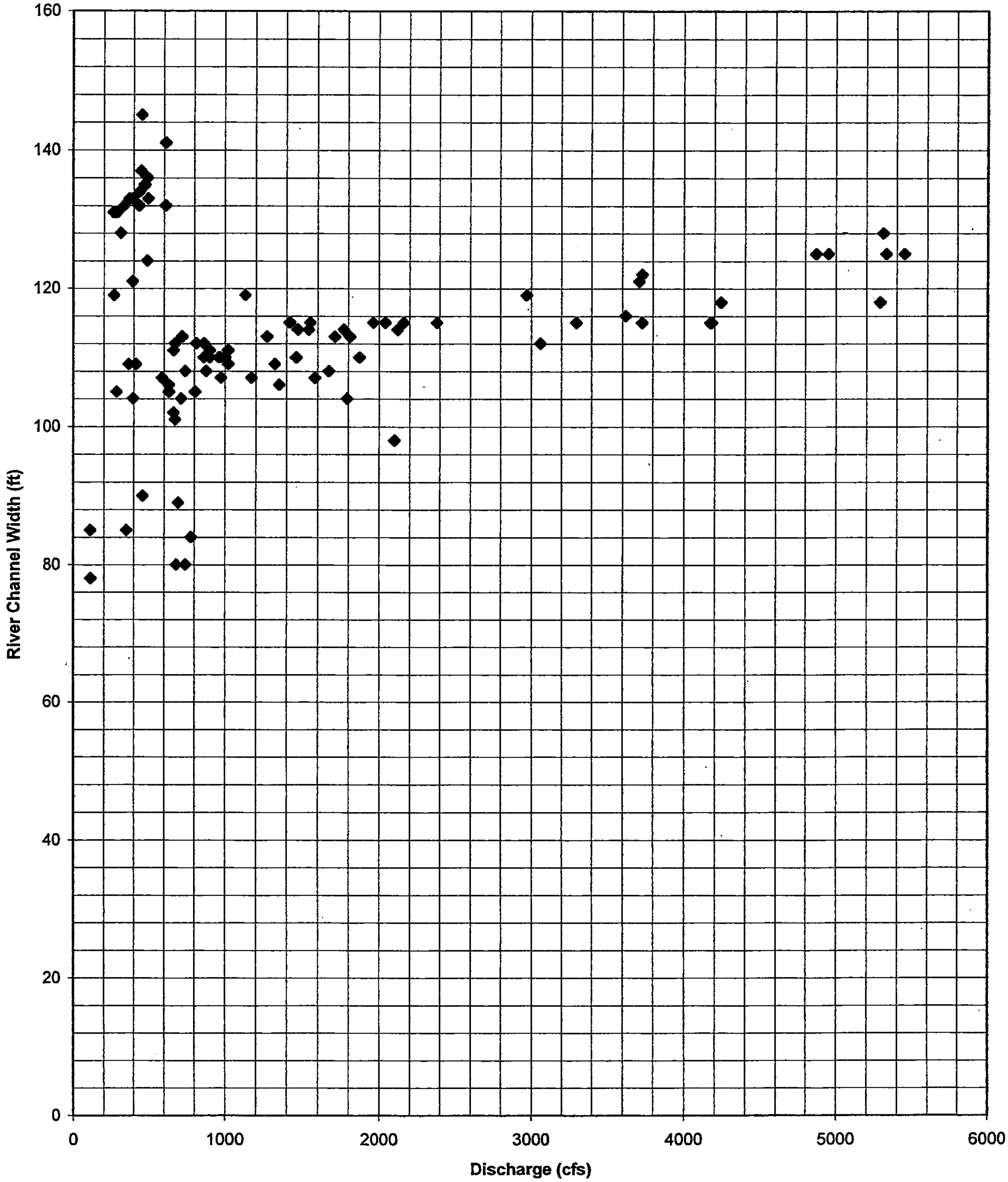


OSE-0466

WHITE RIVER NEAR WATSON, UT
FLOW RATING MEASUREMENTS (1985-2005)

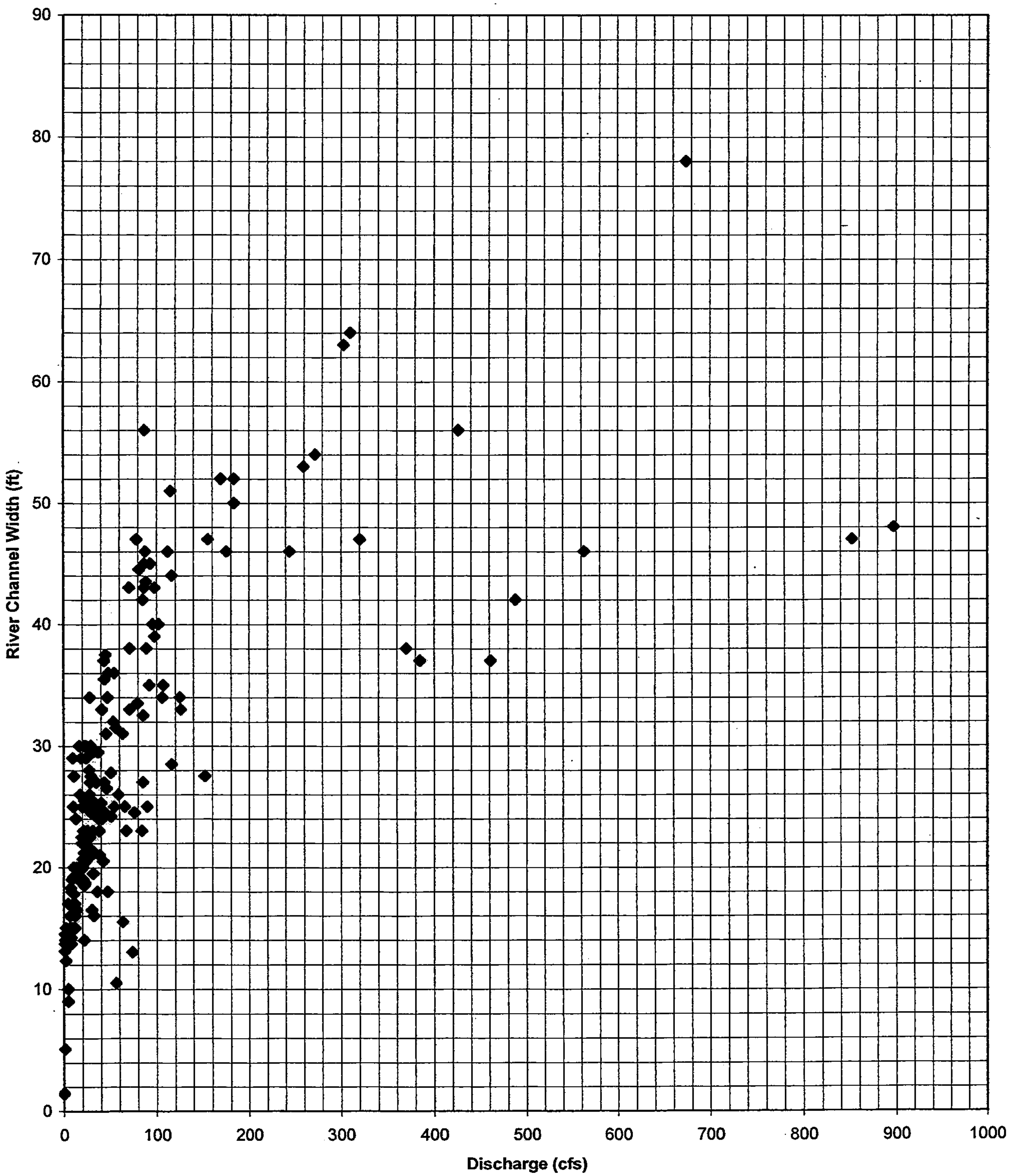


WHITE RIVER AT MOUTH NEAR OURAY UTAH
FLOW RATING MEASUREMENTS (1980-1986)



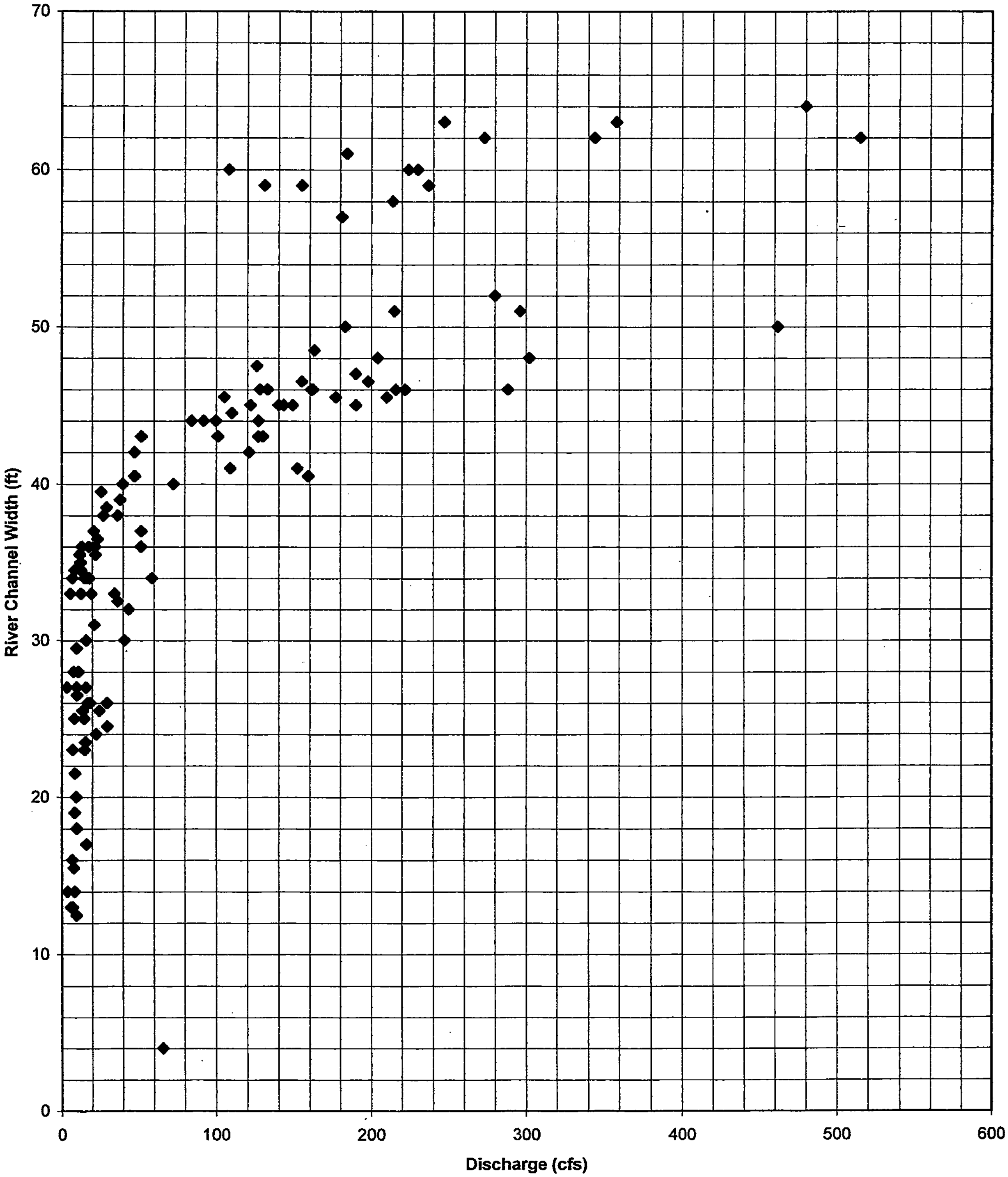
OSE-0468

PRICE RIVER AT WOODSIDE, UT
FLOW RATING MEASUREMENTS (1985-2005)

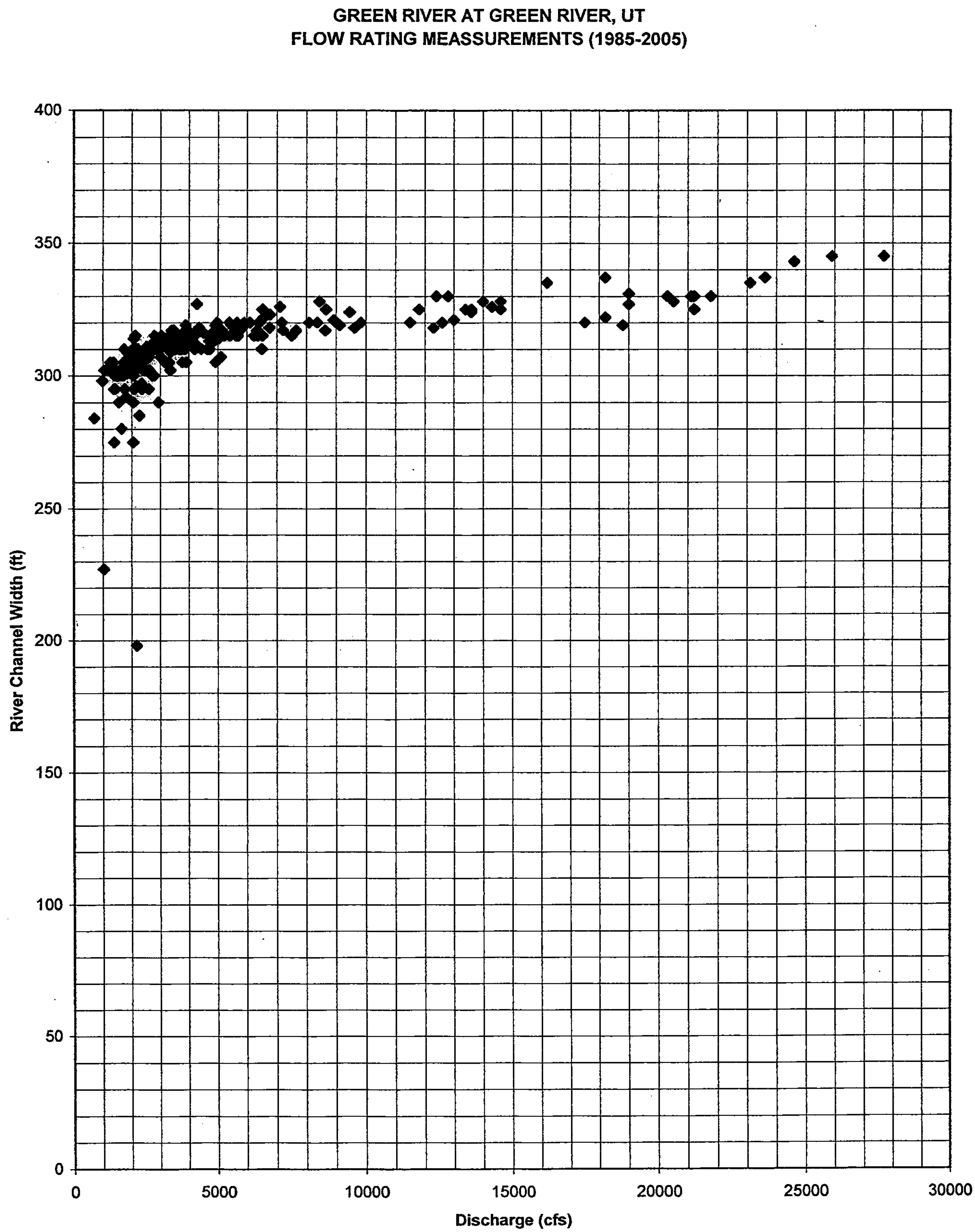


OSE-0469

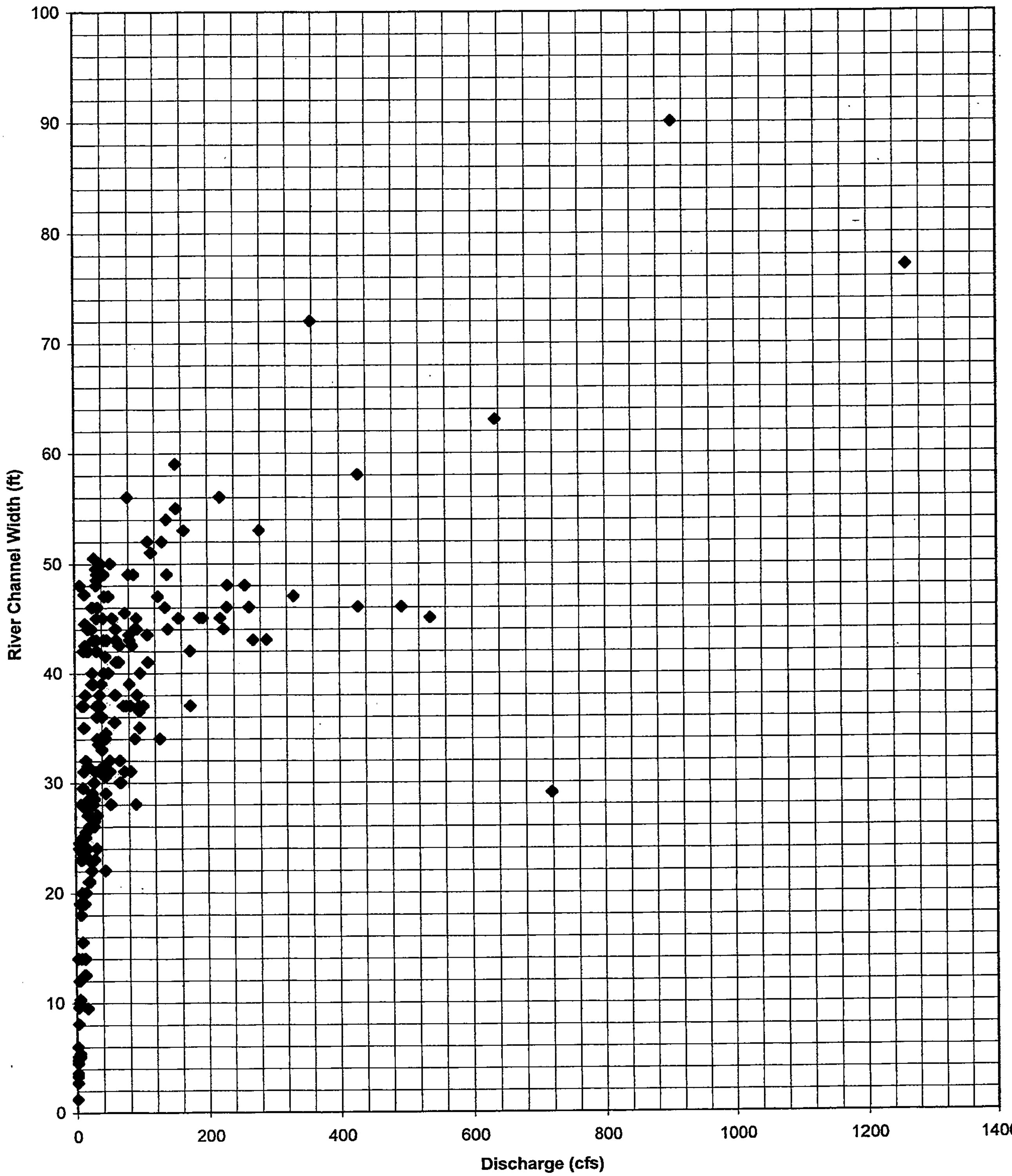
PRICE RIVER NEAR HEINER, UT
FLOW RATING MEASUREMENTS (1990-2003)



OSE-0470

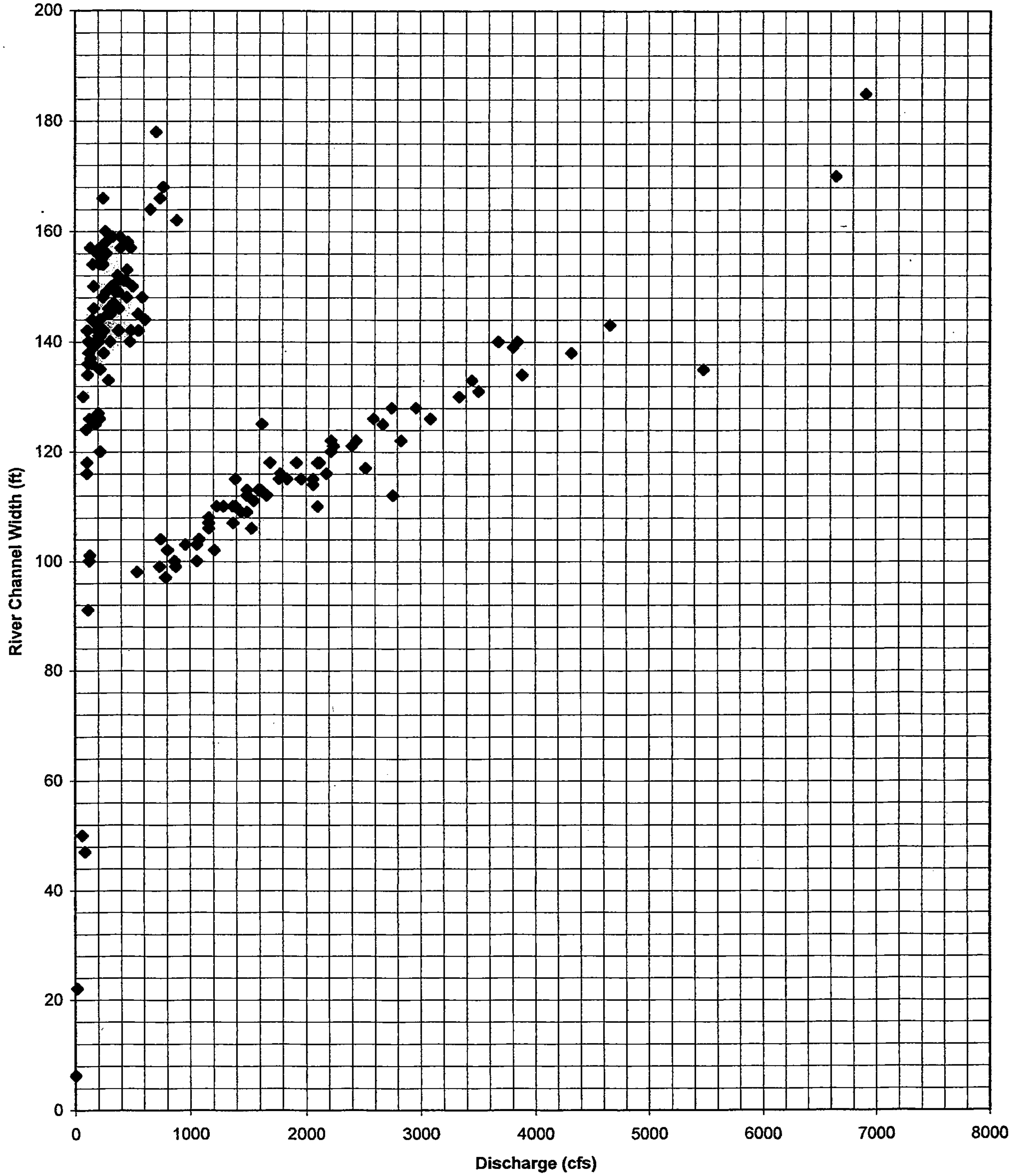

GREEN RIVER AT GREEN RIVER, UT
FLOW RATING MEASSUREMENTS (1985-2005)
River Channel Width (ft)
400
350
300
250
200
150
100
50
0
0
5000
10000
15000
20000
25000
30000
Discharge (cfs)

SAN RAFAEL RIVER NEAR GREEN RIVER, UT
FLOW RATING MEASUREMENTS (1985-2005)

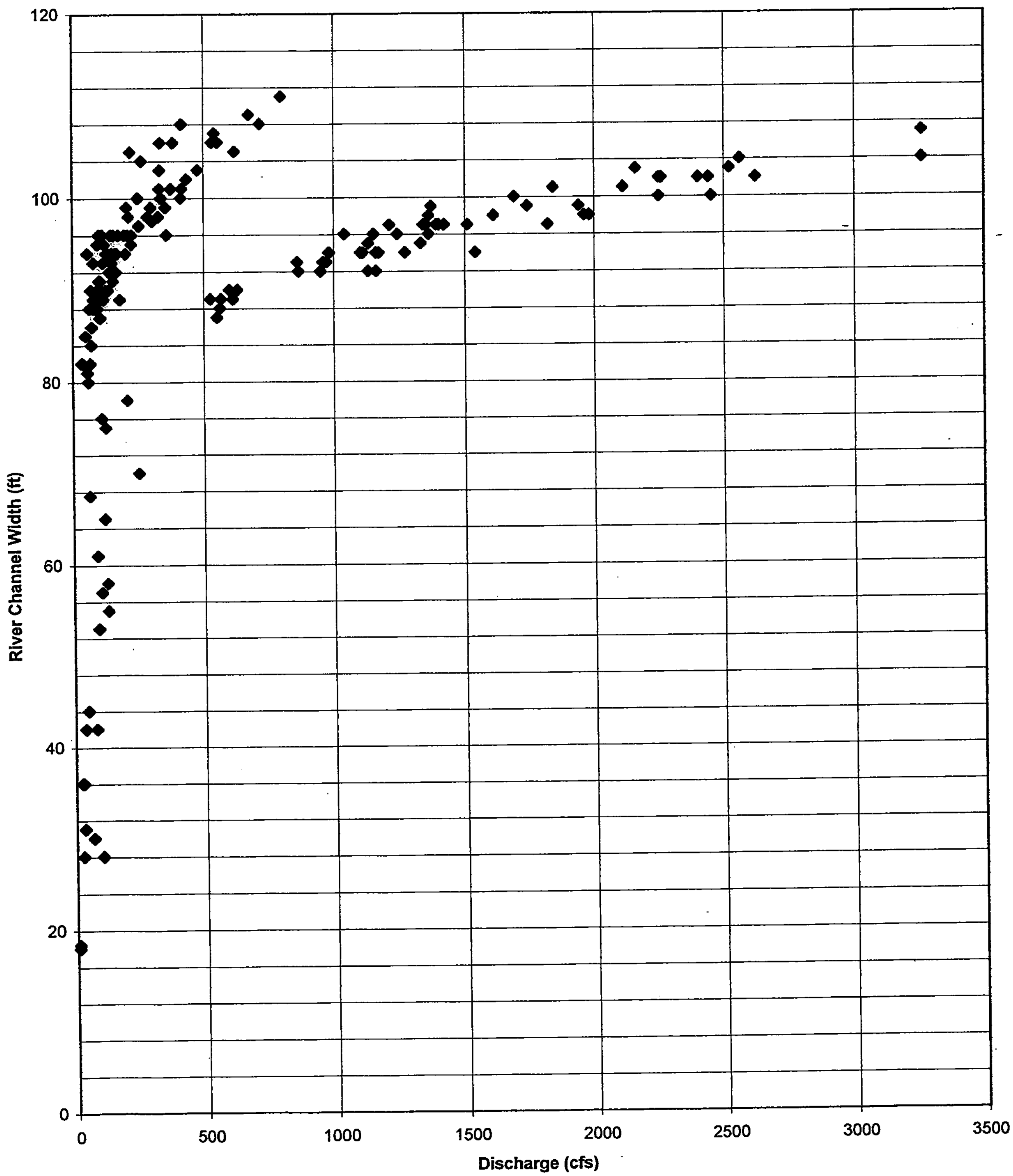


OSE-0472

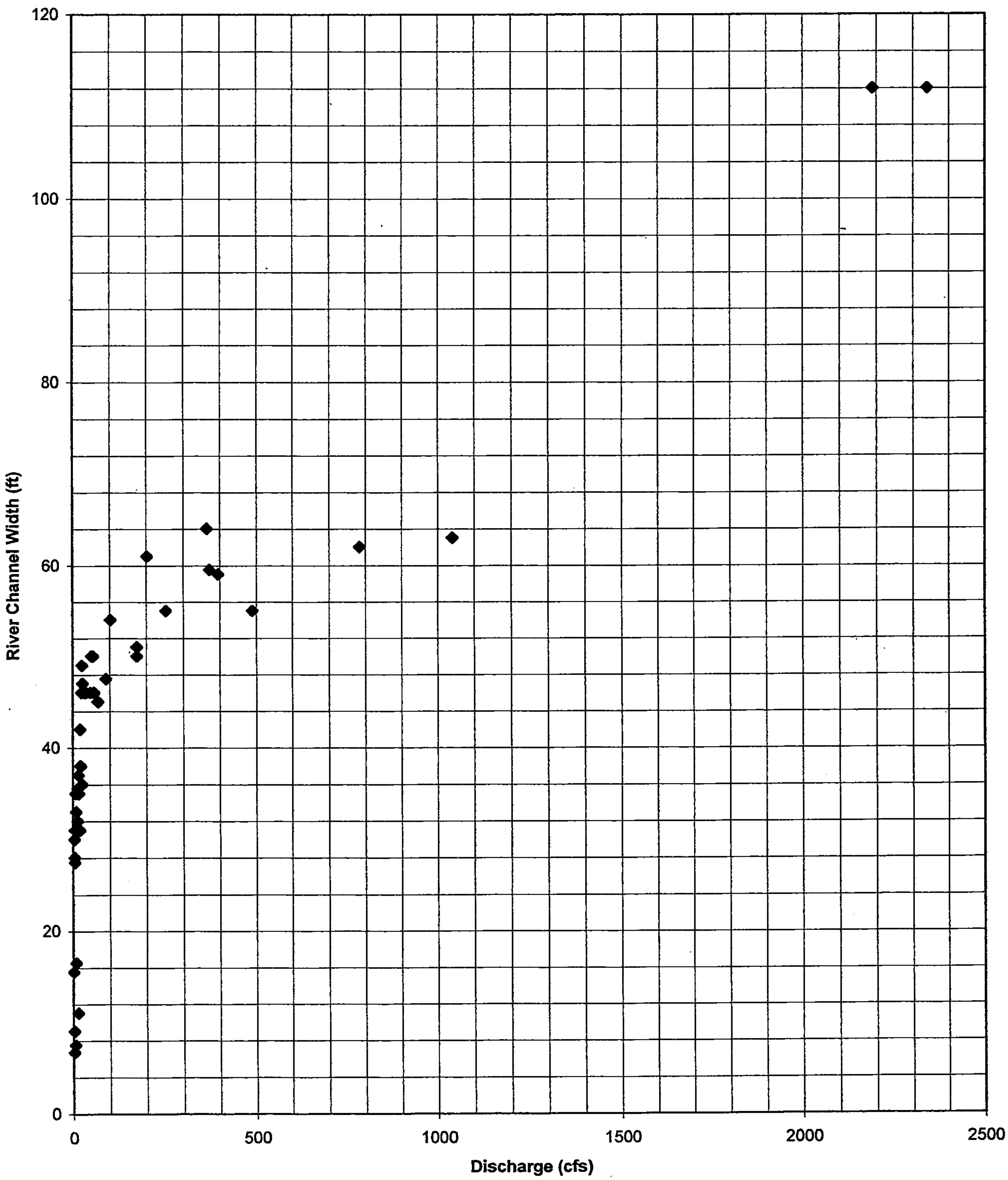
SAN JUAN RIVER NEAR CARRACAS, CO
FLOW RATING MEASUREMENTS (1985-2005)

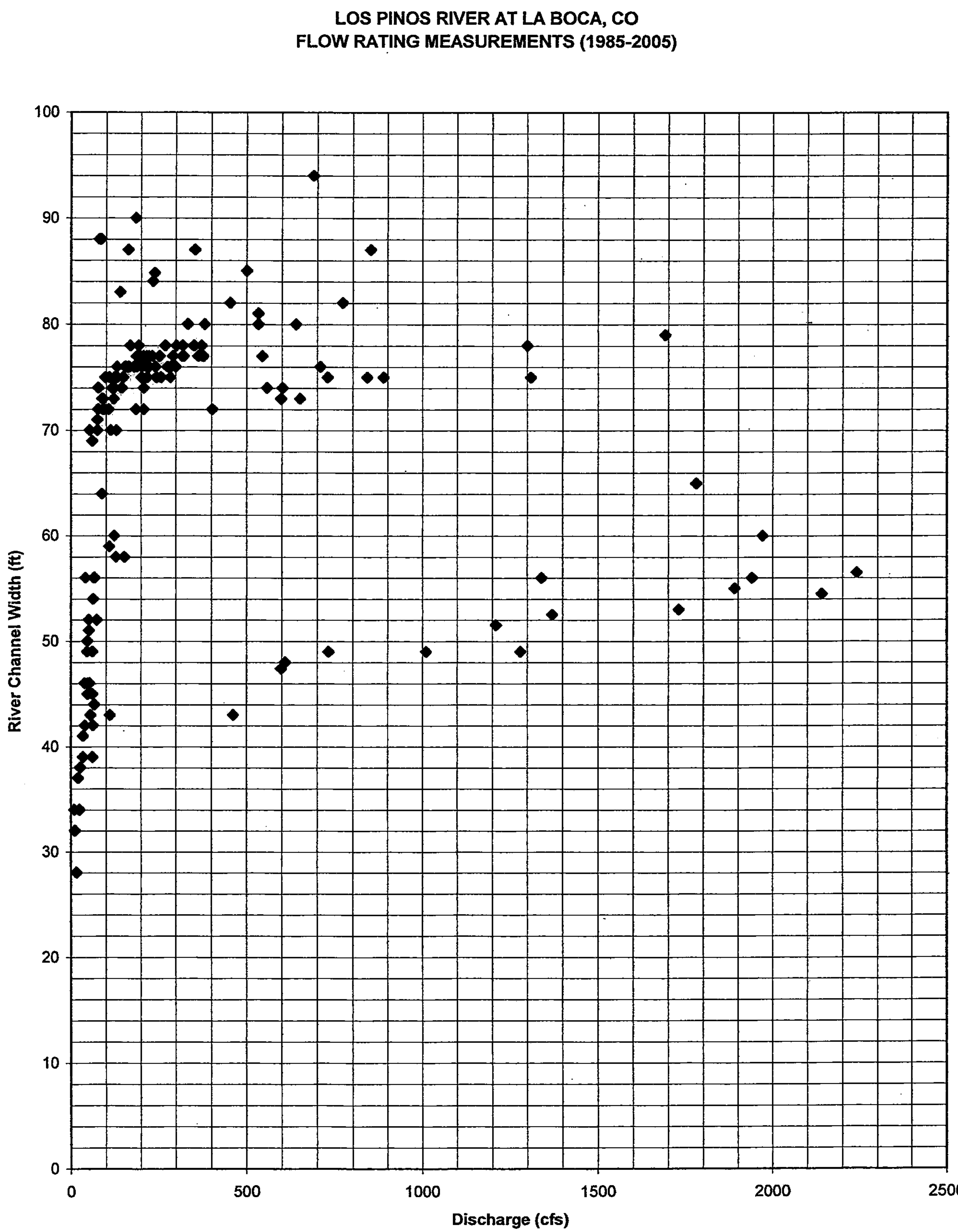


PIEDRA RIVER NEAR ARBOLES, CO
FLOW RATING MEASUREMENTS (1985-2005)

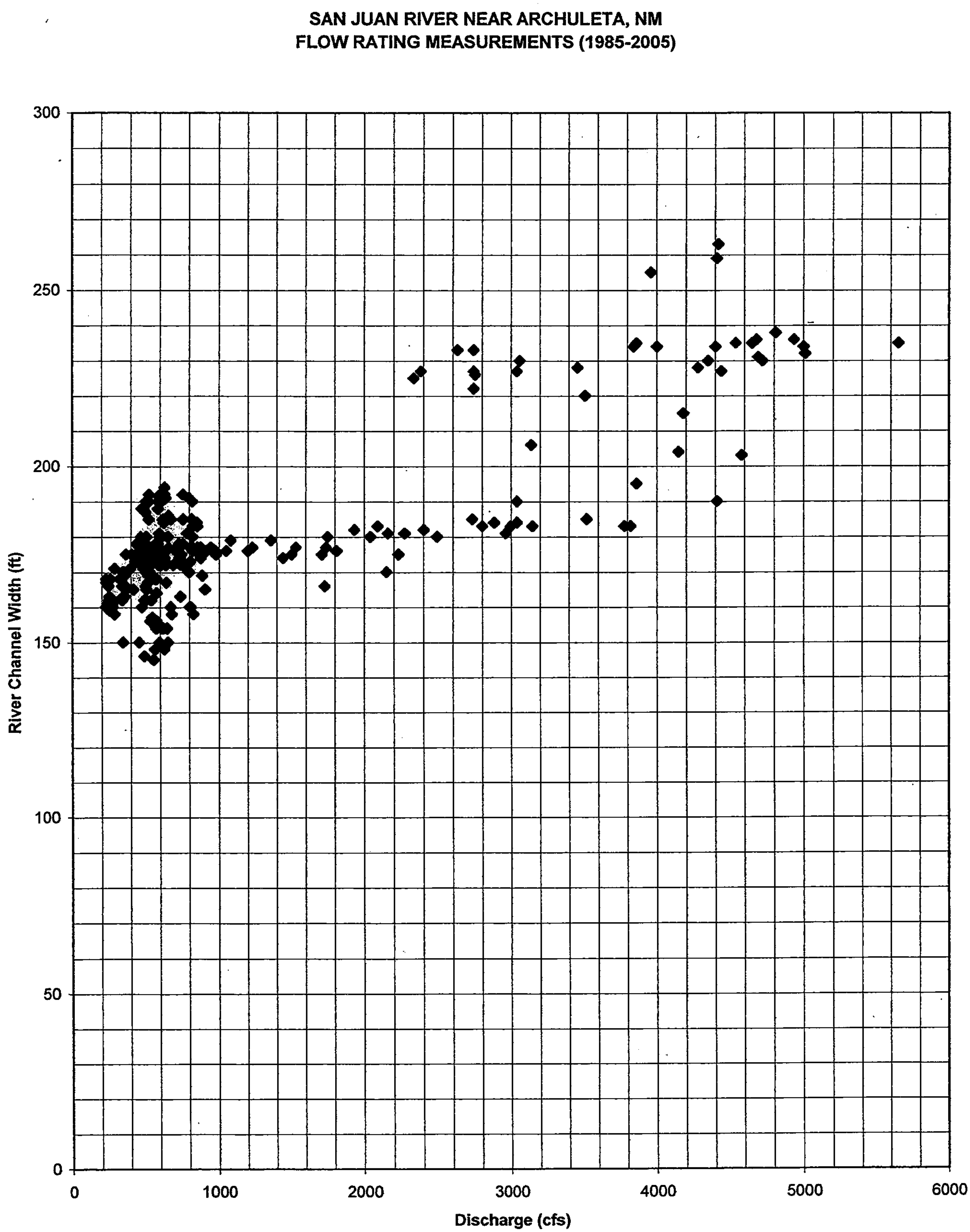


LOS PINOS RIVER NEAR IGNACIO, CO
FLOW RATING MEASUREMENTS (1999-2005)

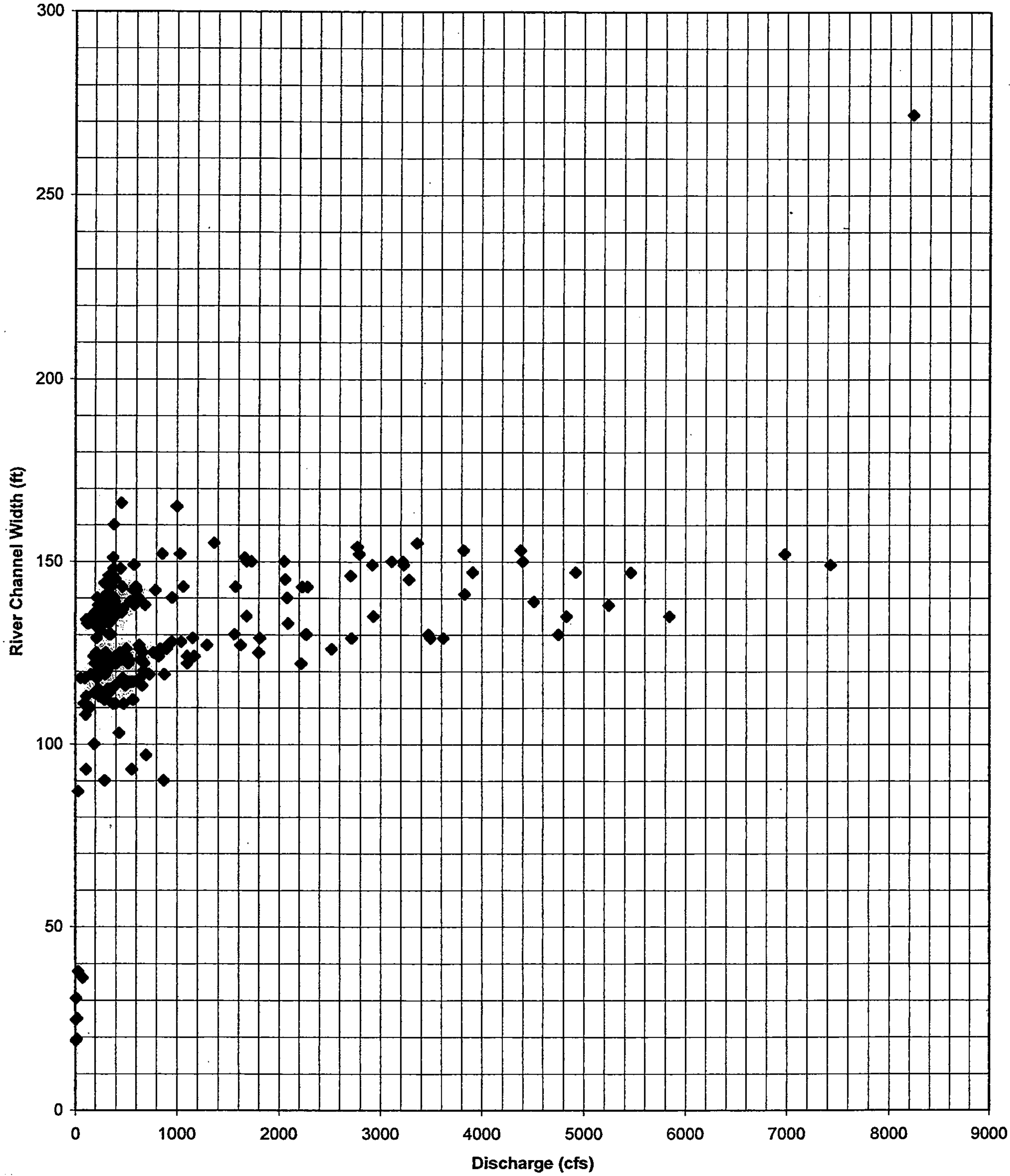



LOS PINOS RIVER AT LA BOCA, CO
FLOW RATING MEASUREMENTS (1985-2005)
100
90
80
70
60
50
40
30
20
10
0
River Channel Width (ft)
0
500
1000
1500
2000
2500
Discharge (cfs)

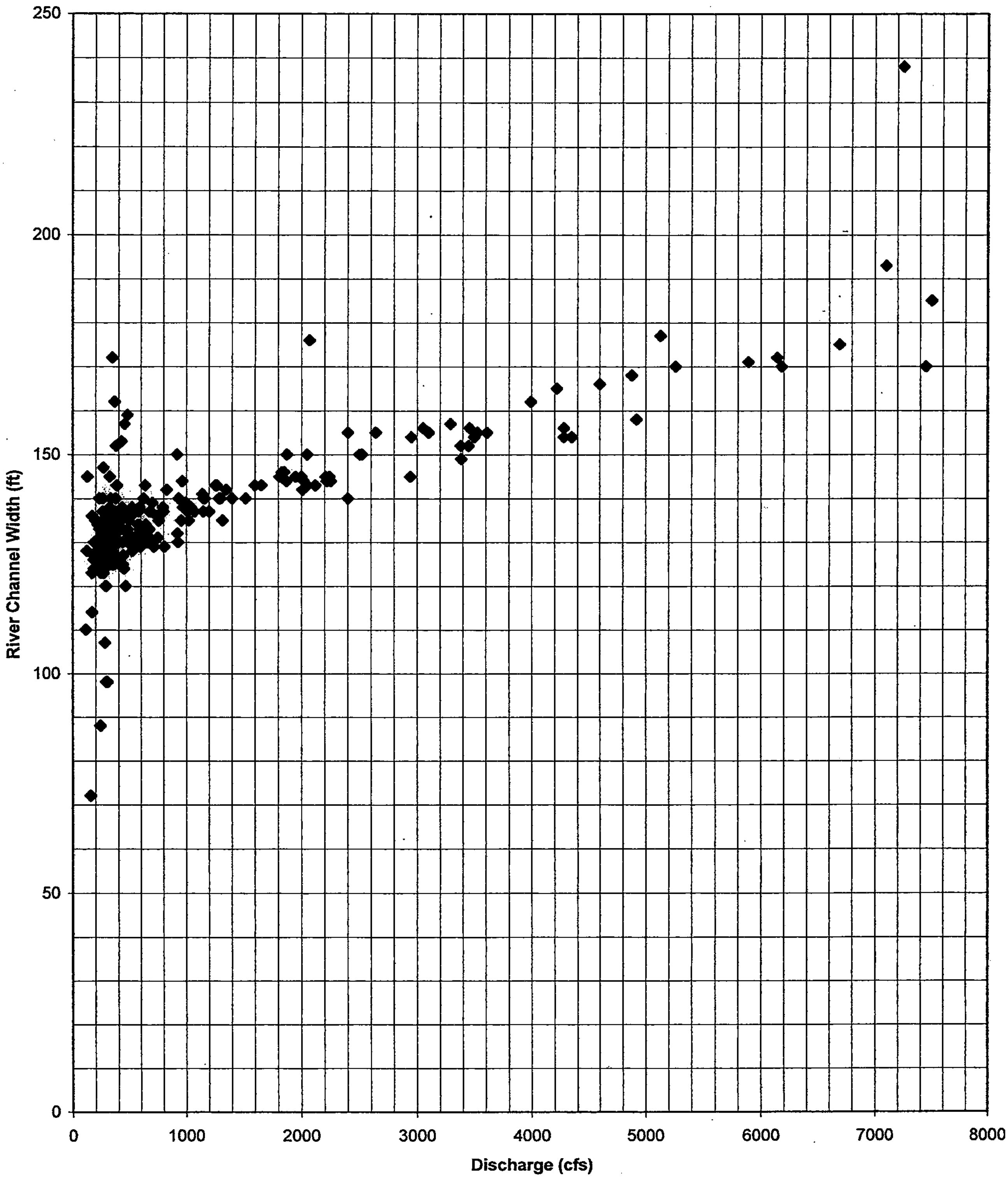
OSE-0476


SAN JUAN RIVER NEAR ARCHULETA, NM
FLOW RATING MEASUREMENTS (1985-2005)
River Channel Width (ft)
Discharge (cfs)
0
50
100
150
200
250
300
0
1000
2000
3000
4000
5000
6000

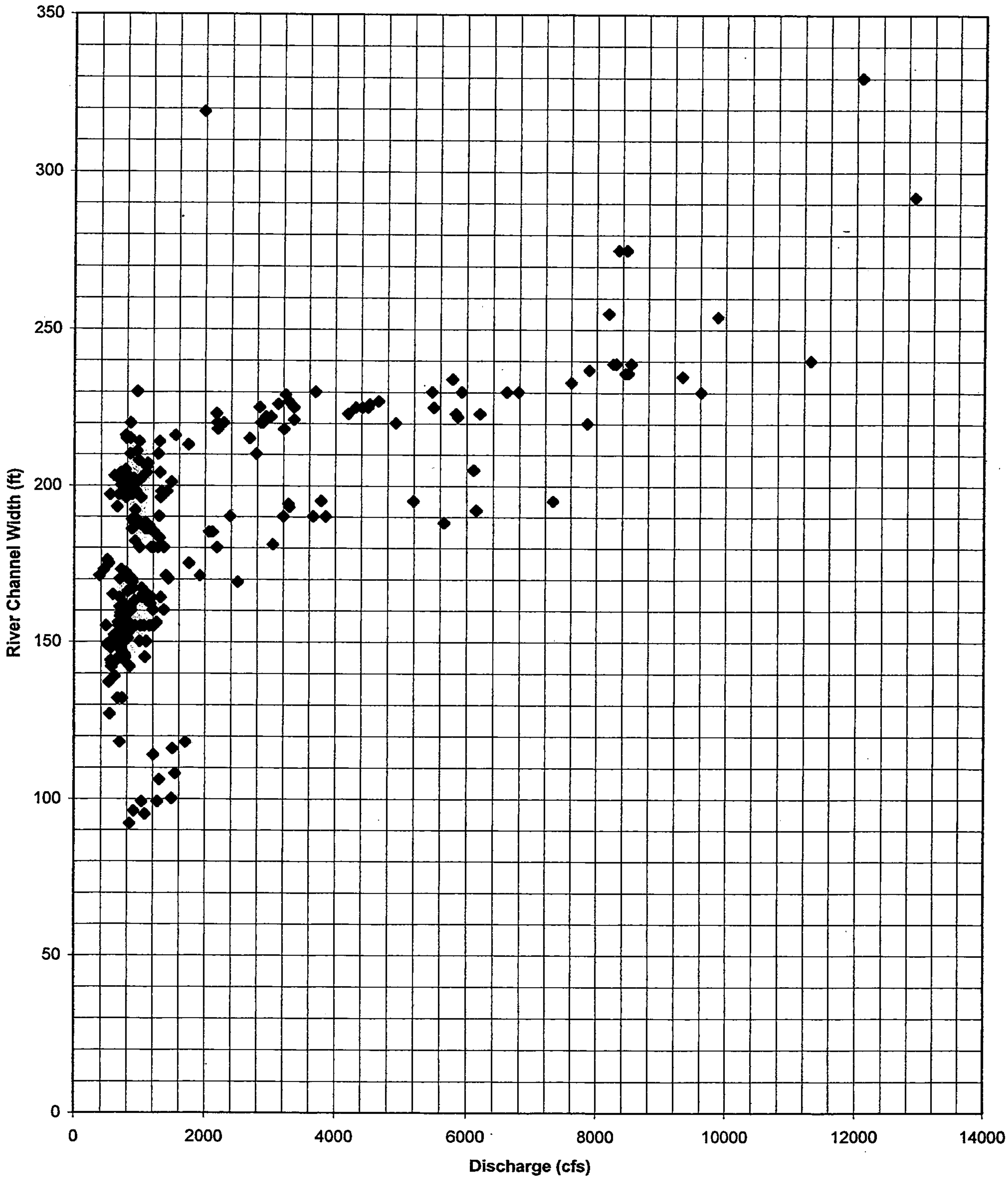
ANIMAS RIVER AT FARMINGTON, NM
FLOW RATING MEASUREMENTS (1985-2005)



ANIMAS RIVER NEAR CEDAR HILL, NM
FLOW RATING MEASUREMENTS (1985-2005)

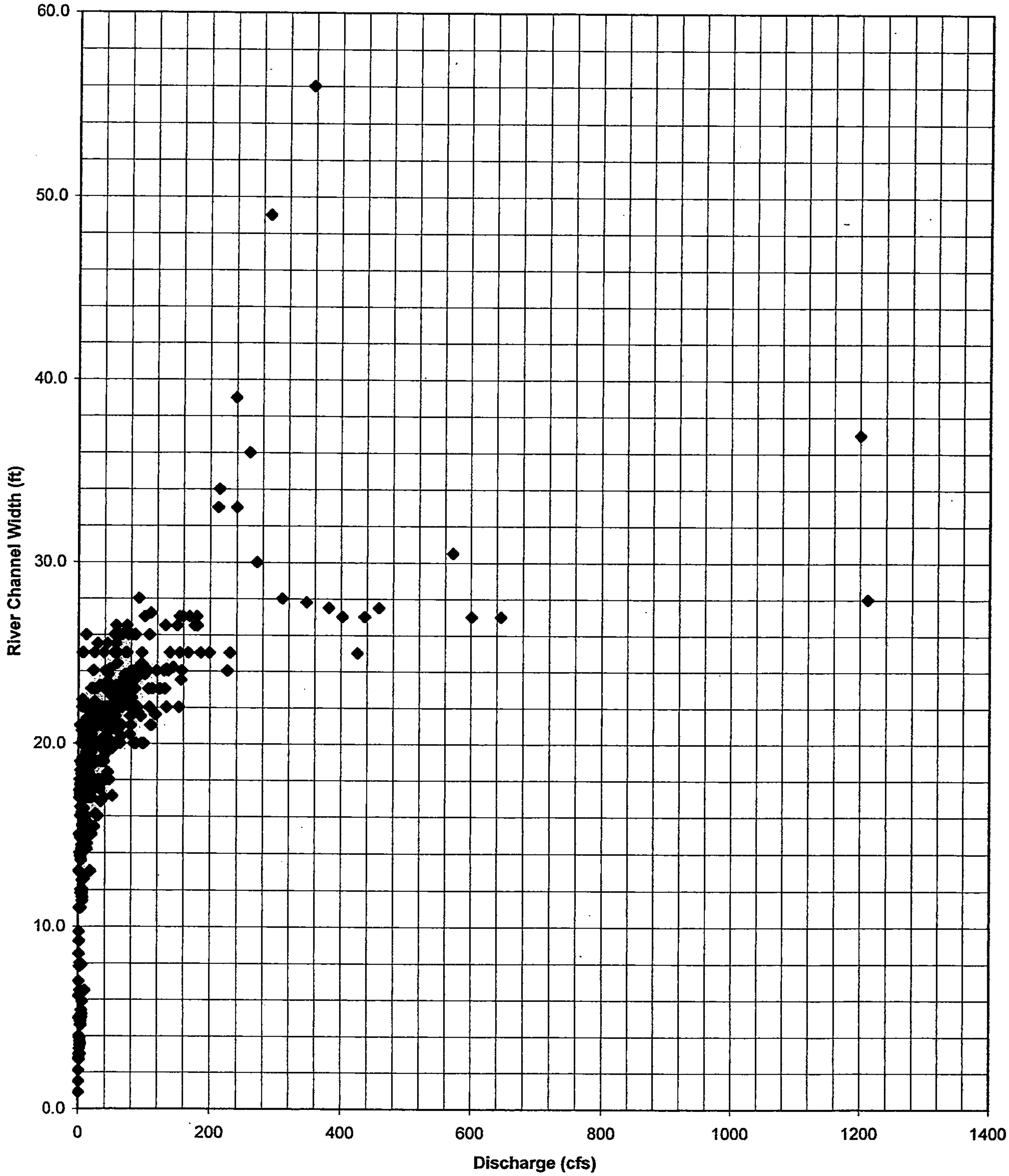


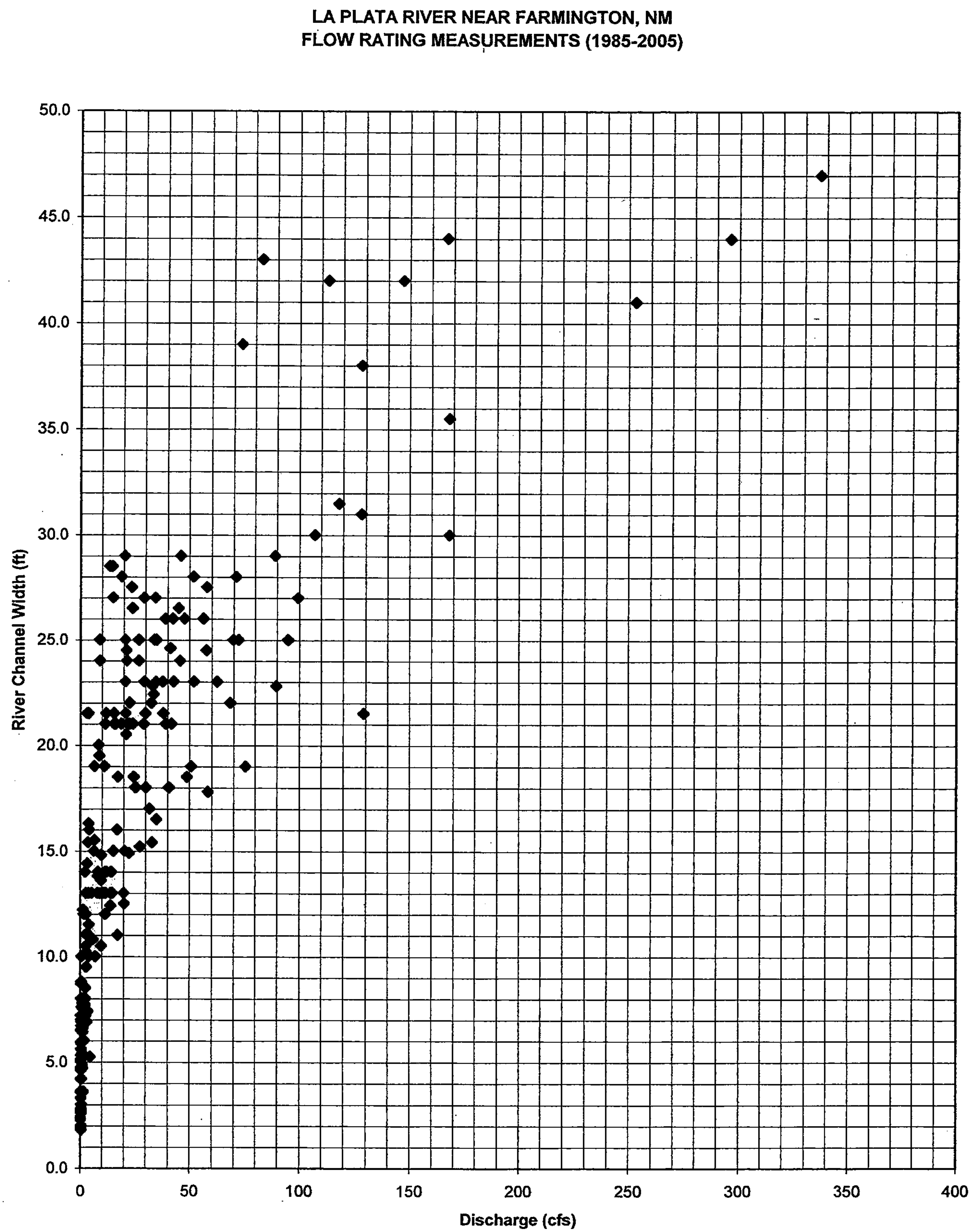
SAN JUAN RIVER AT FARMINGTON, NM
FLOW RATING MEASUREMENTS (1985-2005)



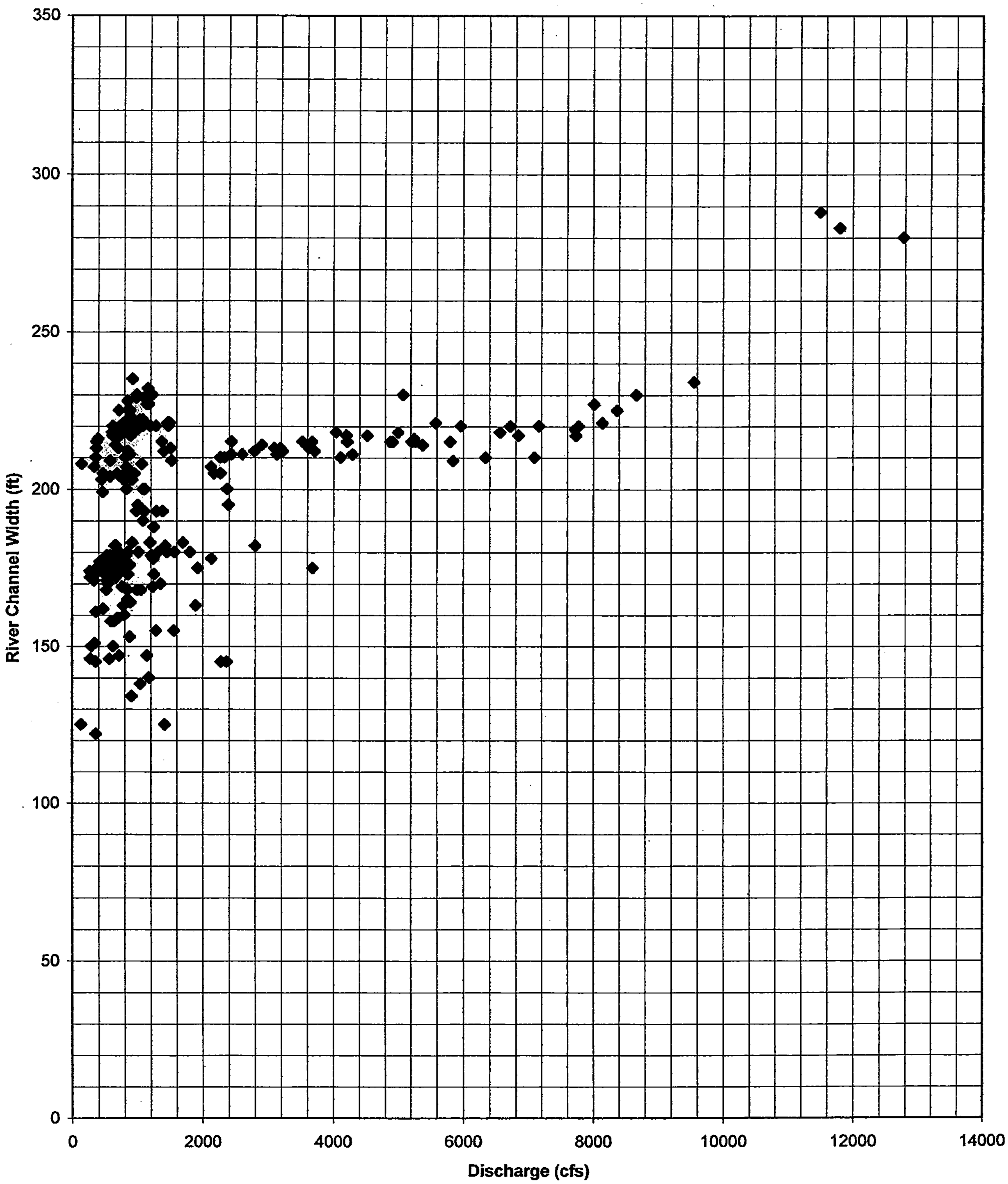
OSE-0480

LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE, CO
FLOW RATING MEASUREMENTS (1985-2005)



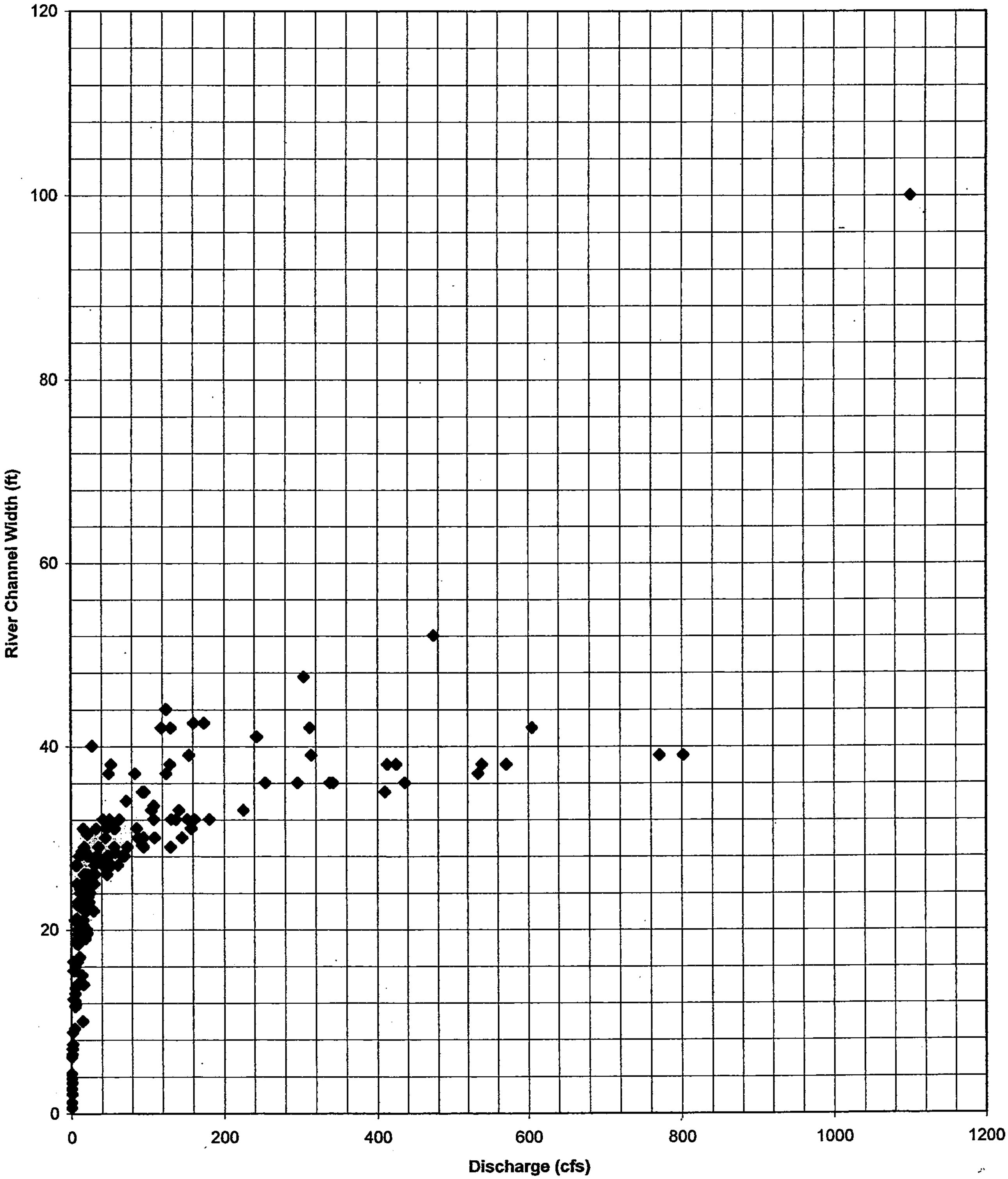

LA PLATA RIVER NEAR FARMINGTON, NM
FLOW RATING MEASUREMENTS (1985-2005)
River Channel Width (ft)
Discharge (cfs)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
0
50
100
150
200
250
300
350
400

SAN JUAN RIVER AT SHIPROCK, NM
FLOW RATING MEASUREMENTS (1985-2005)

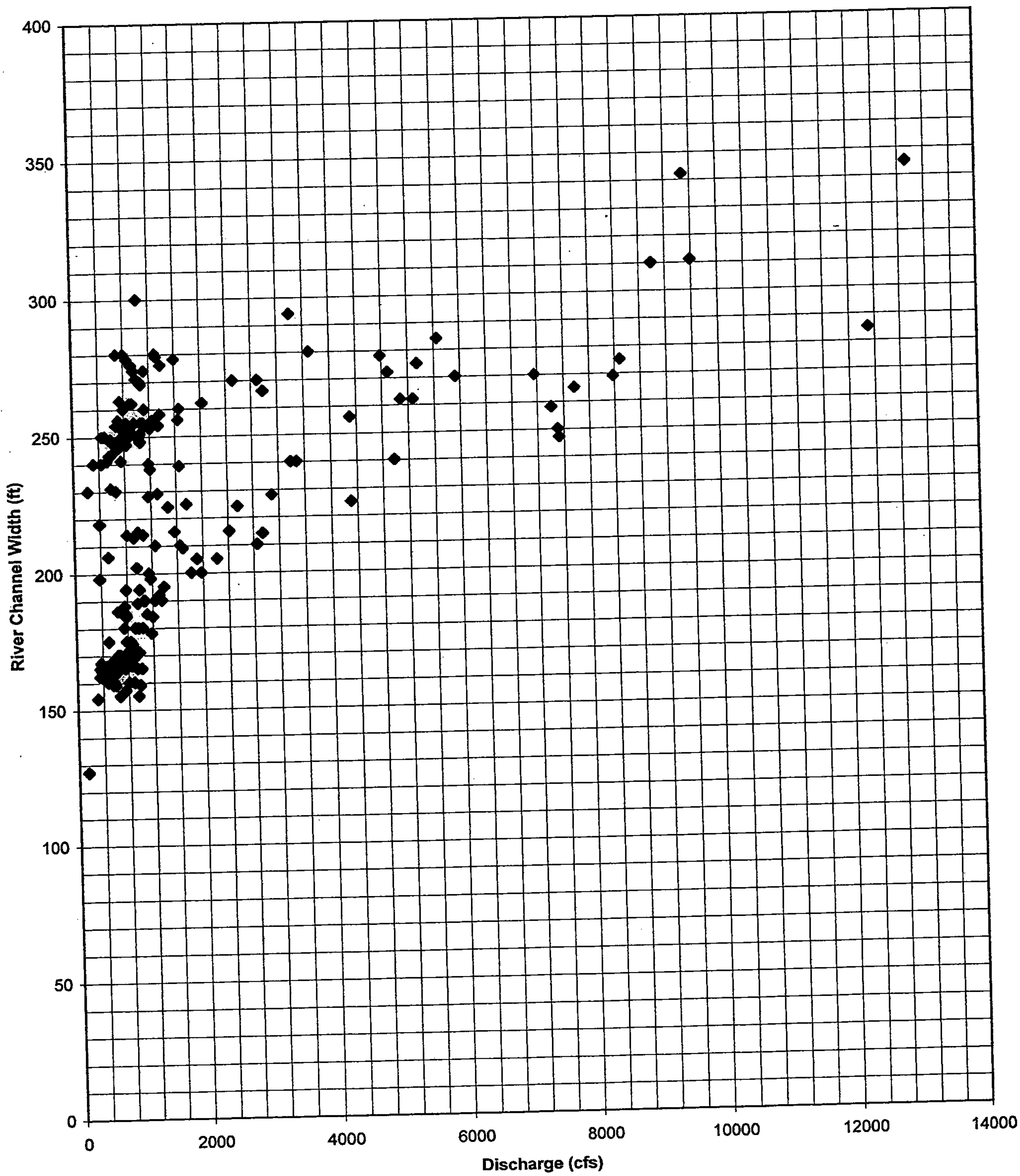


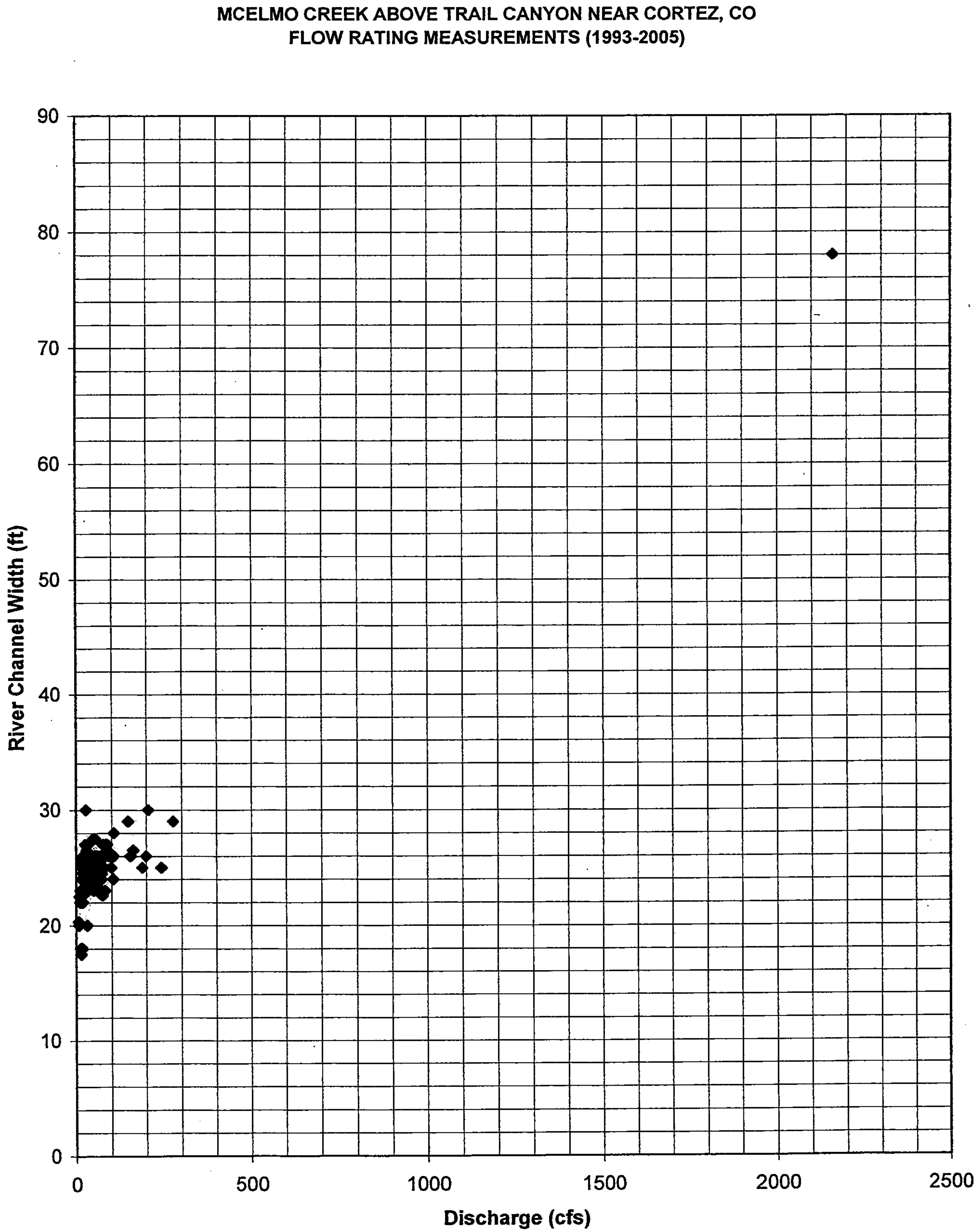
OSE-0483

MANCOS RIVER NEAR TOWAOC, CO
FLOW RATING MEASUREMENTS (1985-2005)



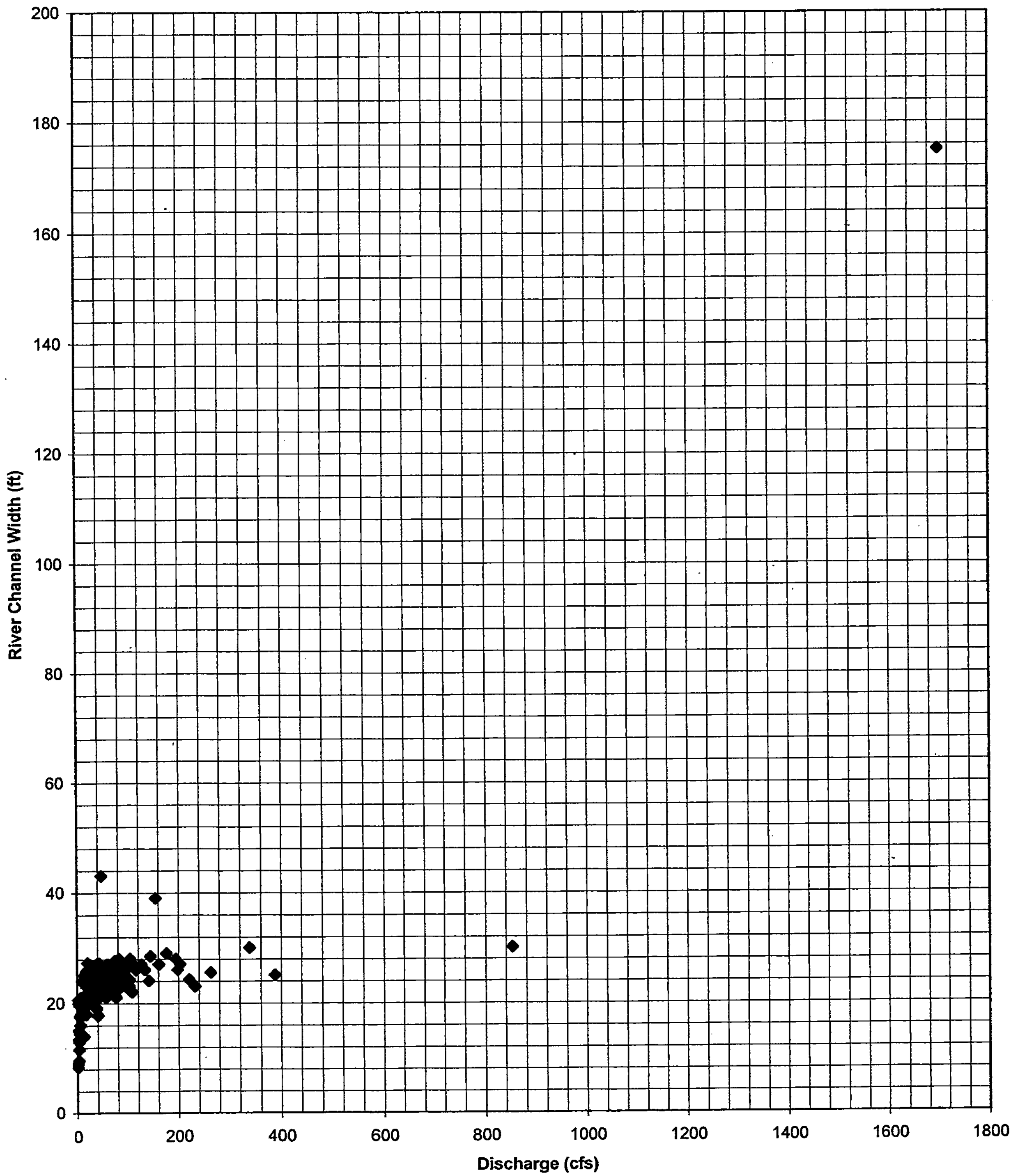
SAN JUAN RIVER AT FOUR CORNERS, CO
FLOW RATING MEASUREMENTS (1985-2005)

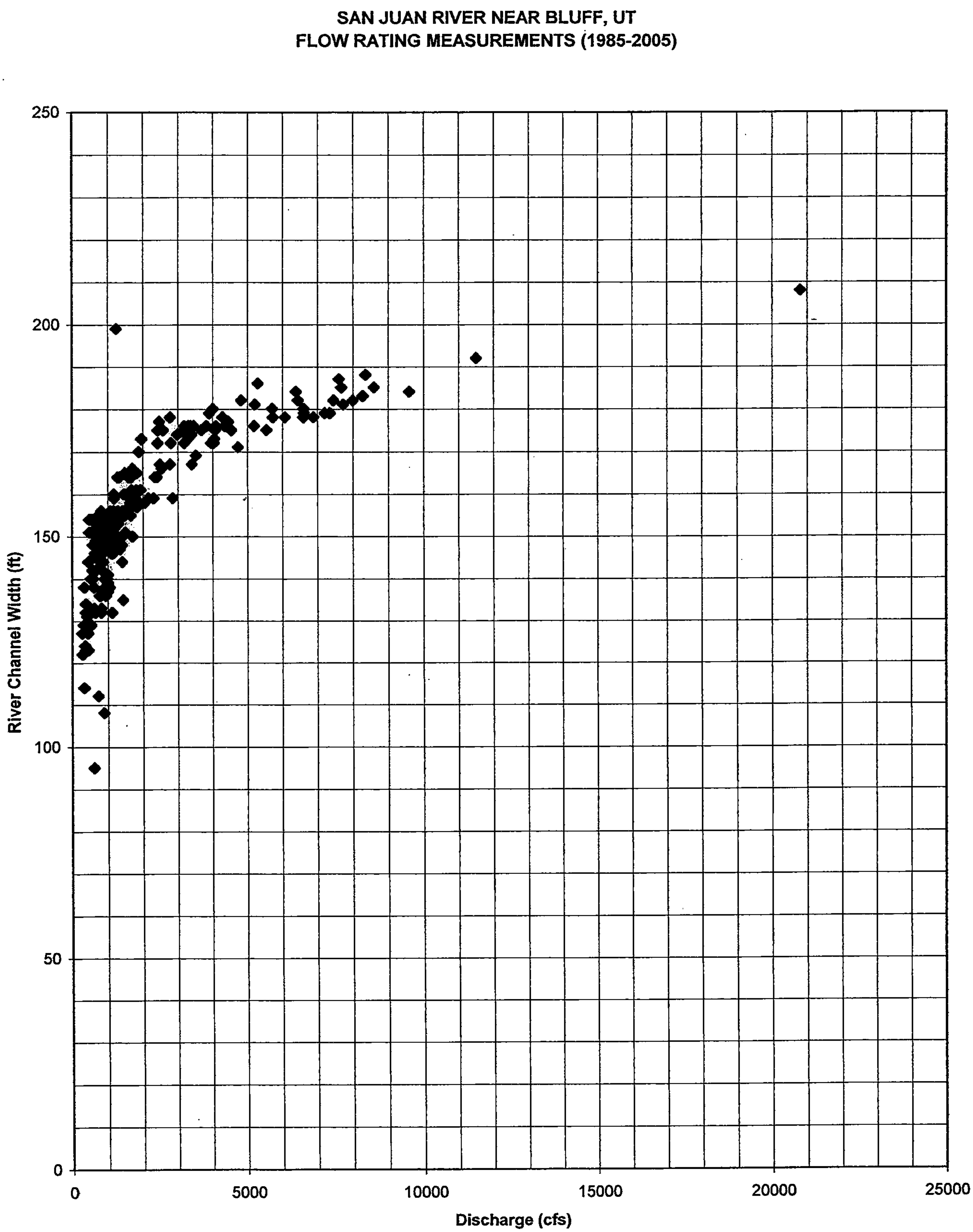



MCELMO CREEK ABOVE TRAIL CANYON NEAR CORTEZ, CO
FLOW RATING MEASUREMENTS (1993-2005)
River Channel Width (ft)
0
10
20
30
40
50
60
70
80
90
0
500
1000
1500
2000
2500
Discharge (cfs)

OSE-0486

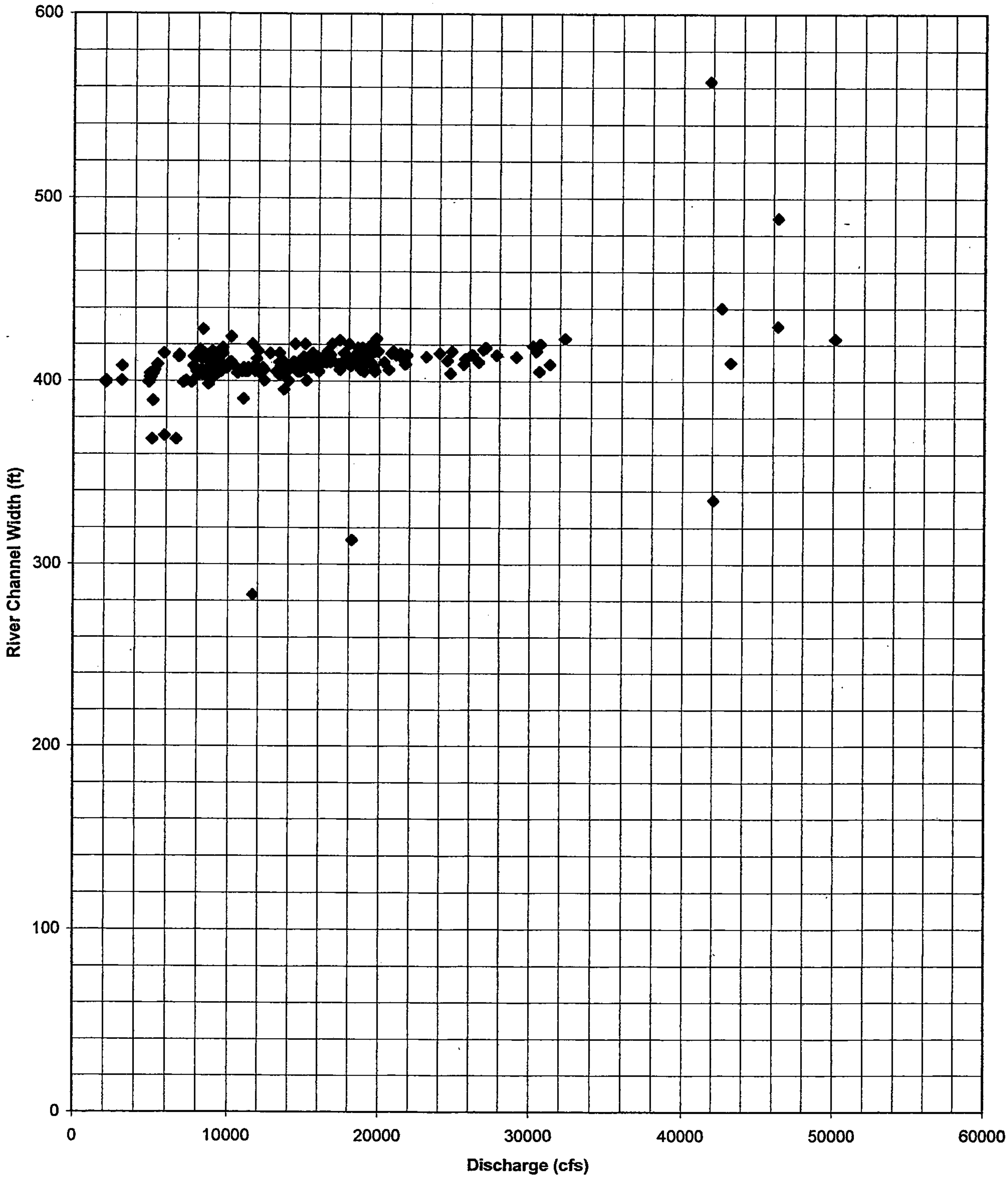
MCELMO CREEK NEAR COLORADO-UTAH STATE LINE, CO
FLOW RATING MEASUREMENTS (1985-2005)




SAN JUAN RIVER NEAR BLUFF, UT
FLOW RATING MEASUREMENTS (1985-2005)
River Channel Width (ft)
Discharge (cfs)
0
50
100
150
200
250
5000
10000
15000
20000
25000

OSE-0488

COLORADO RIVER AT LEE FERRY, AZ
FLOW RATING MEASUREMENTS (1985-2005)



OSE-0489