Dissolved Solids Hazards in the South Platte Basin, Vol. I: Salt Transport in the River

by

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DISSOLVED SOLIDS HAZARDS IN THE SOUTH PLATTE BASIN

Volume I: Salt Transport in the River

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ABSTRACT

SALT TRANSPORT IN THE LOWER SOUTH PLATTE RIVER

This work demonstrates how river salinity may be characterized, in terms of both time and space variations. Fifteen years of daily and monthly salinity and flow data have been reduced to monthly, seasonal, and annual statistical characterizations for five river stations and three tributary stations for the lower South Platte River. From these characterizations distance profiles were plotted for flow, TDS, and salt mass flows.

The distance profiles and measurements of diversion flows, tributary flows, and point source discharges were the basis for a reach by reach materials balance analysis for four reaches of the South Platte River between Henderson and Julesburg. Return flows and return salt mass flows were computed as residuals.

The analysis showed that there is not a salt balance in the lower South Platte River. A net salt loss to the land of 380 tons per day occurs by irrigation.

The analysis provided can be the basis for a more comprehensive materials balance model. But the results can be used to estimate the impact of new water resources developments upon the salinity regime of the lower South Platte River.

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The research proposal upon which funding was based was developed by the junior author and Dr. Charles D. Turner. The report is based upon the Master of Science thesis of Ramon V. Gomez-Ferrer, completed in December 1981.

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TERMINOLOGY USED

Return flows - diffuse or non-point source return flows from irrigation which seep into a given river reach.

Point source inflows - discrete flows of water into a given river reach which include tributary flows, impoundment spillages, discharges from irrigation outlet flows, and municipal and industrial wastewater discharges.

Diversion flows - irrigation canal flows and any other flows diverted from a given river reach.

Streamflow - volume flow of water per unit time in a natural stream at a given station.

Flow - generic term meaning volume of water passage per unit of time. Units used herein are cubic meters per second (m^3/s).

Monthly flow - flow of water averaged over a one month period. Units used are cubic meters per second (m^3/s), i.e., cubic meters per month divided by seconds per month.

Seasonal flow - flow of water averaged over a season period of time. Units used are cubic meters per second (m^3/s), i.e., cubic meters per three month season divided by seconds per season.

Annual flow - flow of water averaged over one year time period. Units used are cubic meters per second (m^3/s), i.e., cubic meters per year divided by seconds per year.

Salt mass flow - mass flux of dissolved salts convected by flow of water. Units used are metric tons per day (T/d).

Monthly salt mass flow - flux of dissolved salts averaged over a one month period. Units used are metric tons per day (T/d), i.e., thousands of kilograms of total dissolved solids per month divided by days per month.

Seasonal salt mass flow - flux of dissolved averaged over a season period of time. Units used are metric tons per day (T/d), i.e., thousands of kilograms of total dissolved solids per three month season divided by days per season.

Annual salt mass flow - flux of dissolved salts averaged over a one year time period. Units used are metric tons per day (T/d), i.e., thousands of kilograms of total dissolved solids per year divided by days per year.

Chapter 1

INTRODUCTION

1.1 Background

Because water is a scarce resource in many arid and semi-arid regions of the world, it is often used and reused to the limit of either salinity increase or water availability after losses. The South Platte River Basin in Colorado is an example of the kind of water system found in such regions. Here the accumulation of dissolved solids due to intensive use and reuse is becoming a limiting factor for new water developments.

While salinity is often a rate limiting factor in development there has been little systematic attention given to understand the characteristics of the accumulation and transport of salt loads through developed river basins. Thus there is a need to know how to analyze these salinity characteristics, and then to use such analyses as tools to predict the effects of new development projects upon an existing salinity regime.

1.2 Objective

The first objective of this project is to demonstrate how river salinity may be characterized in terms of time variations and with distance along the stream. The second objective is to ascertain the role of factors, such as return flows, diversions, point source discharges, which shape this characterization.

1.3 Scope

The limits of this study are as follows:

1) The salinity characterization was for the lower South Platte River between Henderson and Julesburg.

2) This study investigates phenomena affecting the stream and not upon processes external to it such as evapotranspiration, salinity pickup due to leaching, etc. The work does not encompass a basin-wide hydrologic model.

3) The study is empirical, utilizing published records for the period 1965-79.

1.4 Significance for the South Platte

Salinity increase in the South Platte River and its tributaries begins to be observed from below the mouths of the canyons where intensive abstraction starts for urban and agricultural uses. This activity extends along the system to the lower South Platte River at the Colorado-Nebraska state line. Because of this intensive water use the salinity concentrations in the stream systems, which occur naturally at the mouths of the canyons at levels below 100 mg/l, suffer nearly a twenty-fold increase toward the outlet of the watershed. These values are well above the 500 mg/l recommended for drinking water supplies and fall into a level which may have adverse effects on many crops and requires careful management practices for irrigation.

In order to meet the increasing water demand in the basin, several water projects, such as the proposed Grey Mountain Project for the Cache La Poudre River or the authorized Narrows Dam Project for the lower South Platte River, are being considered to increase water yield, while preserving compact requirements at the Colorado-Nebraska state line.

Additional measures being proposed to satisfy future demand include water conservation programs, increased recycling, exchange/reuse between municipalities and agriculture, and improved management and operation of the existing systems.

Such projects are likely to further increase the concentration of total dissolved solids in the lower South Platte River, jeopardizing its continued use by downstream users.

So it is becoming advisable within the South Platte River Basin to assess how the proposed and contemplated water development projects will affect its salinity regime.

1.5 Past Studies

Salinity in streams has been of long-standing interest in the western United States, and has spawned a variety of project oriented studies. It is a critical concern in the Colorado River Basin where municipal and irrigation uses may be limited because of salinity increases caused by return flows from upstream diversions. This same problem exists in the Sevier River in Utah, the Rio Grande in New Mexico, the Salt River in Arizona, the San Joaquin River in California, and the Arkansas River in Colorado. A review of some of these problems can be found from different authors in the Proceedings of a National Conference on Managing Irrigated Agriculture to Improve Water Quality sponsored by U.S. Environmental Protection Agency and Colorado State University in 1972.

Many of the studies on these various systems are focused upon particular components, such as leaching, salinity in return flows, in-stream salinity. Of particular interest is a five volume EPA report (1977) on prediction of mineral quality of irrigation return flows. The comprehensive studies in terms of salinity modeling are few. Hyatt (1970) has developed such a model for the Colorado River. Riley and Jurinak (1979) have outlined a comprehensive model for management purposes. Hendricks and Bagley (1969) have proposed a material balance salinity model which takes into account salt build up by consumptive use and pickup by leaching. Its application is demonstrated for annual data.

The salinity characteristics of the South Platte River have not been discerned in detail, although a variety of studies have addressed portions of the problem. Generally, the problem has just been described in narrative terms, such as in studies by Engineering Consultants Inc. (1974) or Hurr et al. (1975). Salinity has been also a concern in the 208 planning activities as can be seen in the Water Quality Management Plan for Larimer and Weld Counties, Colorado, prepared by Pitts et al. (1978).

1.6 Units

The units of expression used throughout this work for flows and salt mass flows are cubic meters per second and metric tons per day, respectively. These units have been used both for daily, monthly, seasonal and annual flow and salt mass flow values, in order to permit easy comparison of these values for different time periods.

Chapter 2

THE LOWER SOUTH PLATTE RIVER

2.1 The South Platte River Basin

The waters of the South Platte River are used very intensively for municipal and irrigation purposes. The irrigated land is estimated at 572,650 Ha (1,415,000 acres) (Bluestein and Hendricks, 1975). The annual native runoff of the South Platte and its tributaries averages about 1,673 MCM (1,355,919 acre feet) (Hendricks et al., 1977), which is augmented by about 460 MCM (373,122 acre feet) (Hendricks et al., 1977) of imported water. The native runoff varies widely, however, averaging only 1,039 MCM (842,040 acre feet) in 1953-56, and 2,347 MCM (1,902,680 acre feet) in 1970. Most of the discharge is snow melt, which occurs in the April-July period. Figure 2-1 is a map of the South Platte River Basin showing the tributary streams, major urban areas, and irrigated lands.

2.2 The Lower South Platte River

Figure 2-2 shows the lower South Platte River between Henderson and Julesburg, which was the portion of the river considered in this study. Of special interest are the gaging stations which are highlighted on the map.

Estimates of irrigated land in the study area, adjacent to the river, range from 123,000 Ha (304,000 acres) by Hurr et al. (1975) to 202,750 Ha (501,000 acres) by Bluestein and Hendricks (1975). Janonis and Gerlek (1977) also estimate about 202,350 Ha (500,000 acres). The

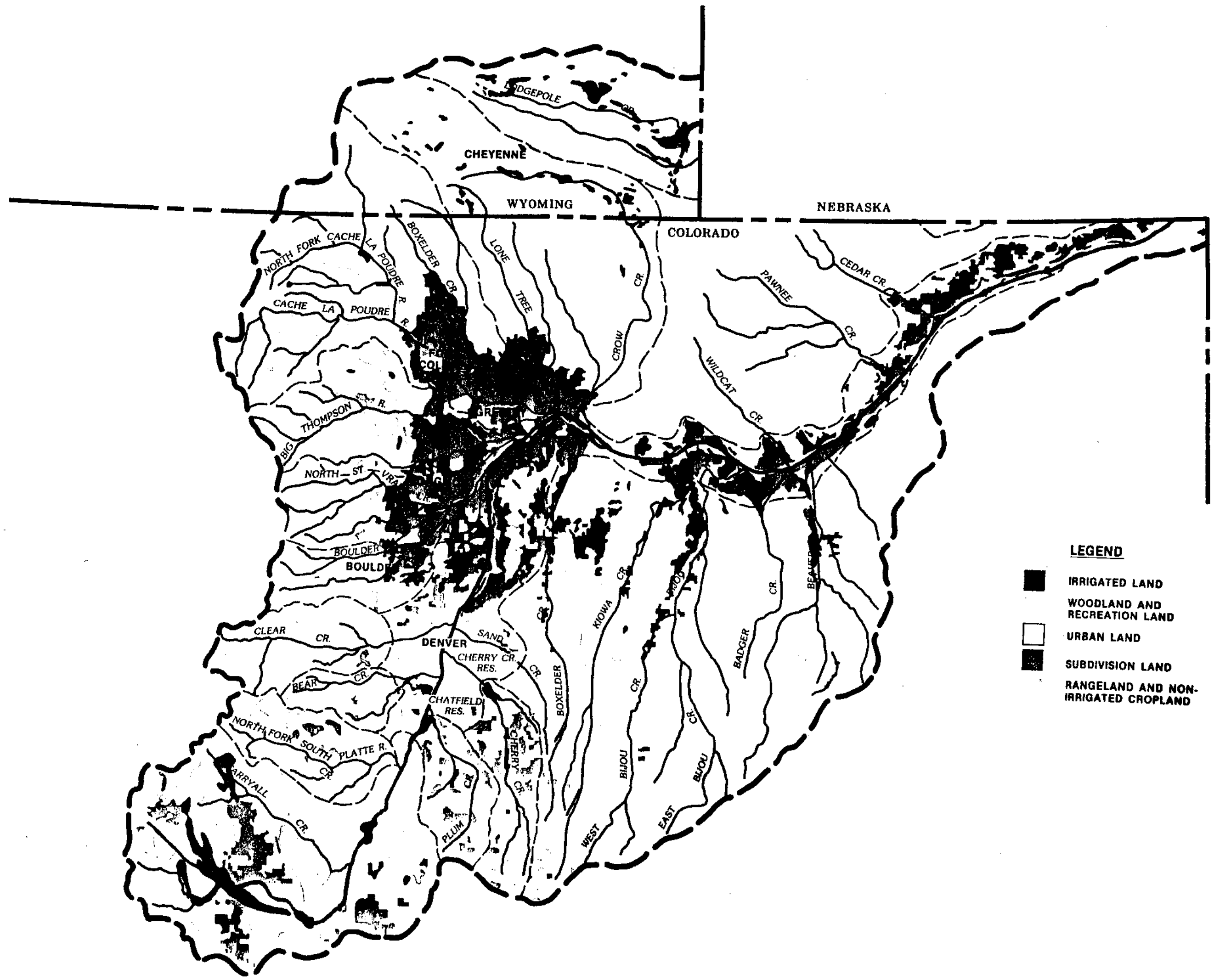


Figure 2-1. The South Platte River Basin (adapted from Hendricks et al., 1977).

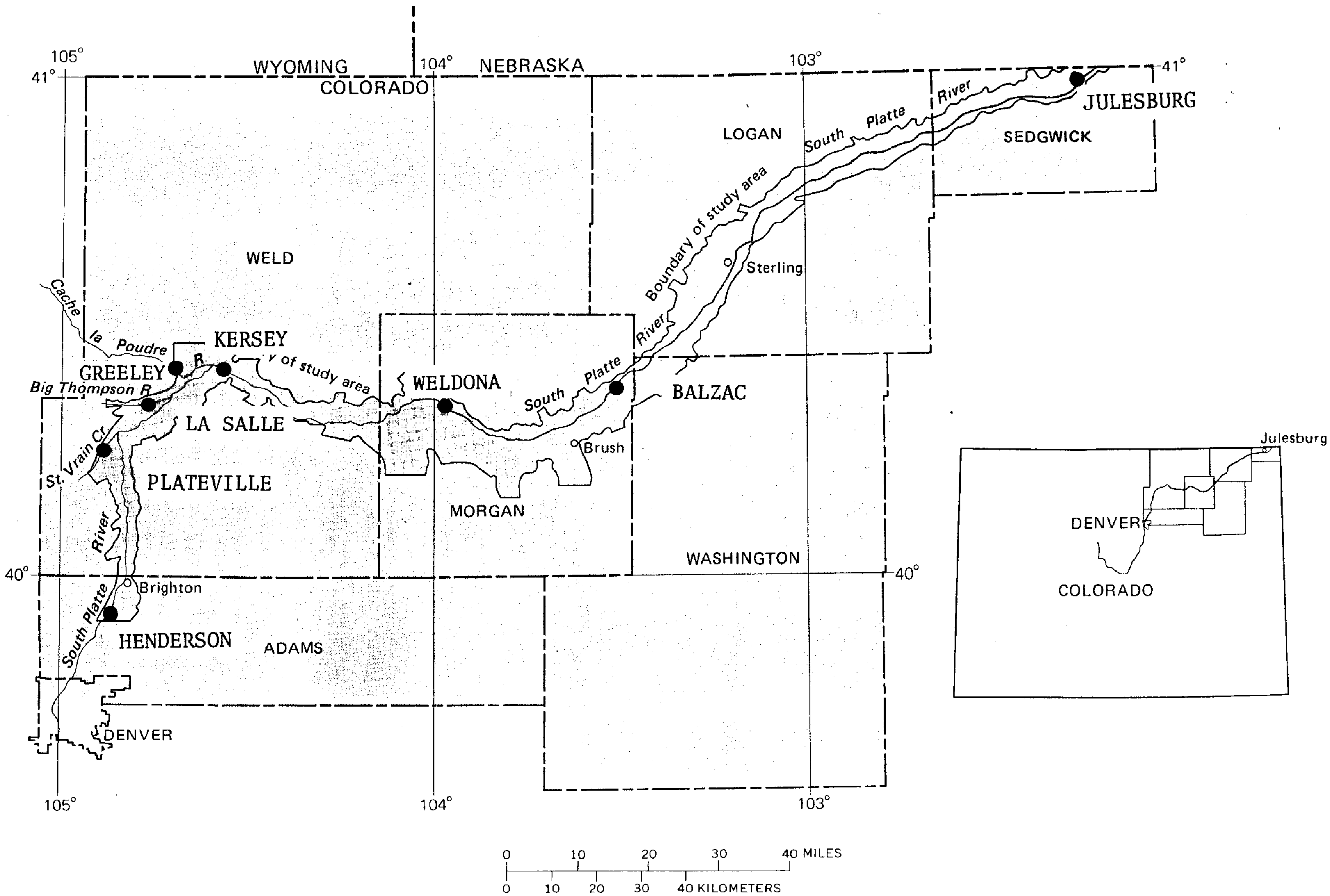


Figure 2-2. Map of Lower South Platte River (adapted from Hurr et al., 1975).

water diverted for irrigation use is about 4,931 MCM (3,997,831 acre feet) for 1970 for the South Platte Basin as a whole by Janonis and Gerlek (1977). They estimated irrigation water diversions for 1970 for the lower South Platte River at 1,264 MCM (1,025,120 acre feet) below Kersey and about 800 MCM (648,858 acre feet) from Kersey to above Denver. In this study the diversions between Henderson and Julesburg were computed to average 1,164 MCM (943,800 acre feet) (WPRS, 1979) for the period comprised by water years 1965 to 1977.

Figure 2-3 is a schematic diagram of the lower South Platte River showing gaging stations and point source inflows considered in this study. Diversions are not shown since they are more numerous.

2.2.1 River flow measurements

U.S. Geological Survey gaging stations are located at Henderson, Kersey, Weldona, Balzac, and Julesburg on the lower South Platte River. Daily flow records are available for each of these stations for various periods of time, but all gaging stations are well-established. The 1965-79 period is of interest for this study.

The daily flows from the USGS records for the period 1965-79 are summarized as monthly, seasonal, and yearly averages in the tables of Appendix D.

Daily records of specific electrical conductance are available since 1945 for Julesburg from the U.S. Geological Survey. Records of total dissolved solids as residue and sum of constituents are available also from monthly grab samples. The other stations provide records of monthly grab samples for TDS as residue, or TDS as sum of constituents, and EC. The salinity data are summarized in Table 4-1.

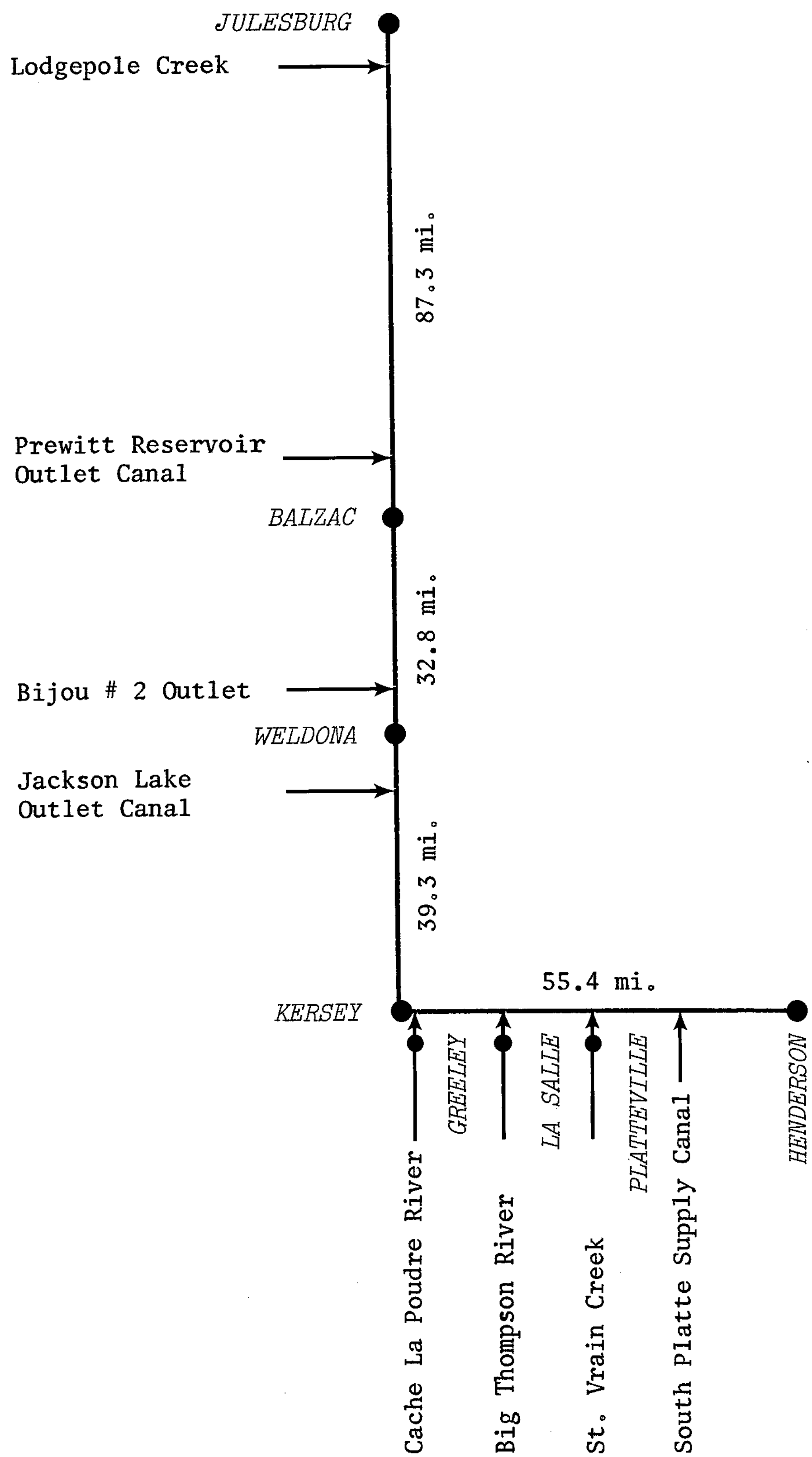


Figure 2-3. Schematic representation of South Platte River between Henderson and Julesburg.

2.2.2 Tributaries and point source inflows

Most of the tributaries in the plains are ephemeral. They include Big Dry Creek, Crow Creek, Boxelder Creek, Lost Creek, Kiowa Creek, etc. They are not considered in this study. The perennial tributary streams are St. Vrain Creek, the Big Thompson River, the Cache La Poudre River and Lodgepole Creek. Gaging stations for the first three are located at their mouths at Platteville, LaSalle, and Greeley, respectively. Salinity and flow records are similar to those of the main stem of the South Platte. They are summarized also in the tables of Appendix D. The flows of Lodgepole Creek are summarized in the tables in Appendix E.

In addition to major tributaries the point source inflows considered include the South Platte Supply Canal, Jackson Lake Outlet Canal, Bijou N. 2 Outlet Canal, and the Prewitt Reservoir Outlet Canal. Their respective locations are seen in Figure 2-3. Flow records for these canals are summarized in Appendix E. The point source waste discharges (e.g. Gates Cycle Poultry, Stokley Van Camp, etc.) have been listed by Battelle (1974) and have been evaluated by Bluestein and Hendricks (1975). They are omitted from this study because they are small compared with other flows.

2.2.3 Diversions

There are over fifty diversions along the lower South Platte River having an aggregate annual diversion flow of nearly one million acre feet. The diversions are listed in Tables 2-1 through 2-4. The annual diversion flows for the period 1965-79 are listed also. The diversions are grouped by reach and the aggregate monthly diversions for each reach are shown in Appendix E.

Table 2-1. Location and annual diversion flow in 1000 AF units of major diversions, water years 1965-77, Henderson-Kersey reach, South Platte River.

Diversion	River Mile	Water Year 65	66	67	68	69	70	71	72	73	74	75	76	77
(USGS Gaging St. Henderson)	301.4													
Brighton Canal	297.5	8.6	7.7	6.8	10.0	9.2	8.3	7.9	8.0	7.5	9.7	11.3	10.1	8.8
Lupton Bottom Canal Syst.	291.9	19.9	17.4	14.2	20.3	18.9	18.7	18.5	15.7	16.2	17.2	17.3	19.8	17.6
Platteville Canal	286.9	16.9	14.1	9.9	18.0	21.7	22.2	18.3	15.4	18.1	17.0	19.5	21.0	17.1
Side Hill Canal (Inc. Meadow Island 1)	284.3	0.0	5.1	4.8	6.2	5.9	5.9	5.4	5.1	5.4	5.5	5.8	5.7	6.1
Platte Valley Canal Syst.	283.7	5.5	23.7	48.7	44.7	51.1	48.9	47.2	56.5	37.3	55.4	45.4	58.2	43.5
Mutual Canal Syst.	279.7	12.1	7.5	8.8	12.2	12.7	11.4	11.0	10.2	9.0	10.9	11.1	11.2	10.3
Bucker Canal	278.2													
Farmers Independent Canal	276.7	18.9	17.3	14.9	16.6	17.2	17.0	15.0	12.9	12.7	13.6	13.5	14.4	15.1
Western Mutual Ditch Syst.	272.2	21.1	14.3	22.3	26.5	22.7	21.0	20.3	19.1	15.1	19.0	20.1	21.9	16.6
Jay Thomas Canal	270.2	2.5	3.0	2.0	3.2	2.2	1.8	2.1	1.8	0.7	1.2	1.6	1.1	3.9
(St. Vrain Ck. confluence)	270.0													
Union Canal Syst.	265.4	37.1	22.0	34.1	29.0	23.7	23.1	23.3	24.3	21.4	26.8	24.6	26.6	30.2
Godfrey Canal	262.3	6.5	8.9	8.6	12.1	8.2	7.0	6.4	10.3	6.5	7.8	8.5	8.5	9.4
(Big Thompson R. confluence)	260.4													
Lower Latham Canal	256.7	51.8	25.4	36.1	41.3	38.4	40.2	39.8	36.2	36.1	36.5	34.9	36.2	34.6
Patterson Canal	253.8	4.6	5.6	4.4	5.3	4.9	4.7	4.4	6.0	4.2	5.2	5.4	4.6	5.8
Highland & Plum Canal	251.0	4.0	5.0	3.6	5.1	3.4	3.4	4.5	4.9	2.7	4.1	3.8	3.9	4.5
(Cache La Poudre R. confluence)	249.0													
(USGS Gaging St. Kersey)	246.1													
Total annual reach diversion flow		209.5	177.0	219.2	250.5	246.2	233.6	224.1	226.4	192.9	229.9	222.8	243.2	223.5

To obtain cubic meters per second (cms), multiply acre feet per year by the factor 3.911×10^{-5}.
Source: Battelle (1974) and WPRS (1979)

Table 2-2. Location and annual diversion flow in 1000 AF units of major diversions, water years 1965-77, Kersey-Weldona reach, South Platte River.

Diversion	River Mile	Water Year												
		65	66	67	68	69	70	71	72	73	74	75	76	77
(USGS Gaging St. Kersey)	246.1													
Hoover Canal	244.1													
Empire Canal Syst.	241.0	87.9	58.9	80.3	70.7	65.9	84.4	77.7	104.1	91.9	65.3	72.3	84.6	53.7
Riverside Canal Syst.	240.2	129.3	71.4	102.2	97.1	136.3	130.0	143.4	100.3	121.3	115.9	147.2	120.8	110.9
Bijou Canal Syst.	233.0	56.6	28.8	63.5	54.4	78.6	61.9	63.1	53.8	39.4	50.8	62.6	42.7	45.0
Jackson Lake Inlet Canal	225.5	58.8	28.8	43.5	22.8	40.8	27.1	17.2	58.2	20.2	32.8	43.3	43.8	39.6
Weldon Valley Canal	220.4	30.2	20.8	30.0	32.9	29.6	25.4	31.0	31.1	28.2	35.9	35.2	41.4	36.2
Fort Morgan Canal	210.0	27.6	27.0	43.3	47.2	48.1	43.0	39.1	37.7	38.8	56.7	63.7	55.3	51.3
(USGS Gaging St. Weldona)	206.7													
Total annual reach diversion flow		390.4	235.7	362.8	325.1	399.3	371.8	371.5	385.2	339.8	357.4	424.3	388.6	336.7

To obtain cubic meters per second (cms), multiply acre feet per year by the factor 3.911×10^{-5}.
Source: Battelle (1974) and WPRS (1979)

Table 2-3. Location and annual diversion flow in 1000 AF units of major diversions, water years 1965-77, Weldona-Balzac reach, South Platte River.

Diversion	River Mile	Water Year												
		65	66	67	68	69	70	71	72	73	74	75	76	77
(USGS Gaging St. Weldona)	206.7													
Devel & Snyder Improv. Co. Canal	199.0	4.2	15.3	4.4	4.2	3.8	3.7	3.5	4.8	4.4	5.9	6.7	4.1	3.6
Upper Platte & Beaver Canal	198.0	18.9	2.9	24.1	28.2	31.8	26.9	25.0	25.8	30.2	30.5	34.0	28.7	25.2
Tremont Canal	191.9	0.5	0.5	2.2	1.8	1.1	0.0	0.0	4.6	5.8	5.3	9.1	8.7	9.1
Lower Platte & Beaver Canal Syst.	190.1	26.1	10.0	19.8	16.2	10.6	23.4	17.1	13.0	22.5	19.0	23.6	17.4	18.1
Snyder Canal Syst.	185.2	0.3	0.0	0.5	1.1									
North Sterling Canal Syst.	179.4	114.3	49.4	81.6	85.0	108.4	113.3	120.2	106.2	105.5	78.4	123.9	120.0	104.6
Tetsel Canal	176.4	3.6	4.5	4.8	5.0	4.7	4.7	4.3	5.5	3.8	5.5	5.9	5.3	4.5
Prewitt Canal Syst.	176.2	55.0	37.7	50.7	37.4	54.3	48.1	51.8	35.3	57.7	47.9	40.7	35.7	37.8
(USGS Gaging St. Balzac)	173.9													
Total annual reach diversion flow		222.9	120.3	194.1	178.9	214.7	220.1	221.9	195.2	229.9	192.5	243.9	219.9	202.9

To obtain cubic meters per second (cms), multiply acre feet per year by the factor 3.911×10^{-5}.
Source: Battelle (1974) and WPRS (1979)

Table 2-4. Location and annual diversion flow in 1000 AF units of major diversions, water years 1965-77, Balzac-Julesburg reach, South Platte River.

Diversion	River Mile	Water Year 65	66	67	68	69	70	71	72	73	74	75	76	77
USGS Gaging St. Balzac	173.9													
South Platte Ditch	172.3	7.7	6.3	7.3	10.9	9.6	11.9	9.1	8.4	9.5	11.4	14.5	12.3	9.7
Farmers Pawnee Canal	167.5	18.3	16.1	18.0	22.6	4.6	26.8	24.7	20.6	23.3	28.4	34.5	27.7	19.5
Davis Brothers Canal	166.5	2.7	2.3	1.9	1.9	1.2	3.7	1.5	1.1	1.5	2.1	1.5	1.1	1.0
Schneider Canal	161.9	5.8	5.0	6.1	11.2	9.4	9.3	8.0	7.0	6.4	11.6	10.6	11.2	9.4
Springdale Canal	158.6	7.2	4.3	5.5	4.8	5.0	8.0	8.2	4.7	6.1	6.2	8.3	6.8	4.8
Batten Canal	156.6													
Sterling #1 Irr. Co. Canal	155.3	14.7	22.9	17.9	21.8	19.6	20.8	22.6	19.7	19.5	26.1	26.9	28.2	12.8
Henderson & Smith Canal	152.4	2.0	2.1	1.7	2.2	2.5	2.8	2.5	2.5	2.4	2.8	2.5	3.3	2.6
Sterling #2 Canal	151.6	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.4	0.3
Low Line Canal	150.2	5.4	4.5	4.0	3.7	3.9	5.2	5.4	3.8	5.0	7.9	6.8	4.9	4.7
Bravo & J. B. Canal Syst.	144.7	0.0	4.5	7.1	7.8	7.5	6.5	4.1	5.5	6.4	5.0	8.0	5.2	7.4
Farmers Canal	143.7	1.7	0.9	1.6	0.9	2.4	2.3	1.7	1.3	1.1	0.7	1.6	1.1	0.6
Iliff & Platte Valley Canal System	141.0	15.9	12.5	12.2	13.3	12.4	16.7	15.3	13.5	14.6	19.8	20.8	9.9	13.4
Lone Tree Canal	137.6	4.0	2.4	5.5	4.0	4.0	2.5	2.2	2.2	1.3	2.9	2.6	1.8	0.1
Powell & Harmony #2 Canal Syst.	133.1	3.1	3.9	3.7	3.4	3.1	4.0	3.2	2.6	5.2	3.6	3.8	3.6	4.7
Ramsey Canal	131.5	0.9	1.3	1.1	1.1	0.8	1.4	0.9	0.8	0.3	1.5	0.9	1.3	1.7
Chambers Canal	127.7	3.0	0.0	1.5	2.1	4.6	5.8	5.4	3.7	4.0	3.7	0.1	0.0	0.0
Julesburg Irr. District Jumbo Syst.	125.6	45.2	20.7	30.1	27.3	35.1	54.8	20.4	27.9	40.1	32.5	53.7	33.3	41.3
Tamarack Canal	121.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9	2.6	1.5
Settlers Ditch	117.5													
Red Lion Canal	109.8	0.7	0.0	0.7	0.8	1.0	0.7	0.0	0.6	0.0	0.7	1.2	1.0	0.4
Peterson Canal	104.7	4.5	2.4	6.8	4.6	5.6	5.7	2.6	3.3	7.1	6.8	5.9	1.1	4.0
South Reservation Canal	99.4	2.9	2.8	3.1	2.2	2.2	3.2	3.1	3.4	3.0	4.8	4.2	2.8	3.9
Liddle Irr. System	96.6	1.4	1.4	2.0	2.1	1.6	2.0	2.1	2.3	1.6	3.1	2.5	2.6	2.4
Carlson Canal	94.8	0.5	0.3	1.3	0.3	0.5	0.1	0.0	0.2	0.0	1.2	0.3	0.3	0.0
(USGS Gaging St. Julesburg)	86.6													
Total annual reach diversion flow		147.6	116.6	139.1	149.0	136.6	194.4	143.2	135.1	158.4	183.3	212.1	162.5	146.2

To obtain cubic meters per second (cms), multiply acre feet per year by the factor 3.911×10^{-5}.
Source: Battelle (1974) and WPRS (1979)

Chapter 3

METHODOLOGY

In order to characterize river salinity in the lower South Platte River and to ascertain the role of factors, such as return flow, diversion flows, point source discharges, which shape this characterization, the research utilized the following approach:

1) Verification of an empirical relationship between in-stream salt mass and flow for five river stations in the South Platte and three tributaries, using published data.

2) Application of the relationships developed to characterize the salt transport at each river station in terms of space and time.

3) Materials balance analysis of water flows and salt flows to and from each four reaches considered.

3.1 In-Stream Salt Mass Flow Relationships

Salinity is commonly characterized in the water field in terms of total dissolved solids (TDS) as residue. Because specific electrical conductance (EC) data are more abundant than total dissolved solids in the study area, we have obtained first total dissolved solids-specific electrical conductance relationships for each river station. A regression analysis between TDS and EC was done with the data available to ascertain the well-established linear relationship between these parameters in the river stations of the South Platte. All EC values were then converted to total dissolved solids as residue using the established relationships, so that all salinity calculations following are performed using the larger data base of EC values, but the results will be expressed in terms of total dissolved solids.

Once all EC values were converted to TDS values, a relationship between salt mass and water flow was sought. Although it is well-known in practice that such relationship exists, there are several possible forms of the relationship. Arithmetic, semi-log, log-log, reciprocal, power series, and exponential forms have been proposed in past studies, as reviewed by Lane (1975). The log-log form is the more commonly form used, however, and thus this form and the intuitive arithmetic form were compared in this study.

The time of year has been shown also in past studies to affect the salinity-flow relationship, as illustrated by Lane too. This was handled here by partitioning the data into four three-month periods, and performing the statistical analysis for each one of these periods. The four periods adopted are referred to as fall season, winter season, spring season and summer season respectively, and each comprised the following months:

- Fall: October, November and December
- Winter: January, February and March
- Spring: April, May and June
- Summer: July, August and September

The appropriateness of the log-log form of the salt mass-water flow relationship for each season for river stations in the lower South Platte River was tested for the Julesburg station, using fifteen years of daily data. A regression analysis was performed for each season, and acceptability was based on the values of the R^2 coefficients and inspection of the plots of data. The coefficients for the regression model were then obtained for the five river stations in the South Platte and the three tributaries, for each season, using the more limited data set of monthly grab samples available. These regression lines were used then in the salt transport characterization.

The statistical analysis described above was performed using Minitab II. Minitab II is a statistical computing system developed by the Statistical Department of the Pennsylvania State University and available at Colorado State University Computer Center Library, which is specially useful for regression analysis. The data used in the statistical analysis were taken from U.S. Geological Survey published records for the period 1962-79. Summaries of the data used, together with a discussion of the results of the analysis are presented in Section 4.1.

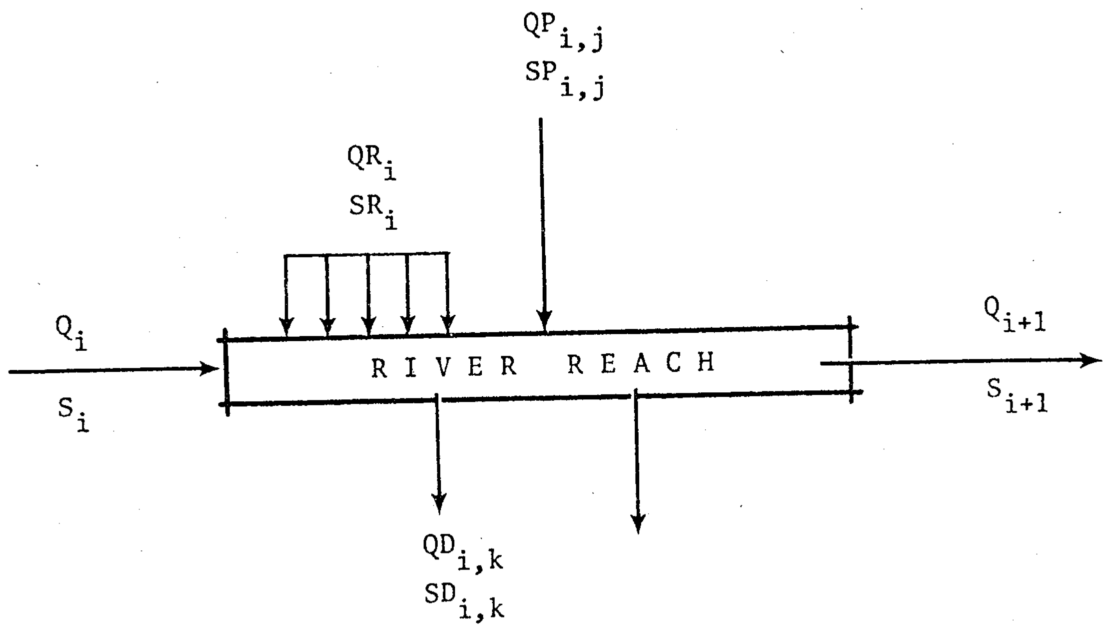
3.2 Salt Transport Characterization

Using daily flow as an argument, the log salt mass-log flow relationships established previously for each season were used to compute daily salt mass flows at each river station considered in the South Platte, i.e. Henderson, Kersey, Weldona, Balzac and Julesburg. The river stations at the mouth of the three major tributaries, i.e. Platteville on the St. Vrain Creek, La Salle on the Big Thompson River, and Greeley on the Cache La Poudre River, were analyzed simultaneously. Daily records of flow published by the U.S. Geological Survey for the period comprising water years 1965 to 1979 were used in the characterization.

The computed daily salt mass flow values were averaged over the month, the season and the year. Monthly, seasonal and annual flow values were computed at the same time, and flow weighted monthly, seasonal and annual average concentration of total dissolved solids were obtained also dividing the corresponding salt mass flows and water flows. The monthly, seasonal and annual time increments were chosen to analyze the salt transport charcterization with time because they are commonly used in planning. The salt transport characterization with distance was facilitated by plotting the annual and seasonal computed flow, salt concentration and salt mass flow values versus river mile. The results of the salt mass characterization are discussed in Section 4.2.

3.3 Materials Balance Analysis

The materials balance analysis was performed for all river reaches considered by taking into consideration all the water flows and salt mass flows to and from the reach. Figure 3-1 shows a diagram of a typical river reach in the South Platte River. A certain streamflow Q_i carrying a salt concentration S_i, enters the reach at its upper end, and as it moves along the reach some diversion flows ($QD_{i,k}$), point source inflows ($QP_{i,j}$) and return flows (QR_i), carrying salt concentrations $SD_{i,k}$, $SP_{i,j}$, SR_i, respectively, occur. As a result, a stream flow Q_{i+1}, carrying a salt concentration S_{i+1}, leaves the reach at its lower end. Diversion flows comprise flows abstracted for agriculture, either for direct use during the irrigation season or for storage at out of season periods. Point source inflows include tributary flows, impoundment spillages, discharges from irrigation outlet canals, and municipal and industrial discharges. Return flows include both unaccounted surface and subsurface agriculture return flows, and excess surface and subsurface water runoff.



Materials balance computations

1. Reach flow balance for computation of return flow to reach

$$QR_i = Q_{i+1} - Q_i + \sum_{k=1}^{K} QD_{i,k} - \sum_{j=1}^{J} QP_{i,j} \quad (1)$$

2. Reach salt balance for computation of return salt mass flow to reach

$$(QR_i)(SR_i) = (Q_{i+1})(S_{i+1}) - (Q_i)(S_i) + \sum_{k=1}^{K} (QD_{i,k})(SD_{i,k}) - \sum_{j=1}^{J} (QP_{i,j})(SP_{i,j}) \quad (2)$$

Notation

Q_i : Streamflow at the upstream end of the reach i

Q_{i+1} : Streamflow at the downstream end of the reach i

$QD_{i,k}$: Flow in diversion k of reach i

$QP_{i,j}$: Flow in point inflow j of reach i

QR_i : Flow in return flows of reach i

S_i : TDS concentration of upstream end of reach i

S_{i+1} : TDS concentration of downstream end of reach i

$SD_{i,k}$: TDS concentration in diversion k of reach i

$SP_{i,j}$: TDS concentration in point inflow j to reach i

SR_i : TDS concentration in return flows to reach i

Figure 3. Flow diagram of a typical river reach in the South Platte showing material balance computations for water and salt.

The lower South Platte was divided into four reaches linking the gaging stations considered, i.e. reach one: Henderson-Kersey, reach two: Kersey-Weldona, reach three: Weldona-Balzac, reach four: Balzac-Julesburg. Figure 2-3 in Section 2-2 shows a schematic representation of the four reaches considered, and it depicts all point source inflows considered. Diversion flows from each reach considered, are listed in Tables 2-1 to 2-4.

All flows but the return flows are known, therefore the return flows to the reach were computed as the residual of all other known inflows and outflows to the reach, using Equation (3-1) in Figure 3-1. Salt mass flows associated with streamflows entering and leaving each reach were the result of the analysis in Section 3-2. Also, the salt mass flows associated with streamflows of the three major tributaries, i.e. St. Vrain Creek, Big Thompson River and Cache La Poudre River, were computed in Section 3-2. Salt mass associated with diversion flows are not known, but it can be assumed that the salinity associated with all diversion flows from a reach in a given time period has a concentration close to the average concentration of the reach streamflow for the same time period. For the other point source inflows, the salt mass flows associated with them are not known, but since their flows are small, a simplifying assumption or an educated guess was made so that we could proceed with the analysis. The values used to characterize the salinity associated to these point source inflows are as follows:

a) South Platte Supply Canal. It discharges excess water from the Colorado-Big Thompson transbasin scheme. A constant value of 50 mg of TDS/ℓ was been chosen to characterize the discharge, based on water quality records of CBT import flows at entrance of Olympus Tunnel at Lake Estes. It was later discovered that this assumption is not true because the canal receives return flows. But the effects on the computational results using the value are minor because the canal flows are low relative to other flows in the reach.

b) Jackson Lake Outlet Canal and Prewitt Reservoir Outlet Canal. The flow weighted average salinity concentration of the flows diverted to the lake by the Jackson Lake outlet canal or to the reservoir by the Prewitt Canal system were computed for each period September through August of the following year. Each value was used to characterize any discharge occurring during the corresponding January to December period. The salinity concentrations of the monthly flows diverted by the Jackson Lake inlet canal were taken equal to the salinity associated with the diversion flows from the reach that month. The salinity concentration of the monthly flows diverted to the Prewitt Reservoir were taken equal to those occurring at the Balzac gaging station.

c) Bijou #2 Outlet and Lodgepole Creek. Salt concentrations were assumed to be in the order of 1000 mg/ℓ.

The salt mass associated with the return flows was then obtained as the residual of all other salt mass flows to and from the reach, using Equation (3-2) in Figure 3-1. Flow weighted average salt concentration in the return flows was computed next dividing the salt mass flow and the water flow. Monthly, seasonal and annual values of water flow, salt concentration and salt mass flow were computed to characterize the return flows to each reach. Plots of average annual salt mass flows and water flows to and from each reach were prepared to illustrate the findings of the materials balance analysis. Also, plots of average annual and seasonal salt mass flow versus water flow for return flows to each reach were made to depict what relationship best relates them. The results of the materials balance analysis is discussed in Section 4.3.

Chapter 4

RESULTS

There are three categories of results: (1) empirical verification of in-stream functional relationships between salt mass and flow, (2) characterization of salt flows in the South Platte River, and (3) materials balance of water flows and salt flows for four reaches. The latter two tasks are done in terms of space and time, reach by reach, using four river reaches between Henderson and Julesburg. The time increments used were the month, season, and year for the period comprising water years 1965-1979.

4.1 In-Stream Salt Mass-Flow Relationships

Because total dissolved solids data are limited and specific electrical conductance data are abundant a TDS-EC relationship was established for each station. From these relationships all EC data were converted to TDS data. The latter data were used in all statistical analyses involving salinity.

Once all EC data were converted to TDS data a salt mass-flow relationship was sought. Fifteen years of daily records at the Julesburg station were used to test already well-known salt mass-flow relationships. From this testing process the relationship, log (salt mass) = A + B log (flow), was found to have the highest regression coefficient.

After establishing the above regression model for Julesburg its coefficients A and B were ascertained for the stations Henderson, Kersey, Weldona, Balzac and Julesburg in the main stem of the river, and for tributary stations, Platteville, La Salle, and Greeley, at the mouths of St. Vrain Creek, the Big Thompson River and the Cache La Poudre River, respectively.

4.1.1 TDS-EC relationships

The well-established relationship between TDS and EC has the form:

$$TDS = \alpha + \beta \cdot EC \qquad (4\text{-}1)$$

This relationship was obtained by regression analysis for each of the five South Platte River stations and the three tributary stations.

Table 4-1 gives the regression coefficients α and β and summarizes the relevant statistical data, including range, median, mean, and standard deviation for each parameter. The R^2 coefficient and number of cases used are seen also. Flow data are shown for reference purposes. Since the TDS-EC relationship sometimes has the form, $TDS = \beta \cdot EC$, this alternate form is shown, too.

Table 4-1 shows the relationship for two data sources for the TDS parameter: (1) TDS as residue, and (2) TDS as sum of constituents. Plots of TDS versus EC data for both "TDS as residue" and "TDS as sum of constituents" are shown in Appendix A.

The "TDS as sum of constituents" data were converted to "TDS as residue" data for the stations Platteville, La Salle, Greeley, and Weldona, using empirical ratios derived in this work. This was done to enlarge the data base for these stations. The "TDS as residue" was used as the parameter of choice in the regression equation because it gave higher R^2 coefficents.

Table 4-1. Total dissolved solids - conductivity relationhips for five stations in the South Platte River and three tributary stations.

RIVER / STATION	TDS as RESIDUE VERSUS CONDUCTIVITY: STATISTICS OF DATA					TDS (R)[1/] = α + β * EC				TDS as SUM OF CONSTITUENTS VERSUS CONDUCTIVITY: STATISTICS OF DATA					TDS (SC)[2/] = α'+β' * EC			
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	α	β	R^2	CASES USED	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	α'	β'	R^2	CASES USED
S.P.R. / HENDERSON	TDS(R) (mg/1)	181-980	697	674	195	14	0.614	0.967	94	TDS (SC) (mg/1)	239-823	678	581	215	-7	0.617	0.998	15
	EC (μmho/cm)	308-1470	1120	1031	313	Plotted Points shown in FIGURE A - 1 (a)				EC (μmho/cm)	401-1350	1100	953	348	Plotted Points shown in FIGURE A - 1 (b)			
	FLOW (m^3/s)	0.59-191	5.1	12.1	24.0	Regression line for (0,0) intercept: TDS(R) = 0.627 EC				FLOW (m^3/s)	3.3-108	8.4	19.6	27.3	Regression line for (0,0) intercept: TDS(SC) = 0.611 EC			
ST.V.C. / PLATTEVILLE	TDS(R) (mg/1)	203-1703	1099	1090	264	-127	0.873	0.974	143	TDS(SC) (mg/1)	185-1550	1015	998	244	-112	0.792	0.973	130
	EC (μmho/cm)	315-2000	1440	1394	299	Plotted Points shown in FIGURE A - 2 (a)				EC (μmho/cm)	315-2000	1450	1401	304	Plotted Points shown in FIGURE A - 2 (b)			
	FLOW (m^3/s)	1.1-50.4	4.3	5.9	7.2	Regression line for (0,0) intercept: TDS(R) = 0.786 EC				FLOW (m^3/s)	1.1-39.1	4.3	5.7	6.4	Regression line for (0,0) intercept: TDS(SC) = 0.716 EC			
B.T.R. / LA SALLE	TDS(R) (mg/1)	220-2441	1842	1701	460	-172	0.956	0.959	106	TDS (SC) (mg/1)	195-2160	1630	1491	417	-144	0.842	0.958	96
	EC (μmho/cm)	325-2580	2100	1958	471	Plotted Points shown in FIGURE A - 3 (a)				EC (μmho/cm)	325-2580	2100	1943	486	Plotted Points shown in FIGURE A - 3 (b)			
	FLOW (m^3/s)	0.10-24.2	2.1	2.9	3.4	Regression line for (0,0) intercept: TDS(R) = 0.873 EC				FLOW (m^3/s)	0.21-24.2	2.1	3.1	3.5	Regression line for (0,0) intercept: TDS(SC) = 0.772 EC			
C.L.P.R. / GREELEY	TDS(R) (mg/1)	183-1840	1416	1334	309	-89	0.848	0.943	150	TDS (SC) (mg/1)	169-1620	1290	1205	287	-86	0.785	0.957	117
	EC (μmho/cm)	277-2350	1755	1680	354	Plotted Points shown in FIGURE A - 4 (a)				EC (μmho/cm)	277-2140	1750	1644	358	Plotted Points shown in FIGURE A - 4 (b)			
	FLOW (m^3/s)	0.18-54.9		4.0	7.9	Regression line for (0,0) intercept: TDS(R) = 0.797 EC				FLOW (m^3/s)	0.23-54.9	2.6	4.4	8.2	Regression line for (0,0) intercept: TDS(SC) = 0.735 EC			

1/ TDS (R) is TOTAL DISSOLVED SOLIDS as RESIDUE

2/ TDS (SC) is TOTAL DISSOLVED SOLIDS as SUM OF CONSTITUENTS

Table 4-1. (continued)

RIVER STATION	TDS as RESIDUE VERSUS CONDUCTIVITY									TDS as SUM OF CONSTITUENTS VERSUS CONDUCTIVITY								
	STATISTICS OF DATA					TDS (R)1/ = α + β * EC				STATISTICS OF DATA					TDS (SC)2/ = α'+β' * EC			
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	α	β	R^2	CASES USED	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	α'	β'	R^2	CASES USED
S.P.R. KERSEY	TDS (R) (mg/l)	373-1530	1290	1210	271	-137	0.859	0.981	61	TDS (SC) (mg/l)	226-1410	1120	1083	211	-61	0.753	0.875	67
	EC (μmho/cm)	558-1920	1670	1568	313	Plotted Points shown in FIGURE A - 5 (a)				EC (μmho/cm)	370-1890	1600	1519	262	Plotted Points shown in FIGURE A - 5 (b)			
	FLOW (m^3/s)	1.2-250	12.7	25.1	45.8	Regression line for (0,0) intercept: TDS(R) = 0.775 EC				FLOW (m^3/s)	1.5-317	14.0	19.3	38.4	Regression line for (0,0) intercept: TDS(SC) = 0.714 EC			
S.P.R. WELDONA	TDS (R) (mg/l)	414-2620	1381	1420	312	-133	0.895	0.900	115	TDS (SC) (mg/l)	375-2240	1250	1278	273	-91	0.791	0.896	105
	EC (μmho/cm)	598-2870	1700	1736	330	Plotted Points shown in FIGURE A - 6 (a)				EC (μmho/cm)	598-2800	1700	1730	327	Plotted Points shown in FIGURE A - 6 (b)			
	FLOW (m^3/s)	1.2-311	9.3	16.5	34.5	Regression line for (0,0) intercept: TDS(R) = 0.821 EC				FLOW (m^3/s)	1.2-311	9.7	17.3	36.2	Regression line for (0,0) intercept: TDS(SC) = 0.741 EC			
S.P.R. BALZAC	TDS (R) (mg/l)	548-1590	1460	1407	206	-149	0.879	0.977	58	TDS (SC) (mg/l)	1080-1560	1350	1352	125	-374	0.966	0.959	24
	EC (μmho/cm)	787-1980	1830	1770	232	Plotted Points shown in FIGURE A - 7 (a)				EC (μmho/cm)	1520-2020	1795	1786	127	Plotted Points shown in FIGURE A - 7 (b)			
	FLOW (m^3/s)	0.19-110	3.7	7.2	17.3	Regression line for (0,0) intercept: TDS(R) = 0.796 EC				FLOW (m^3/s)	0.22-28.1	3.3	6.6	7.6	Regression line for (0,0) intercept: TDS(SC) = 0.758 EC			
S.P.R. JULESBURG	TDS (R) (mg/l)	508-1890	1555	1479	278	-16	0.803	0.898	134	TDS (SC) (mg/l)	469-1860	1500	1437	247	39	0.729	0.857	79
	EC (μmho/cm)	738-2500	1940	1862	328	Plotted Points shown in FIGURE A - 8 (a)				EC (μmho/cm)	738-2500	2000	1917	313	Plotted Points shown in FIGURE A - 8 (b)			
	FLOW (m^3/s)	0.31-279	7.1	18.5	36.1	Regression line for (0,0) intercept: TDS(R) = 0.794 EC				FLOW (m^3/s)	0.31-279	5.1	16.2	36.4	Regression line for (0,0) intercept: TDS(SC) = 0.749 EC			

1/ TDS (R) is TOTAL DISSOLVED SOLIDS as RESIDUE

2/ TDS (SC) is TOTAL DISSOLVED SOLIDS as SUM OF CONSTITUENTS

The R^2 coefficients for the TDS-EC regression equations were uniformly high for all stations, as seen in Table 4-1. It should be noted also that, although the α and β coefficients are in the same range for the various stations, they are, nevertheless, unique.

4.1.2 Deriving a Salt Mass-Flow Relationship

Although it is well known in practice that a relationship exists between salt mass and flow there are several possible forms of the relationship. In this work only the arithmetic and log-log salt mass-flow regression equations were compared. This was done by computing the correlation coefficients for fifteen years of daily data grouped into seasons, as outlined in Section 3.1, for the Julesburg station. The results of the comparison are shown in Table 4-2. Because the R coefficients were slightly higher for the log-log form for all seasons, this form was selected for use. It is expressed:

$$\log(\text{salt mass}) = A + B \log(\text{flow}) \tag{4-2}$$

Table 4-2. Comparison between correlation coefficients for arithmetic and log-log forms of salt mass-flow data vectors at Julesburg.

Season	R, correlation coefficient	
	Arithmetic	Log-log
Fall	0.996	0.997
Winter	0.989	0.993
Spring	0.974	0.992
Summer	0.908	0.993

Figure 4-1 shows four log(salt mass) versus log(flow) plots by season for the Julesburg station. The specific log-log regression equations are seen also in each plot, along with the R^2 regression coefficients and number of cases used. It should be noted that the

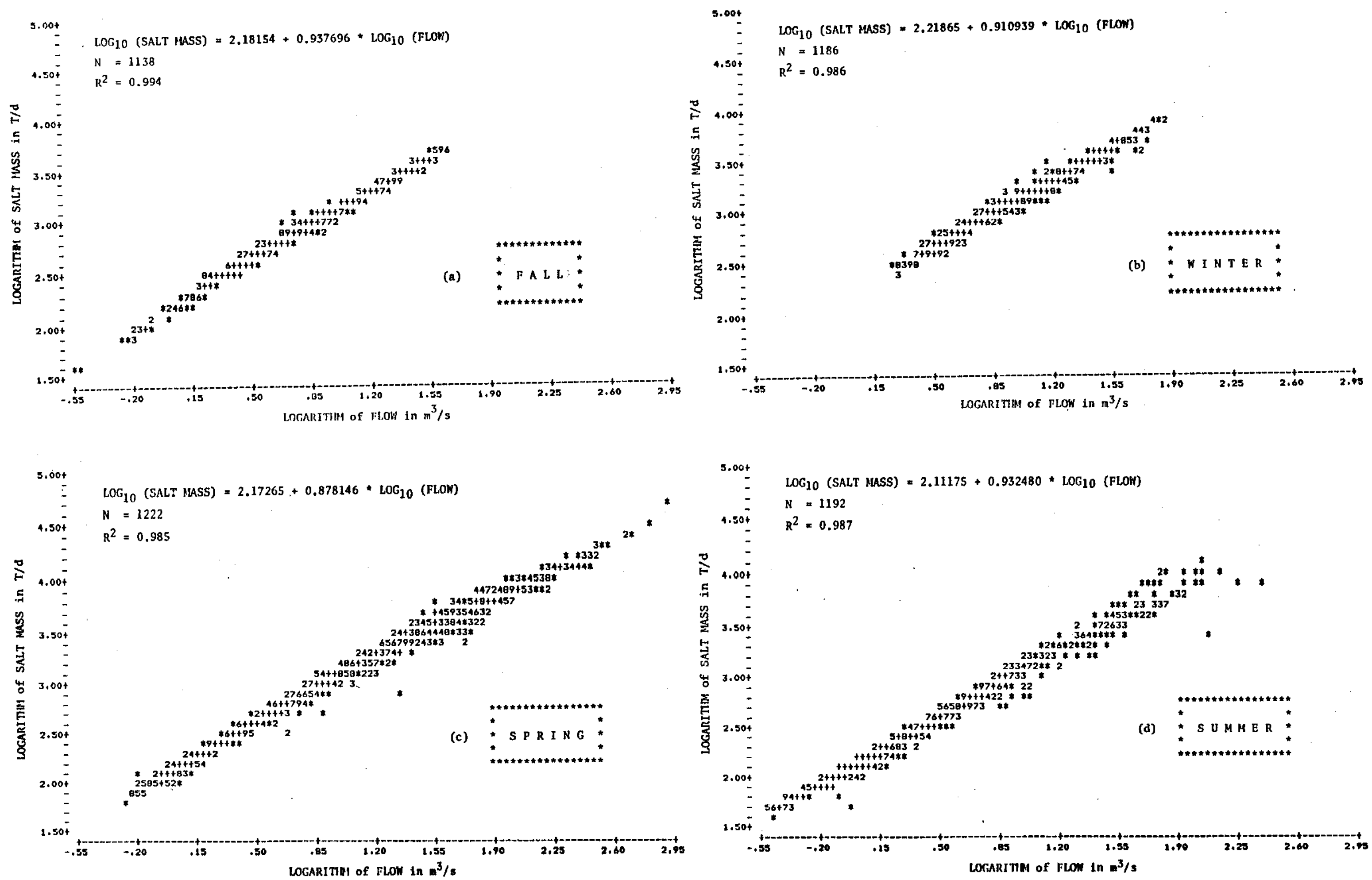


Figure 4-1. Salinity mass-flow, daily data used in regression analysis, water years 1965-79, South Platte River at Julesburg.

log-log plot for spring appears to be a discontinuous linear function, i.e. there are two-linear equations. For simplicity in this work the function was handled as a single straight line function for all seasons. But the accuracy of the salt mass-flow relationship would be improved if it was broken into two equations for the spring season.

Table 4-3 shows in tabular format the information seen in the plots of Figure 4-1. In addition, Table 4-3 summarizes the statistics of the basic supporting data, i.e. total dissolved solids and flow.

Inspection of Table 4-3 shows that the highest TDS concentrations occur with the very low flows of fall and winter, as might be expected. Lower TDS concentrations, on the other hand, are seen to accompany the runoff flows of spring and early summer.

Visual inspection of the seasonal plots of Figure 4-1 and the statistical summaries in Table 4-3 support strongly the use of Equation (4-2). Furthermore its use is improved markedly by the seasonal resolution (as compared with annual resolution).

4.1.3 Coefficients of Salt Mass-Flow Regression Model for Other Stations

After verification of Equation (4-2), based upon the abundant data available at the Julesburg station, its coefficients A and B were obtained for the other stations, for which data were more limited. Table 4-4 gives the A and B coefficients by season for the eight stations, including Julesburg, along with the R^2 coefficients and number of cases used. For the South Platte stations, i.e. Henderson, Kersey, Weldona, Balzac, and Julesburg, the R^2 regression coefficients are above 0.9. For the tributary stations, i.e. Platteville, La Salle, and Greeley, the R^2 values are generally above 0.8, with a low value of

Table 4-3. Salinity mass-flow regression results using daily records for the South Platte River at Julesburg, water years 1965-79.

SEASON	REGRESSION EQUATION : LOG_{10} (SALT MASS)1/ = A + B * LOG_{10} (FLOW)2/								
	SOUTH PLATTE RIVER AT JULESBURG								
	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/l)	1116-2730	1574	1577	163	2.18154	0.937696	0.994	1138
	FLOW (m^3/s)	0.28-46.4	5.8	10.5	10.5	Plotted Points shown in FIGURE 4 - 1 (a)			
WINTER	TDS (mg./l)	835-2610	1574	1563	176	2.21865	0.910939	0.986	1186
	FLOW (m^3/s)	1.8-71.1	9.5	14.5	11.8	Plotted Points shown in FIGURE 4 - 1 (b)			
SPRING	TDS (mg/l)	428-2024	1454	1353	316	2.17265	0.878146	0.985	1222
	FLOW (m^3/s)	0.54-850	8.2	34.2	65.5	Plotted Points shown in FIGURE 4 - 1 (c)			
SUMMER	TDS (mg/l)	263-1783	1462	1431	202	2.11175	0.932480	0.987	1192
	FLOW (m^3/s)	0.31-253	1.5	7.3	17.7	Plotted Points shown in FIGURE 4 - 1 (d)			

1/ Metric tons of total disolved solids per day
2/ m^3/s

Table 4-4. Salinity mass-flow regression results for five stations in the South Platte River and three tributary stations.

REGRESSION EQUATION : LOG_{10} (SALT MASS)1/ = A + B * LOG_{10} (FLOW)2/

(1) SOUTH PLATTE RIVER AT HENDERSON

SEASON	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/l)	498-892	757	747	92	1.88972	0.86651	0.983	34
	FLOW (m^3/s)	0.59-21.8	4.1	5.1	4.4	Plotted Points shown in FIGURE B - 1 (a)			
WINTER	TDS (mg/l)	640-917	806	788	74	1.92490	0.85308	0.981	35
	FLOW (m^3/s)	1.8-11.6	4.4	4.9	2.5	Plotted Points shown in FIGURE B - 1 (b)			
SPRING	TDS (mg/l)	203-917	470	520	215	1.95982	0.66988	0.947	39
	FLOW (m^3/s)	0.88-191	10.5	24.4	36.7	Plotted Points shown in FIGURE B - 1 (c)			
SUMMER	TDS (mg/l)	215-843	581	558	140	2.01677	0.62713	0.941	40
	FLOW (m^3/s)	2.6-58.3	7.6	11.7	11.6	Plotted Points shown in FIGURE B - 1 (d)			

(2) ST. VRAIN CREEK NEAR PLATTEVILLE

SEASON	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/l)	868-1619	1121	1130	180	2.11151	0.78749	0.880	34
	FLOW (m^3/s)	1.2-7.9	4.4	4.3	1.6	Plotted Points shown in FIGURE B - 2 (a)			
WINTER	TDS (mg/l)	746-1540	1078	1084	206	2.06051	0.81870	0.834	35
	FLOW (m^3/s)	1.1-6.7	3.6	3.8	1.5	Plotted Points shown in FIGURE B - 2 (b)			
SPRING	TDS (mg/l)	148-1462	1069	979	384	2.21640	0.51585	0.802	37
	FLOW (m^3/s)	1.4-50.4	3.4	9.8	13.1	Plotted Points shown in FIGURE B -2 (c)			
SUMMER	TDS (mg/l)	877-1532	1191	1170	173	2.17309	0.75677	0.811	37
	FLOW (m^3/s)	2.6-11.5	5.3	5.5	2.0	Plotted Points shown in FIGURE B - 2 (d)			

1/ Metric tons of total dissolved solids per day
2/ m^3/s

Table 4-4. (continued).

REGRESSION EQUATION : LOG_{10} (SALT MASS)[1/] = A + B * LOG_{10} (FLOW)[2/]

SEASON	(3) BIG THOMPSON RIVER NEAR LA SALLE								
	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/l)	1396-2295	1931	1888	171	2.24150	0.91543	0.878	25
	FLOW (m^3/s)	1.2-4.2	2.3	2.4	0.63	Plotted Points shown in FIGURE B - 3 (a)			
WINTER	TDS (mg/l)	1644-2275	1941	1936	159	2.22834	0.9778	0.795	26
	FLOW (m^3/s)	1.3-2.6	1.9	1.9	0.32	Plotted Points shown in FIGURE B - 3 (b)			
SPRING	TDS (mg/l)	139-2218	1817	1483	677	2.17124	0.53669	0.722	28
	FLOW (m^3/s)	0.10-24.2	1.9	4.5	6.2	Plotted Points shown in FIGURE B - 3 (c)			
SUMMER	TDS (mg/l)	736-2142	1597	1525	347	2.24276	0.64232	0.847	27
	FLOW (m^3/s)	1.1-7.3	2.3	2.8	1.8	Plotted Points shown in FIGURE B - 4 (d)			

SEASON	(4) CACHE LA POUDRE RIVER NEAR GREELEY								
	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/l)	878-1700	1437	1402	190	2.13052	0.88447	0.952	35
	FLOW (m^3/s)	0.40-8.6	2.8	3.3	1.7	Plotted Points shown in FIGURE B - 4 (a)			
WINTER	TDS (mg/l)	1013-1903	1399	1401	180	2.19833	0.73287	0.880	38
	FLOW (m^3/s)	1.2-4.9	2.7	2.9	0.98	Plotted Points shown in FIGURE B- 4 (b)			
SPRING	TDS (mg/l)	146-1709	1353	1155	476	2.07037	0.63708	0.861	39
	FLOW (m^3/s)	0.18-54.9	2.3	8.2	14.7	Plotted Points shown in FIGURE B -4 (c)			
SUMMER	TDS (mg/l)	1056-1726	1395	1384	147	2.07584	0.97904	0.984	39
	FLOW (m^3/s)	0.25-5.6	1.2	1.5	1.3	Plotted Points shown in FIGURE B - 4 (d)			

1/ Metric tons of total dissolved solids per day
2/ m^3/s

Table 4-4. (continued).

REGRESSION EQUATION : LOG_{10} (SALT MASS)[1/] = A + B * LOG_{10} (FLOW)[2/]

(5) SOUTH PLATTE RIVER NEAR KERSEY

SEASON	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	A	B	R^2	CASES USED
	STATISTICS OF DATA								
FALL	TDS (mg/l)	1006-2028	1341	1354	220	2.21943	0.86662	0.905	33
FALL	FLOW (m^3/s)	3.9-56.6	14.6	16.9	10.0	Plotted Points shown in FIGURE B - 5 (a)			
WINTER	TDS (mg/l)	1014-1435	1263	1270	93	2.32168	0.76200	0.927	34
WINTER	FLOW (m^3/s)	8.8-30.6	15.1	15.8	4.0	Plotted Points shown in FIGURE B - 5 (b)			
SPRING	TDS (mg/l)	181-1512	1199	1038	371	2.23611	0.70748	0.950	42
SPRING	FLOW (m^3/s)	1.2-317	11.5	41.6	73.1	Plotted Points shown in FIGURE B - 5 (c)			
SUMMER	TDS (mg/l)	638-1487	1203	1169	193	2.18826	0.80276	0.971	41
SUMMER	FLOW (m^3/s)	2.3-74.2	9.9	13.0	13.8	Plotted Points shown in FIGURE B - 5 (d)			

(6) SOUTH PLATTE RIVER NEAR WELDONA

SEASON	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.	A	B	R^2	CASES USED
	STATISTICS OF DATA								
FALL	TDS (mg/l)	1334-2435	1490	1612	315	2.28834	0.84017	0.977	26
FALL	FLOW (m^3/s)	1.8-39.6	9.4	12.2	9.9	Plotted Points shown in FIGURE B - 6 (a)			
WINTER	TDS (mg/l)	1164-1835	1365	1393	166	2.17763	0.90709	0.974	26
WINTER	FLOW (m^3/s)	3.2-30.6	14.0	14.0	7.3	Plotted Points shown in FIGURE B - 6 (b)			
SPRING	TDS (mg/l)	401-1925	1347	1256	332	2.24678	0.76104	0.971	32
SPRING	FLOW (m^3/s)	1.2-311	7.7	27.7	64.3	Plotted Points shown in FIGURE B - 6 (c)			
SUMMER	TDS (mg/l)	1074-2283	1414	1459	229	2.20865	0.88332	0.943	33
SUMMER	FLOW (m^3/s)	2.2-35.1	9.1	11.1	7.4	Plotted Points shown in FIGURE B - 6 (d)			

1/ Metric tons of total dissolved solids per day
2/ m^3/s

Table 4-4. (continued).

SEASON	REGRESSION EQUATION : LOG_{10} (SALT MASS)1/ = A + B * LOG_{10} (FLOW)2/																	
	(7) SOUTH PLATTE RIVER AT BALZAC									(8) SOUTH PLATTE RIVER AT JULESBURG								
	STATISTICS OF DATA					A	B	R^2	CASES USED	STATISTICS OF DATA					A	B	R^2	CASES USED
	PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.					PARAMETERS	RANGE	MEDIAN	MEAN	ST.DV.				
FALL	TDS (mg/1)	1187-1556	1433	1422	87	2.08783	0.980071	0.999	19	TDS (mg/1)	940-1831	1598	1584	192	2.19170	0.92424	0.983	33
	FLOW (m^3/s)	0.20-28.1	0.57	3.6	7.2	Plotted Points shown in FIGURE B - 7 (a)				FLOW (m^3/s)	1.5-43.0	6.4	9.4	10.0	Plotted Points shown in FIGURE B - 8 (a)			
WINTER	TDS (mg/1)	1319-1530	1420	1413	62	2.08587	1.00350	0.999	20	TDS (mg/1)	1253-1992	1510	1554	171	2.22058	0.91375	0.985	35
	FLOW (m^3/s)	0.22-19.3	0.61	4.8	7.0	Plotted Points shown in FIGURE B - 7 (b)				FLOW (m^3/s)	2.3-54.1	14.1	16.4	11.9	Plotted Points shown in FIGURE B - 8 (b)			
SPRING	TDS (mg/1)	543-1627	1495	1363	324	2.15948	0.83840	0.971	21	TDS (mg/1)	577-1757	1349	1307	339	2.17928	0.86453	0.986	39
	FLOW (m^3/s)	0.19-110	4.2	14.0	27.4	Plotted Points shown in FIGURE B - 7 (c)				FLOW (m^3/s)	0.69-279	10.3	38.4	61.4	Plotted Points shown in FIGURE B - 8 (c)			
SUMMER	TDS (mg/1)	1099-1591	1473	1444	114	2.09197	1.00433	0.983	22	TDS (mg/1)	811-1710	1550	1492	187	2.12656	0.94023	0.992	34
	FLOW (m^3/s)	0.79-14.1	4.5	5.3	2.9	Plotted Points shown in FIGURE B - 7 (d)				FLOW (m^3/s)	0.31-66.8	1.3	6.95	13.5	Plotted Points shown in FIGURE B - 8 (d)			

1/ Metric tons of total dissolved solids per day
2/ m^3/s

0.722. The cases used were comprised of monthly grab samples and numbered in the range 20 to 40 for each season. These numbers contrast with the thousand cases used in the verification obtained from the Julesburg station.

Based on the evidence presented the linear log-log salt mass-flow relationships contained in Table 4-4 will be applied in the salt transport characterization, described in Section 4.2. They provide the means for this larger purpose.

It should be noted that the A and B coefficients seen in Table 4-4(8) for Julesburg also are based upon the grab samples. It is remarkable to notice that they are virtually identical to the A and B coefficients seen in Table 4-3 for the large sample size using daily data. This similarity is further illustrated in Appendix C. Tables C-1 and C-2 show a comparison between computed seasonal and annual in-stream salt mass flows at Julesburg. The computed salt mass flows in columns C.1 and C.2 were obtained using the regression model for daily data and grab sample data, respectively. Observed averages are shown for reference, and to indicate by their differences with the "computed" columns, the residuals from the regression lines.

Again the statistics of the basic supporting data, i.e. total dissolved solids and flow are also included in Table 4-4. The corresponding plots of salt mass-flow data can be seen in Appendix B. They are grouped into sets of four by season for each station. The linear log-log relationships are evident by visual inspection of each plot, although the discontinuous linear function for the spring season plots that was noticed earlier at Julesburg, can be seen again at other stations.

4.2 Characterization of Salt Flows in the South Platte River

The salt flows in the South Platte River are characterized in terms of distance along the river for different years over the 1965-79 water year period. The five stations along the river were used as the basis for the distance profiles of flow, TDS, and salt mass. For the Julesburg station the time profiles were plotted by season and year; these are discussed first.

4.2.1 Time Profiles of Salt Flows at Julesburg

The variation in annual flow, TDS, and salt mass is seen in Figure 4-2 for Julesburg for the period 1965-79. Figure 4-2(a) shows that annual flow varies over a wide range during the fifteen year period considered. (It should be noted that the flows given are the total annual flow averaged over the year and expressed as cubic meters per second. This is done to permit easy comparison with monthly and seasonal flows.) The range in mean annual flow varies from a low of 2.84 m^3/s in water year 1978 to 43.08 m^3/s in 1973. Figure 4-2(b) shows that the flow weighted average annual salt concentration ranges from 1000 mg/ℓ at the highest flow to 1600 mg/ℓ at the lowest flow. The mean annual salt mass flows, seen in Figure 4-2(c), also have a wide range following a pattern similar to the flows, as might be expected. But in some years with similar flows, e.g. (1965, 1966) and (1969, 1974), the salt transport is quite different. Ostensibly this is due to changes in average annual salt concentration as seen in Figure 4-2(b). The behavior is better explained, however, by reference to Figure 4-3, which shows the same information plotted with seasonal resolution. The correlation between seasonal salt mass flow and

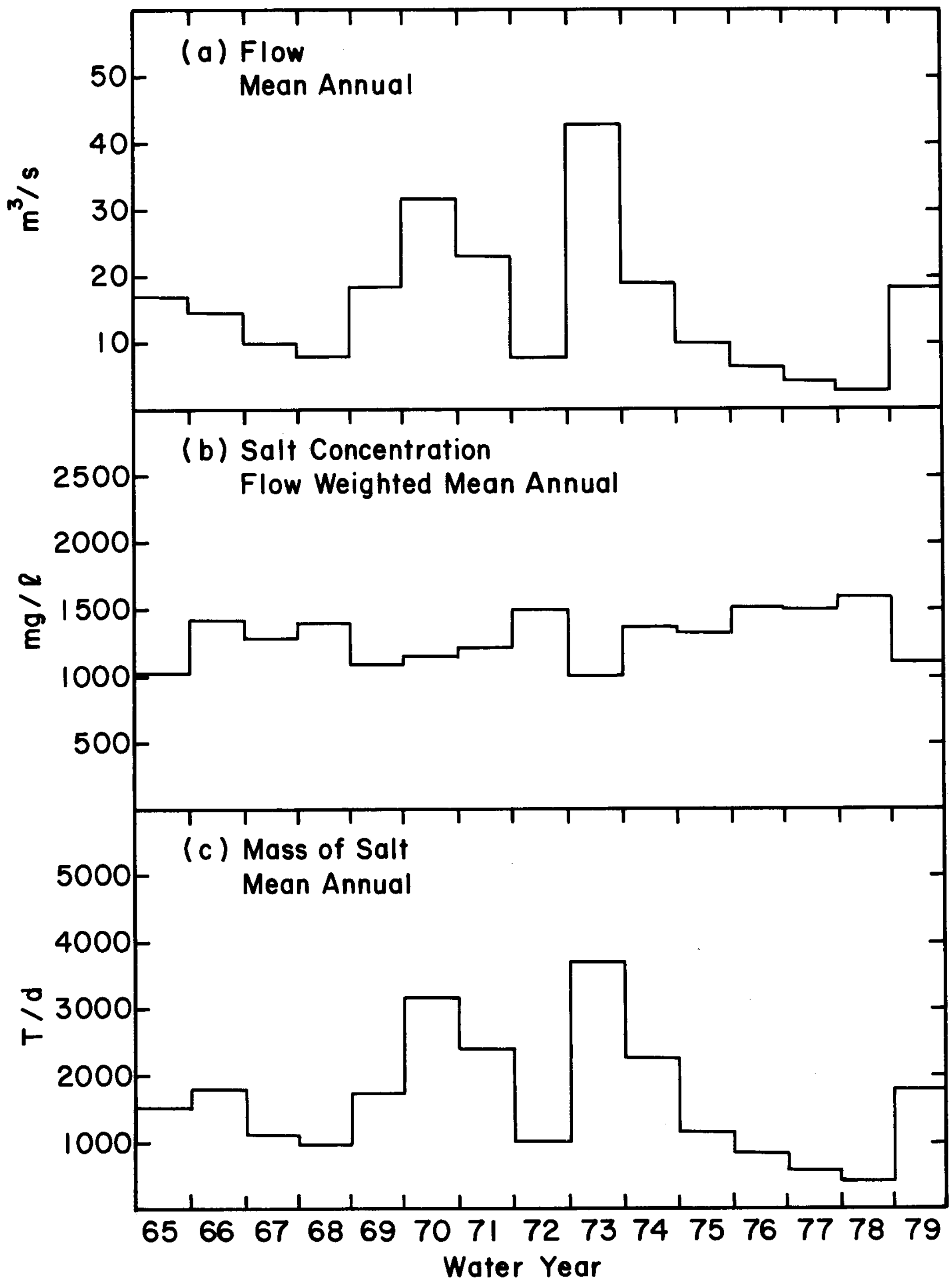


Figure 4-2. Flow, salt concentration, and salt mass flow averaged by year, water years 1965-79, South Platte River at Julesburg.

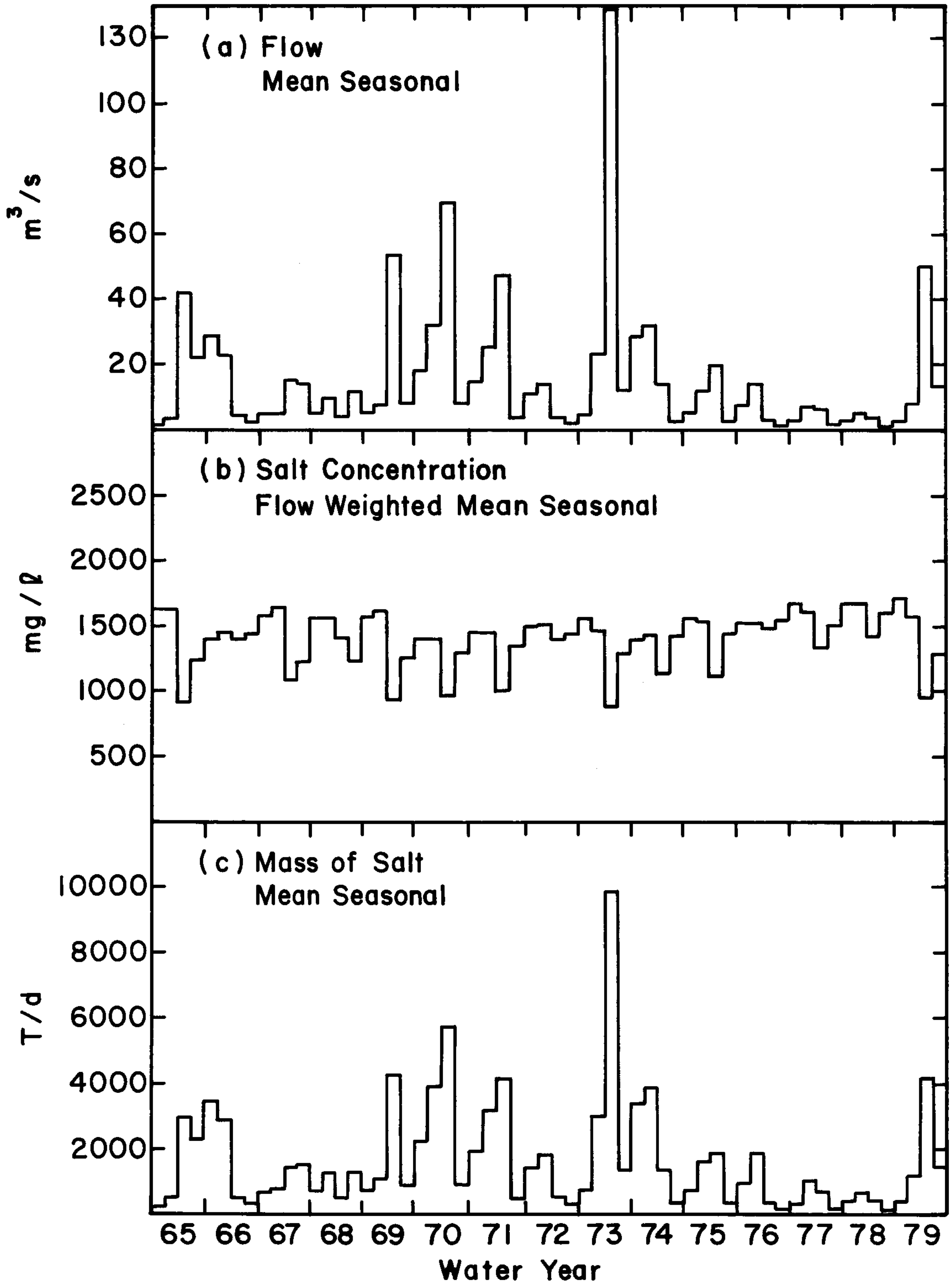


Figure 4-3. Flow, salt concentration and salt mass flow averaged by season, water years 1965-79, South Platte River at Julesburg.

seasonal flow, previously established by regression analysis, is illustrated by the data shown. Thus, meaning is given to the regression equations in terms of seasonal behavior of the three parameters shown, i.e. flow, salt concentration, and salt mass flow. Inspection shows a wide range variation from season to season, especially between fall-winter and spring-summer. Salt concentrations are notably higher in fall and winter than for spring and summer, for comparable flows, as can be seen, by comparing fall-winter 1965 with spring-summer 1966.

The fall and winter salt flows are comprised of the salts that remain from applied irrigation water and the pickup due to leaching. The spring salt load, however, is comprised mainly of those salts carried by the spring runoff. This runoff is also reflected in the summer season runoff statistics which includes July.

4.2.2 Distance Profiles of Salt Flows by Year

Figures 4-4, 4-5, and 4-6 are distance profiles of mean annual flow, flow weighted mean annual concentration, and mean annual salt mass flow for water years 1965-69, 1970-74 and 1975-79, respectively, along the main stem of the South Platte River from Henderson to Julesburg. The annual time variation in these parameters, illustrated in Figures 4-2 for Julesburg, is seen in another form in these three diagrams, together with the four other stations along the river. The basic data used in constructing these plots, i.e. Figures 4-4, 4-5, and 4-6, is seen in Table D-1, Appendix D. Appendix D also contains distance profiles by season in Figure D-1 to D-15, for the years 1965-79. The corresponding tabular data are seen in Table D-2.

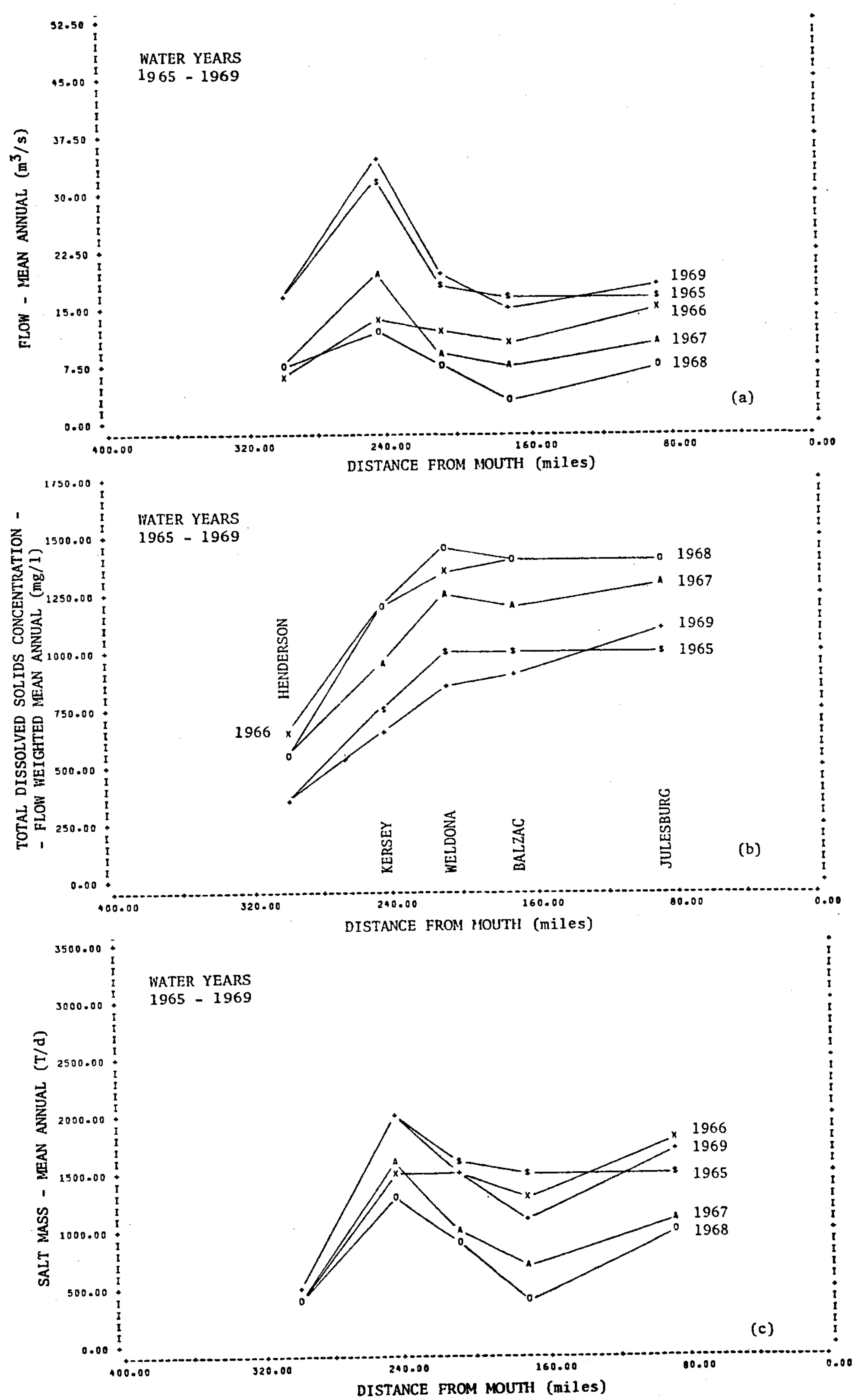


Figure 4-4. Distance profiles of flow, salt concentration, and salt mass flow, averaged by year, 1965-69, South Platte River.

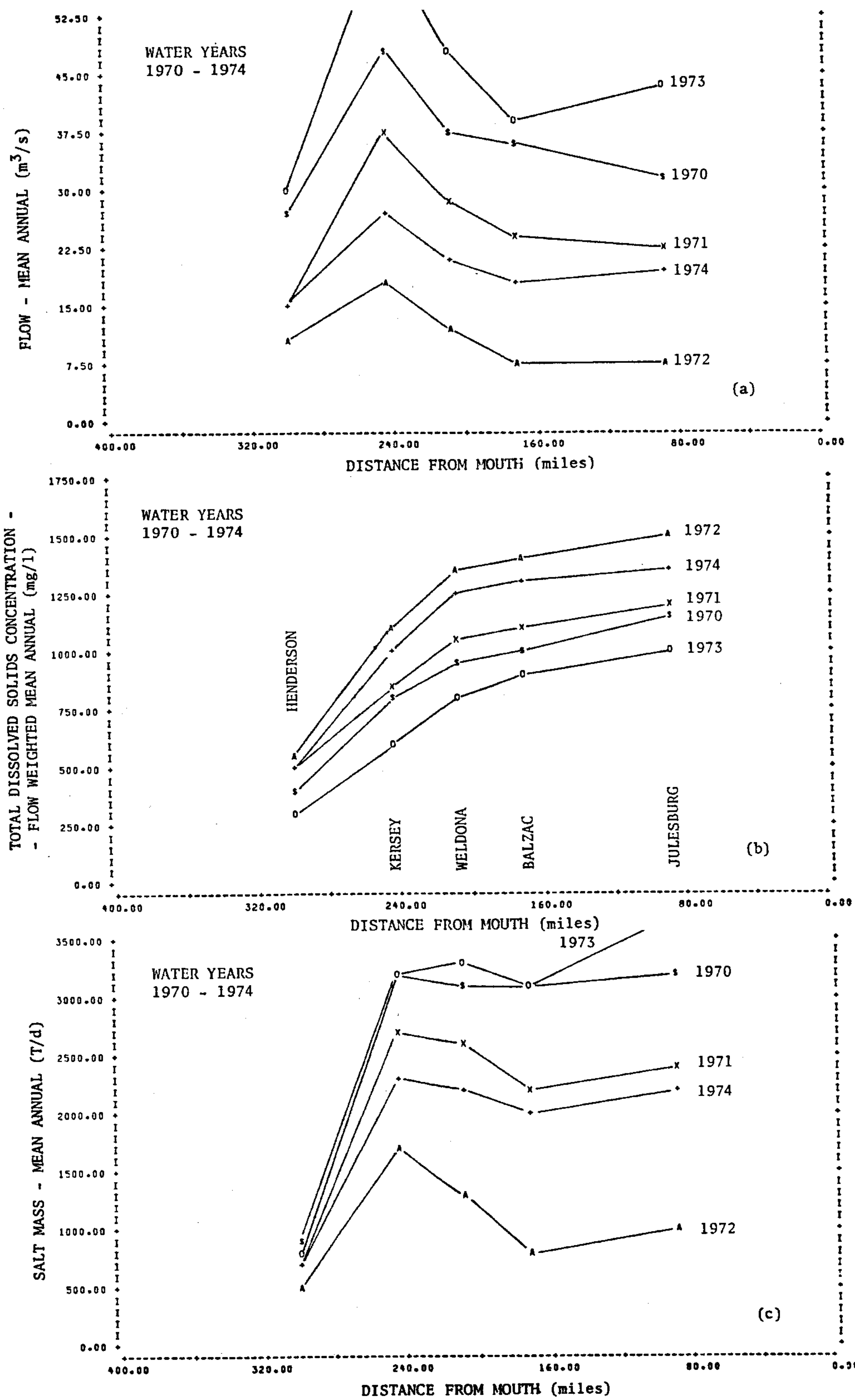


Figure 4-5. Distance profiles of flow, salt concentration, and salt mass flow, averaged by year, 1970-74, South Platte River.

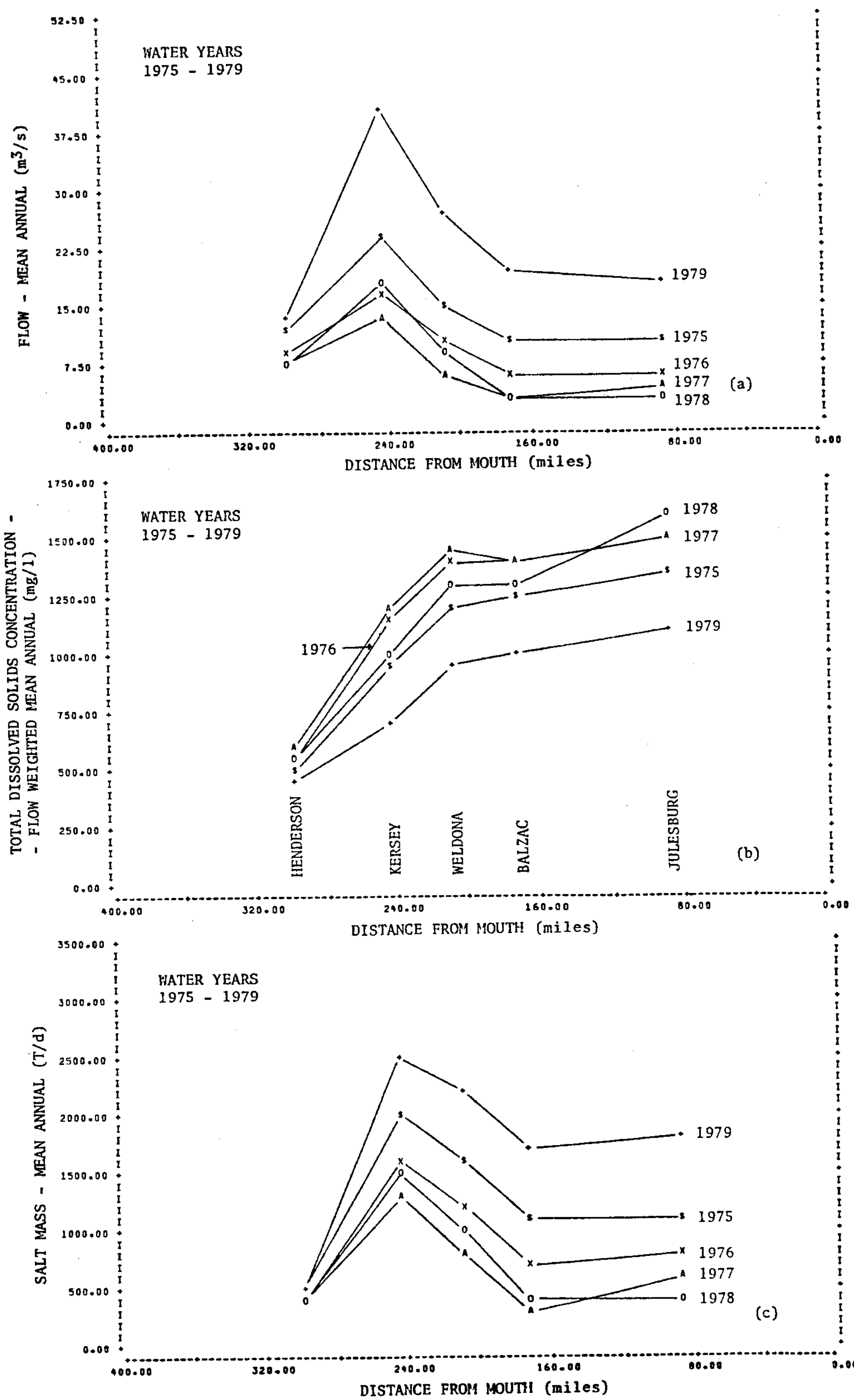


Figure 4-6. Distance profiles of flow, salt concentration, and salt mass flow, averaged by year, 1975-79, South Platte River.

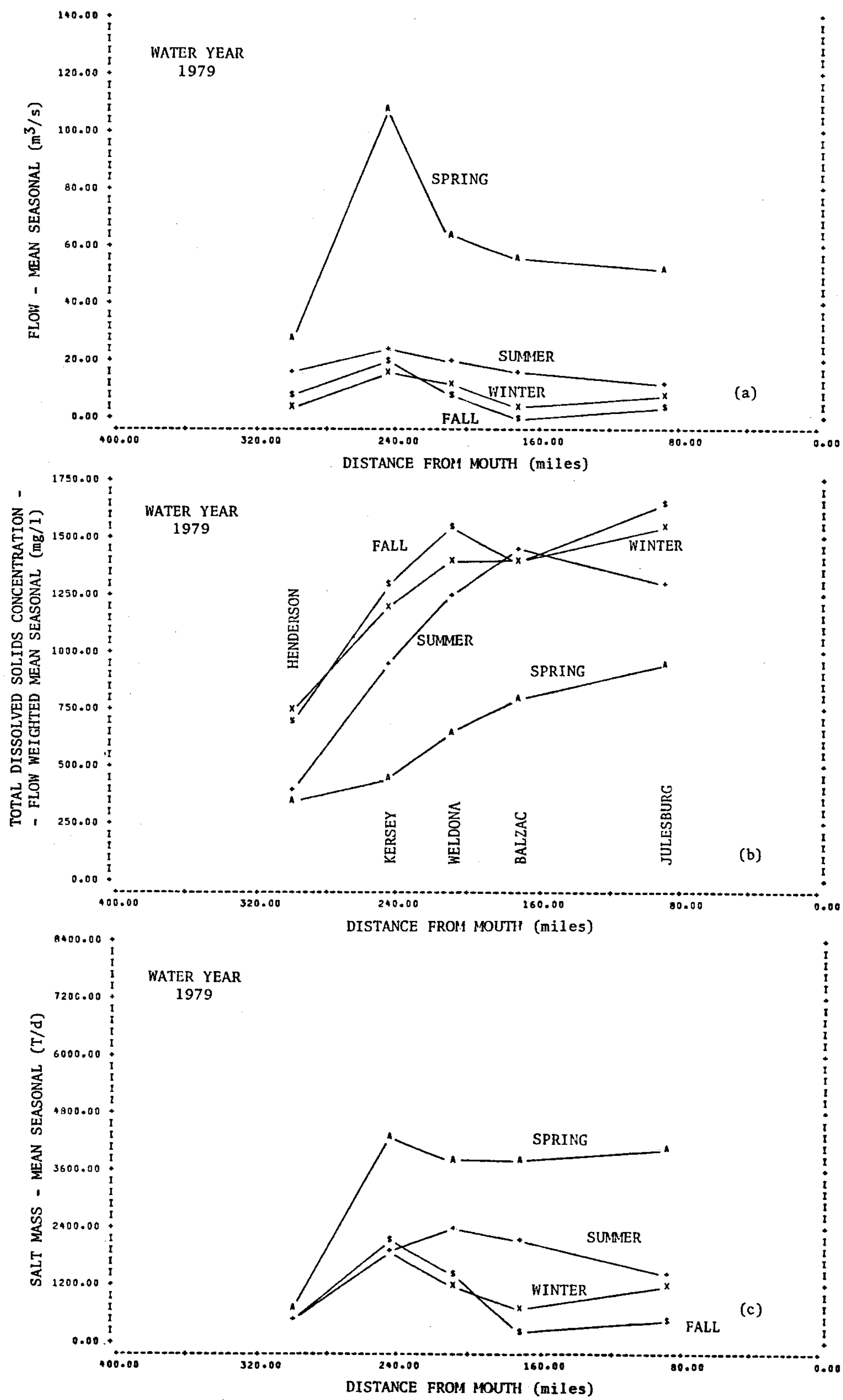


Figure 4-7. Distance profiles of flow, salt concentration, and salt mass flow, averaged by season, 1979, South Platte River.

Table D-3 shows monthly averages in event analysis with such resolution is of interest. Figure D-15 is included here as Figure 4-7.

Comparing the fifteen profiles of each of the three parameters, in Figures 4-4, 4-5, and 4-6 shows that they are consistent from year to year for any flow condition. The flow profiles show an increase from Henderson to Kersey. This due mainly to the tributary flows from St. Vrain Creek, and the Big Thompson and Cache La Poudre Rivers. The flow is essentially doubled between these stations for any given year. From Kersey to Weldona the flows decline sharply due to diversions. These flows decline further to Balzac with a slight increase from Balzac to Julesburg.

Salt concentration increases sharply from Henderson to Weldona. During the years of low salt concentration (high flows) the level increases from 300 mg/ℓ to 800 mg/ℓ between these stations. For low flow conditions, e.g. 1977, the range is from 600 mg/ℓ to 1400 mg/ℓ. The levels increase slightly to Julesburg where the range is 1000 mg/ℓ to 1600 mg/ℓ.

The distance profiles of mean annual salt mass flows are similar to those of mean annual flows, except they are generally accentuated by the increasing salt concentration levels. It should be noted that the annual distance profiles, seen in Figures 4-4, 4-5, and 4-6, are the average of a wide range of daily behavior. This range is seen in terms of seasonal resolution in Figure 4-7. This illustrates the idea that a strong seasonal influence exists. But the same trends, as seen in the annual profiles, exist also from season to season.

From the standpoint of salt transport the key point is that while an accumulation of salts occurs from Henderson to Kersey, the river loses salt between Kersey and Balzac. While there is a gain in river salt flow from Balzac to Julesburg, i.e. the reach farthest downstream, there is a net loss to the land, i.e. by irrigation, between Kersey and Julesburg. Table 4-5 gives the salt mass flows for each station averaged over the fifteen year period, expressed as tons of salts transported per day. The net loss to the land is seen as the difference in salt flows between Kersey and Julesburg, which amounts to 379.9 metric tons per day.

Table 4-5. Mean daily salt mass flows at stations in the South Platte River and tributaries averaged over 15 fifteen-years of records.

Station	Mean daily salt mass flow (metric tons/day)
South Platte River at Henderson	523.0
St. Vrain Creek near Platteville	464.3
Big Thompson River near La Salle	312.7
Cache La Poudre River near Greeley	327.7
South Platte River near Kersey	2007.8
South Platte River near Weldona	1713.2
South Platte River at Balzac	1368.0
South Platte River at Julesburg	1627.9

This analysis of changes in salt mass flows for the stations between Henderson and Julesburg is further illustrated in Figure 4-8, which shows plots of the cumulative salt mass flows for the period 1965-79. Figure 4-8 shows that the increases and decreases in salt transport along the stream have the same pattern from year to year. It further points out the need to relate these changes to the other inputs and outputs of flow and salt mass flow to and from each reach. This is, in fact, the focus of Section 4.3.

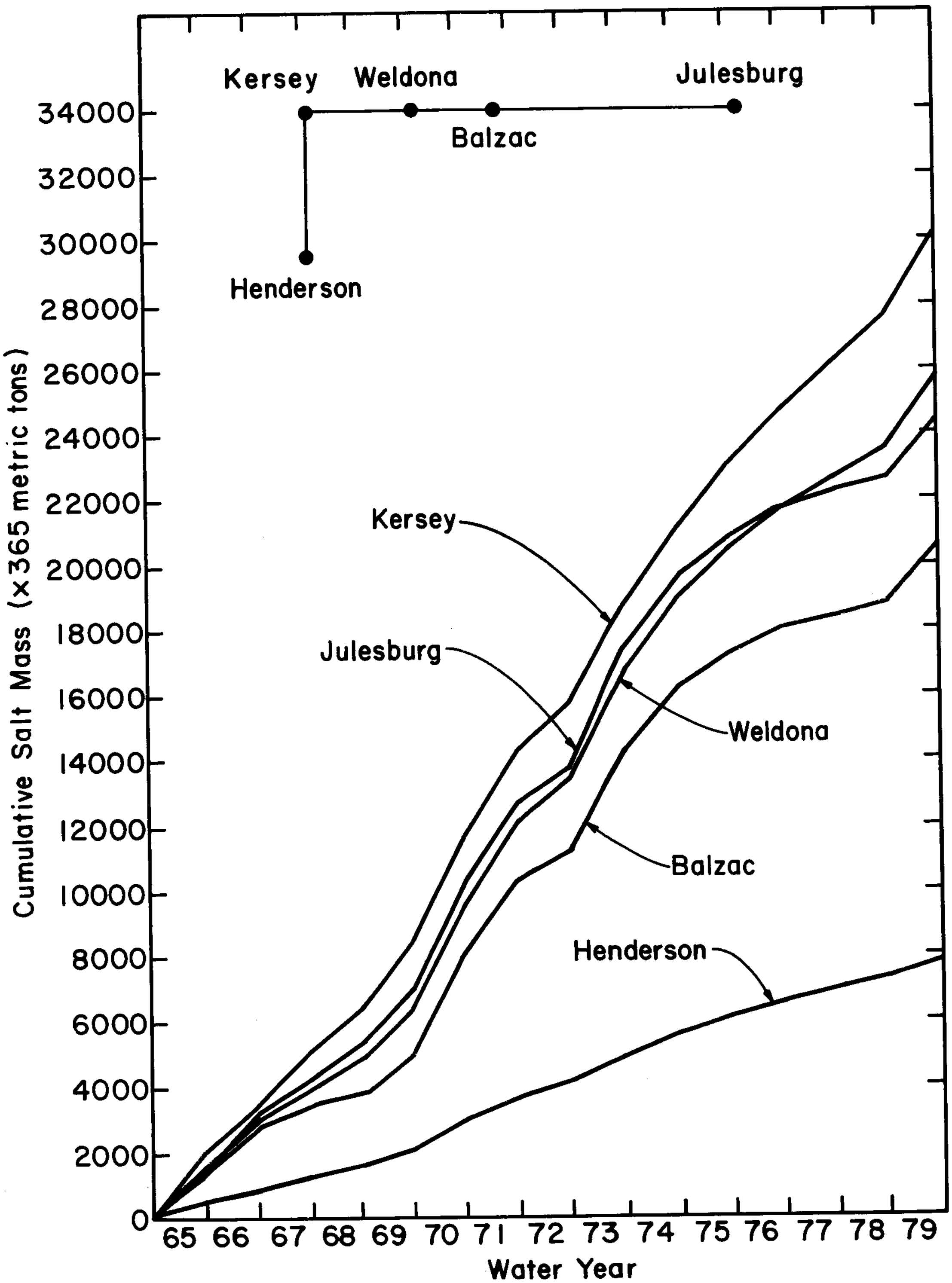


Figure 4-8. Cumulative salt mass flow at various river stations in the South Platte River between Henderson and Julesburg, water years 1965-79.

4.3 Mass Balance Analysis of Salt Flows by River Reach

The focus of this section is the salt balance analyses for each of the four stream reaches in the lower South Platte River. This has been done in terms of monthly, seasonal, and annual time intervals, with annual results presented in this section. Appendix F contains the results of the monthly, seasonal, and annual analyses in tabular form. The final output of the mass balance analyses consists of the computations of water flows and salt mass flows associated with the return flows.

4.3.1 Data Sources

The river reaches between the stations Henderson, Kersey, Weldona, Balzac, and Julesburg were used in the mass balance analyses for flow and salt mass flow. Measured diversions, point source inflows, and in-stream flows at the beginning and end of the reach were used to calculate the return flows to or from the reach. The salt mass flows associated with the river flows in the South Platte River and the three tributaries considered were taken from Section 4.2 and Appendix D. The salt mass flows associated with reach diversions and with point source inflows (e.g. canals and minor tributaries) were computed as outlined in Section 3.3. Salt mass flows associated with return flows then were computed as the mass balance residuals.

Appendix E contains the monthly flow data for the 1965-77 water year period for all diversions from the South Platte River between Henderson and Julesburg and for all point source inflows. River flows for the gaging stations on the South Platte River and the three tributaries used are given in Appendix D.

4.3.2 Annual Mass Balance Plots

Figures 4-9, 4-11, 4-13, and 4-15 show the annual flow balances for each of the four reaches for the 1965-79 water year period. Figures 4-10, 4-12, 4-14, and 4-16 show the corresponding cumulative salt balances. The basic data used in constructing these plots, i.e. Figures 4-9 to 4-16, is seen in Table F-1, Appendix F. These diagrams show the annual flows of water and salt mass, respectively for all inputs and outputs to and from the reaches.

The mass balance analysis for Henderson-Kersey reach, Reach #1, seen in Figure 4-9 shows that the sharp increase in river flow in the reach is due to the large point source inflows from the three tributary streams. The diversion flows, as noted, are significant also. They vary within a narrow range, while the river flows vary over a large range. The return flows averaged over the year vary generally between 6 and 10 m^3/sec, with only values for three years lying outside that range. The return flows, of course, are calculated and therefore are subject to any errors in measurement for the other flow components.

Figure 4-10 shows the corresponding salt mass flows for Henderson-Kersey reach plotted as cumulative salt mass. The large increase in river salt mass flow previously noted in Section 4.2 is seen to be due to both point source inflows and return flows. Thus mass balance analysis has utility in explaining the observed behavior of the system.

For the Kersey-Weldona reach, it is seen in Figure 4-11 that the return flows average about 6.5 m^3/sec while the diversion flows are about 14.5 m^3/sec, and the point inflows are almost insignificant at about 1 m^3/sec. This explains the decrease in river flow between the two stations.

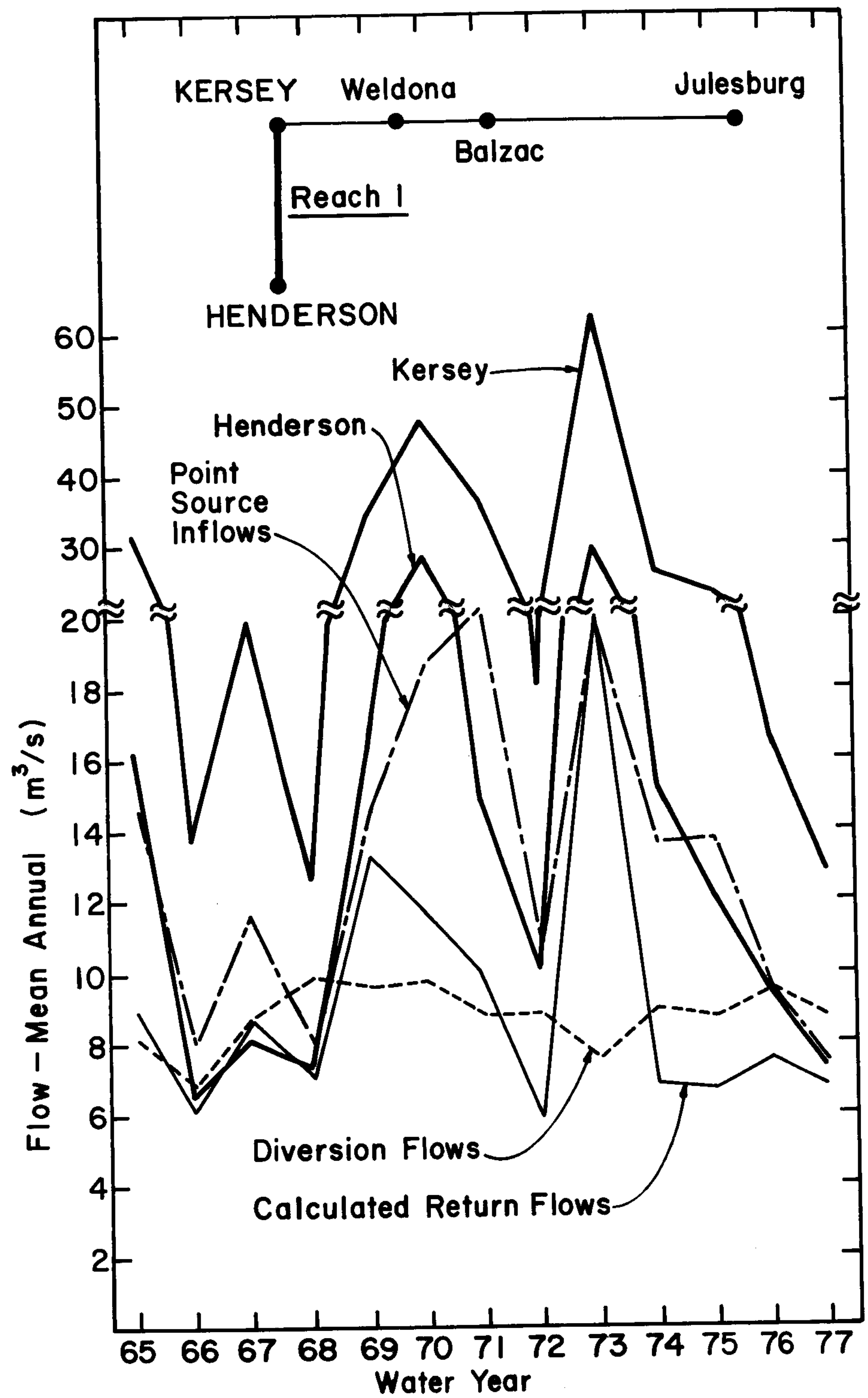


Figure 4-9. Annual flow balance by water year for Henderson-Kersey reach, South Platte River, 1965-77.

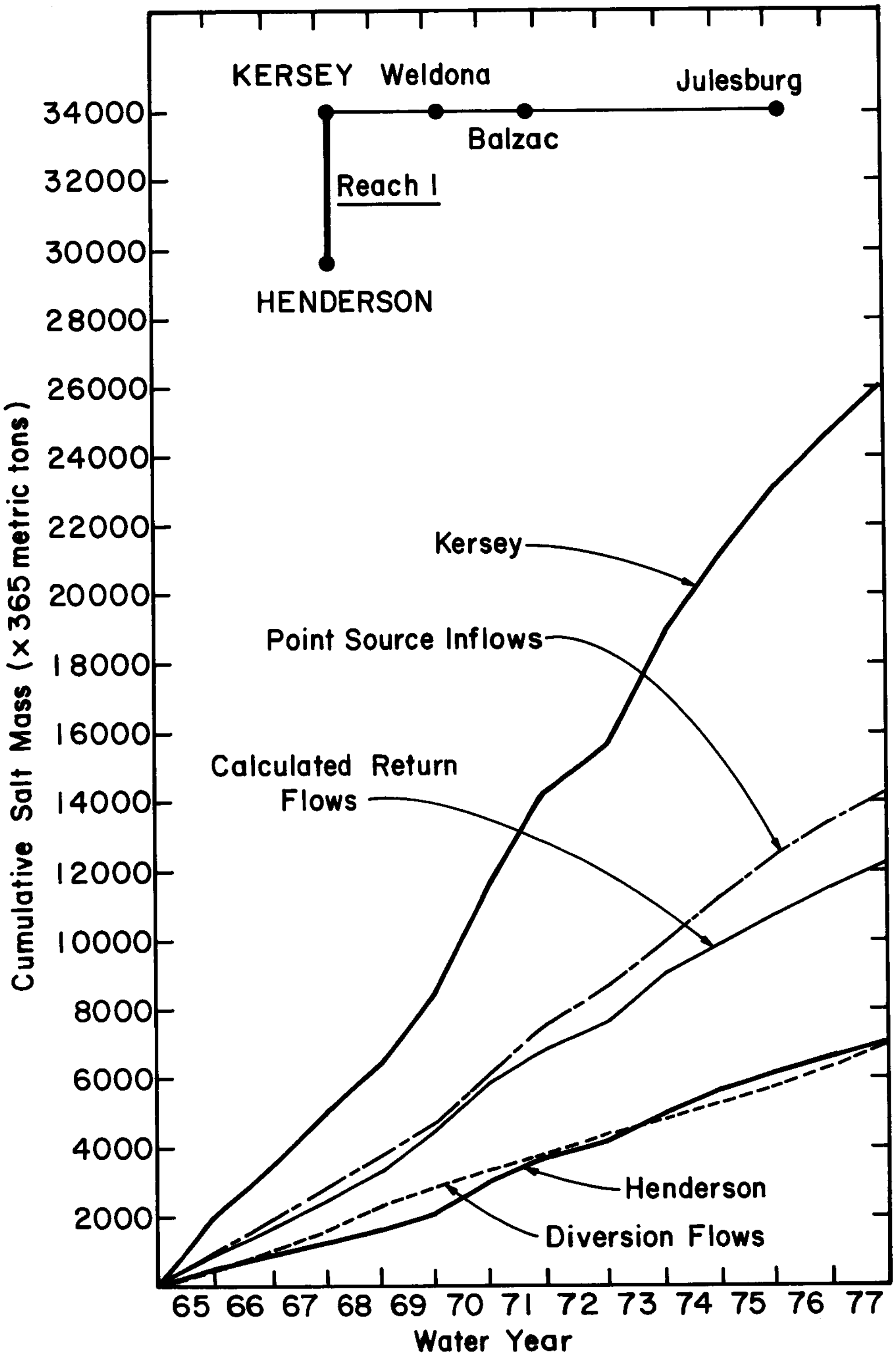


Figure 4-10. Cumulative salt mass to and from Henderson-Kersey reach, South Platte River, water years 1965-77.

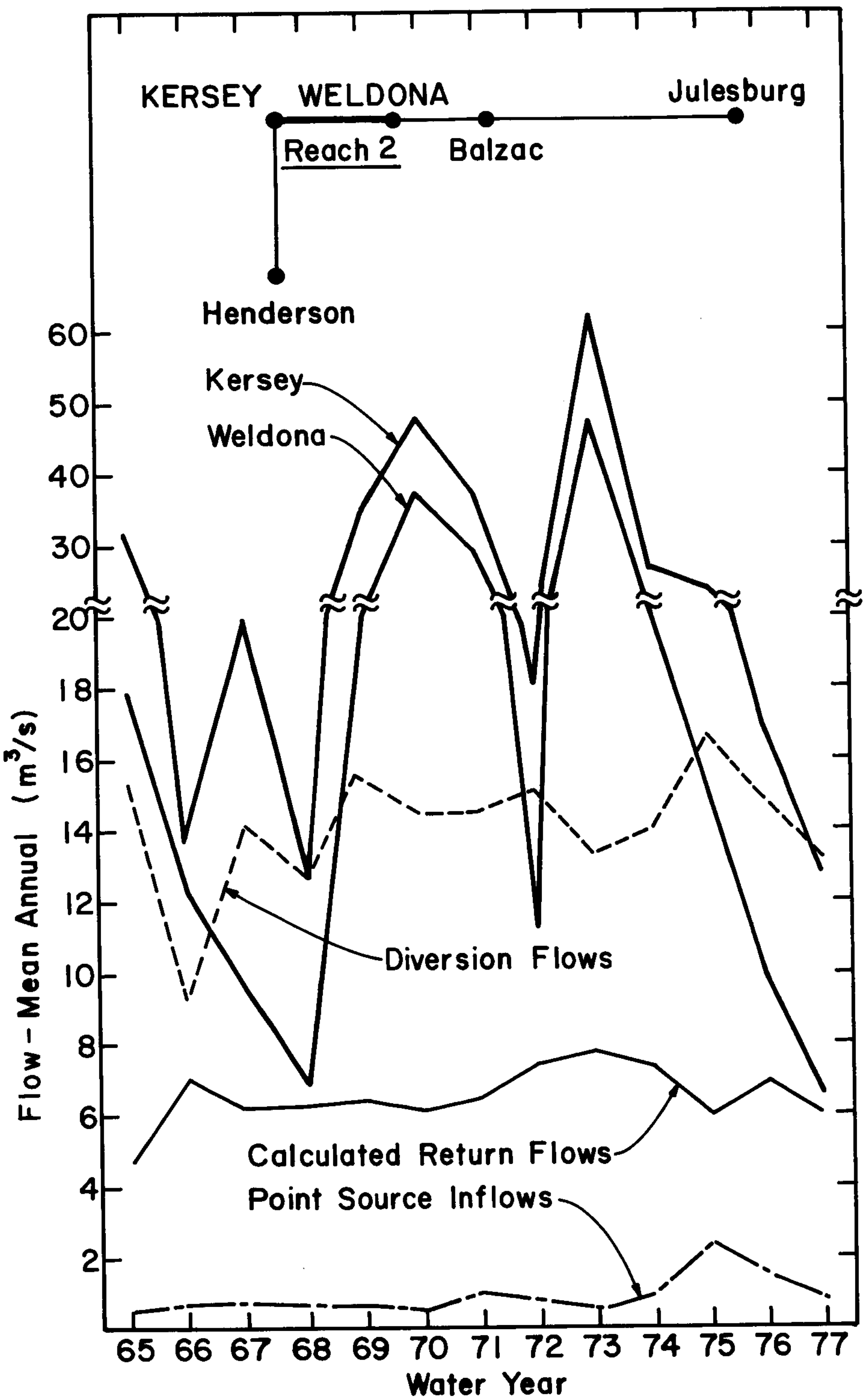


Figure 4-11. Annual flow balance by water year for Kersey-Weldona reach, South Platte River, 1965-77.

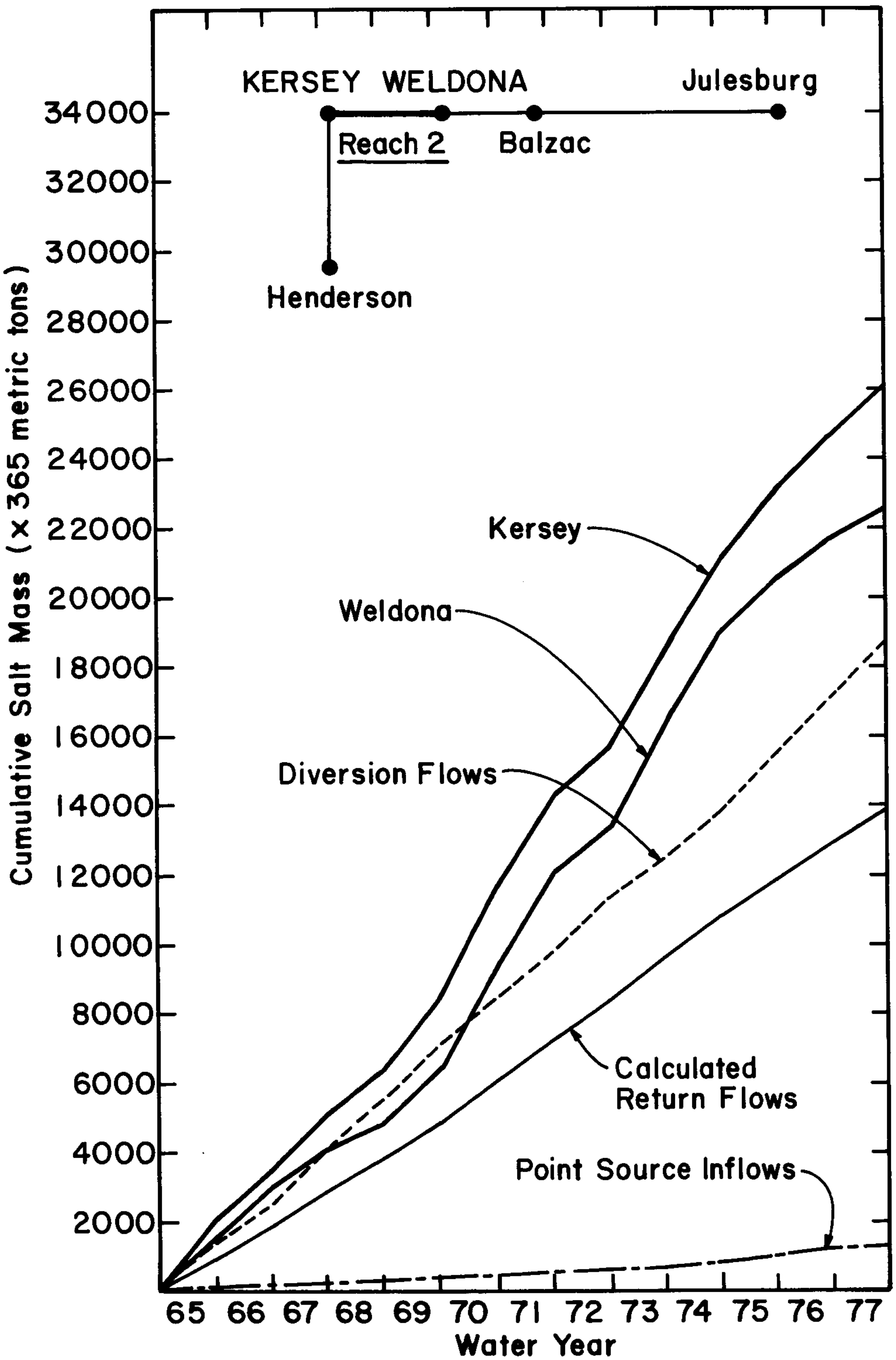


Figure 4-12. Cumulative salt mass to and from Kersey-Weldona reach, South Platte River, water years 1965-77.

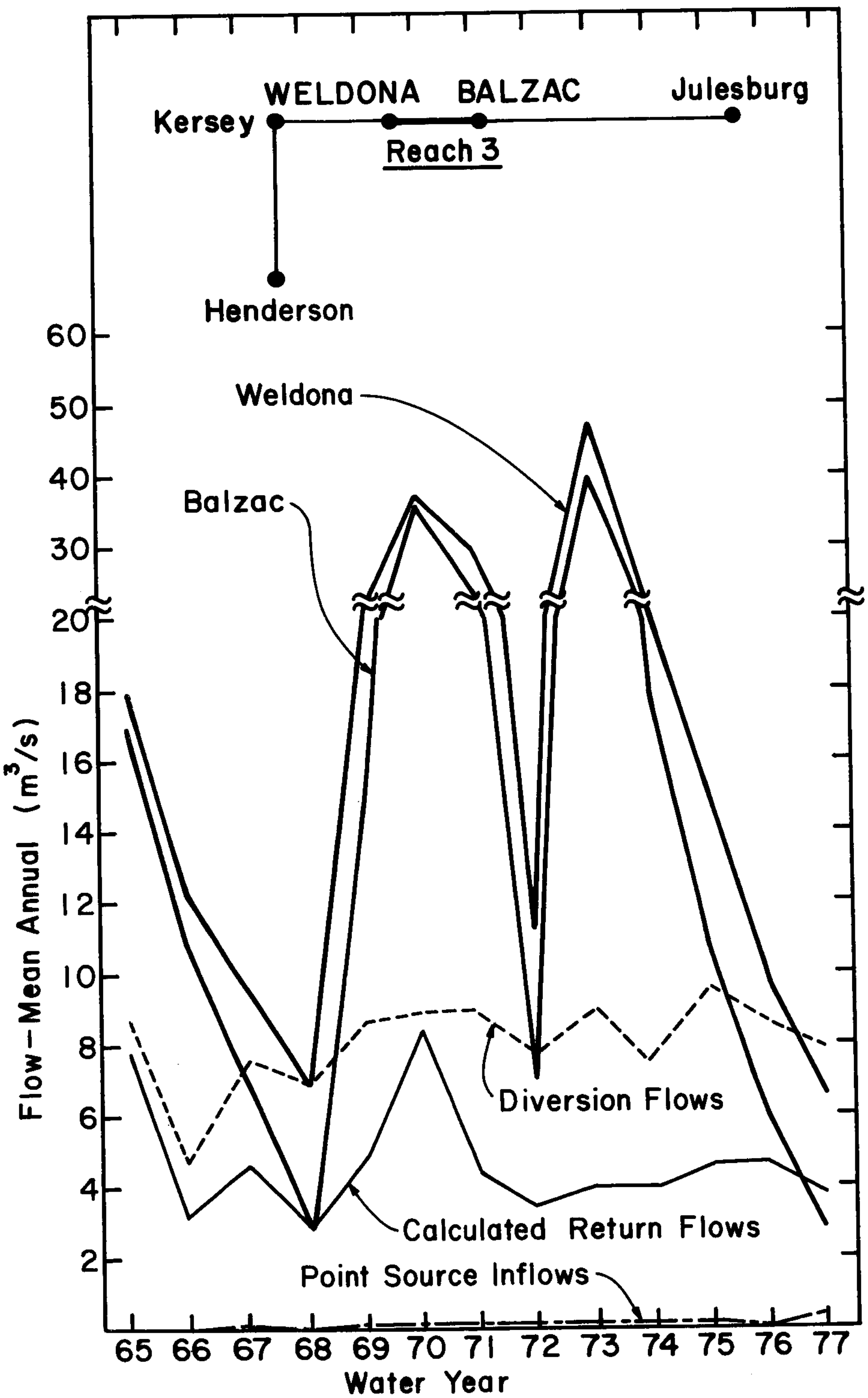


Figure 4-13. Annual flow balance by water year for Weldona-Balzac reach, South Platte River, 1965-77.

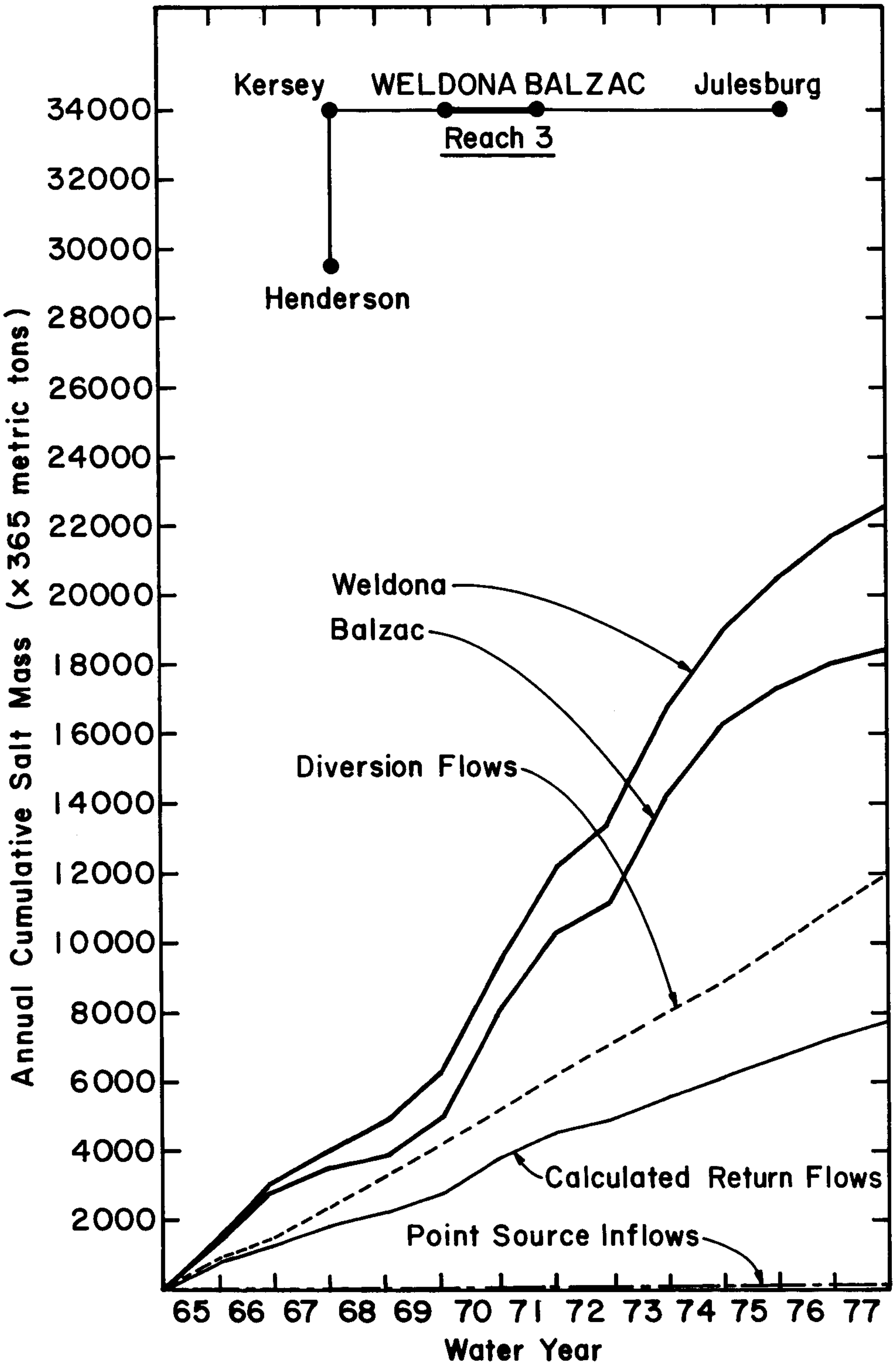


Figure 4-14. Cumulative salt mass to and from Weldona-Balzac reach, South Platte River, water years 1965-77.

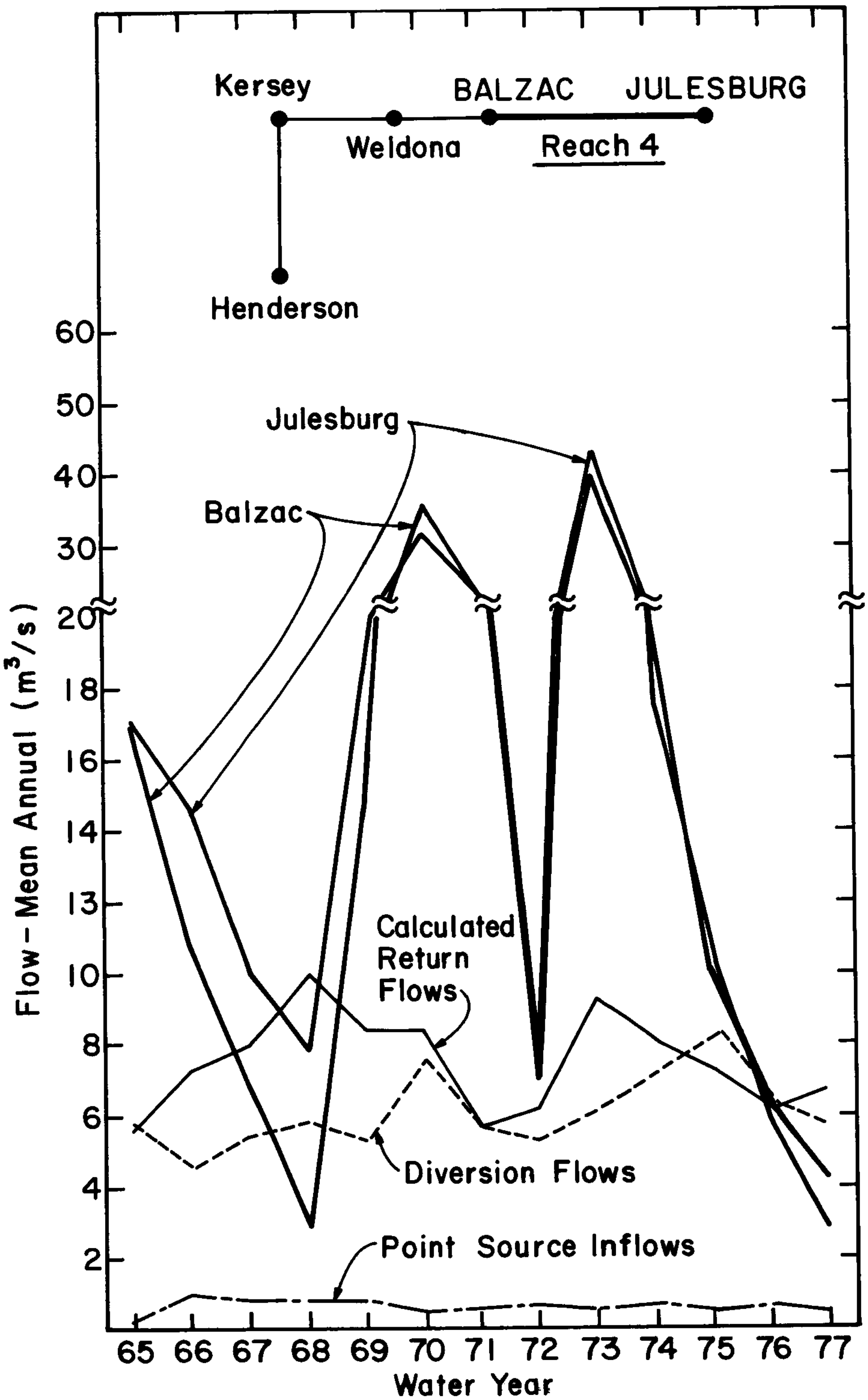


Figure 4-15. Annual flow balance by water year for Balzac-Julesburg reach, South Platte River, 1965-77.

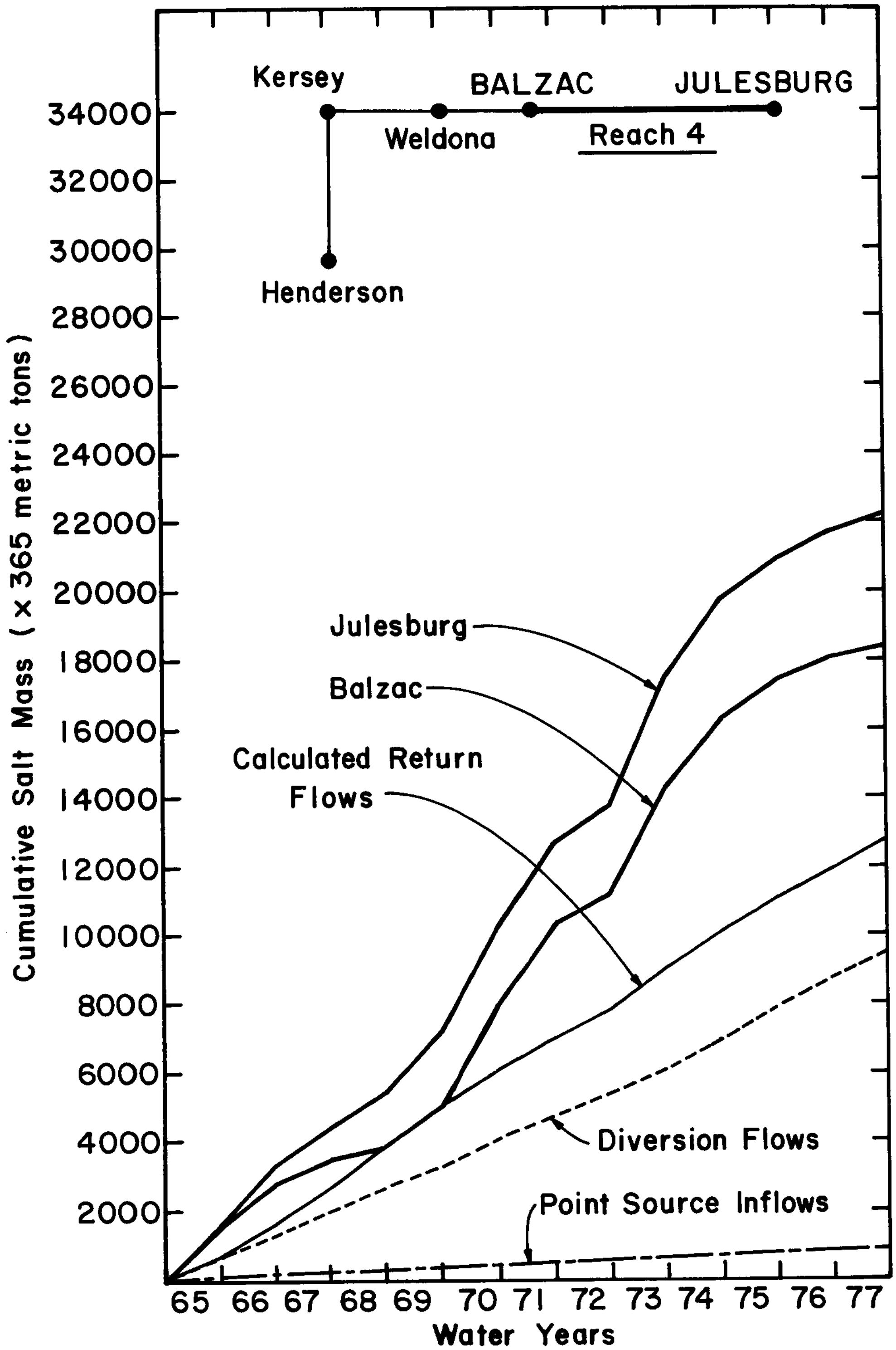


Figure 4-16. Cumulative salt mass to and from Balzac-Julesburg reach, South Platte River, water years 1965-77.

The cumulative salt mass for each component seen in Figure 4-12 is seen to follow the same trends as the flows of water. As noted in Section 4.2 there is a net loss of salt from the reach. This is explained in Figure 4-12 because the salt mass associated with the return flows is less than for the diversion flows, higher salt concentration in the former notwithstanding.

The mass balance analyses of the Weldona-Balzac reach, seen in Figures 4-13 and 4-14, is not marked different in its flow and salt mass flow characteristics than the previous reach. The diversion flows still exceed the return flows, it should be noted, which explains the difference in streamflows between Weldona and Balzac.

The picture changes in the Balzac-Julesburg reach, where the return flows, as seen in Figure 4-15, generally exceed by a small margin the diversion flows. Figure 4-16 shows that a small gain in salt exists between Balzac and Julesburg. The point source inflows in these last three reaches are generally not significant.

When reviewing all reaches the return flows seem to vary within a narrow range. Similarly the associated salt mass flows are almost constant as seen by the nearly straight line in the cumulative salt mass-time plot. Thus a linear relationship between flow and salt mass seems to be likely. Whether this is true or not is explored in the section following.

4.3.3 <u>Plots of Computed Return Salt Mass Flow and Computed Return Flow</u>

In Figure 4-17 the daily mean of the annual computed return salt mass flows is plotted against the daily mean of the annual computed return flows for each of the four reaches. These plots are the computed residuals from the materials balance analyses for each reach

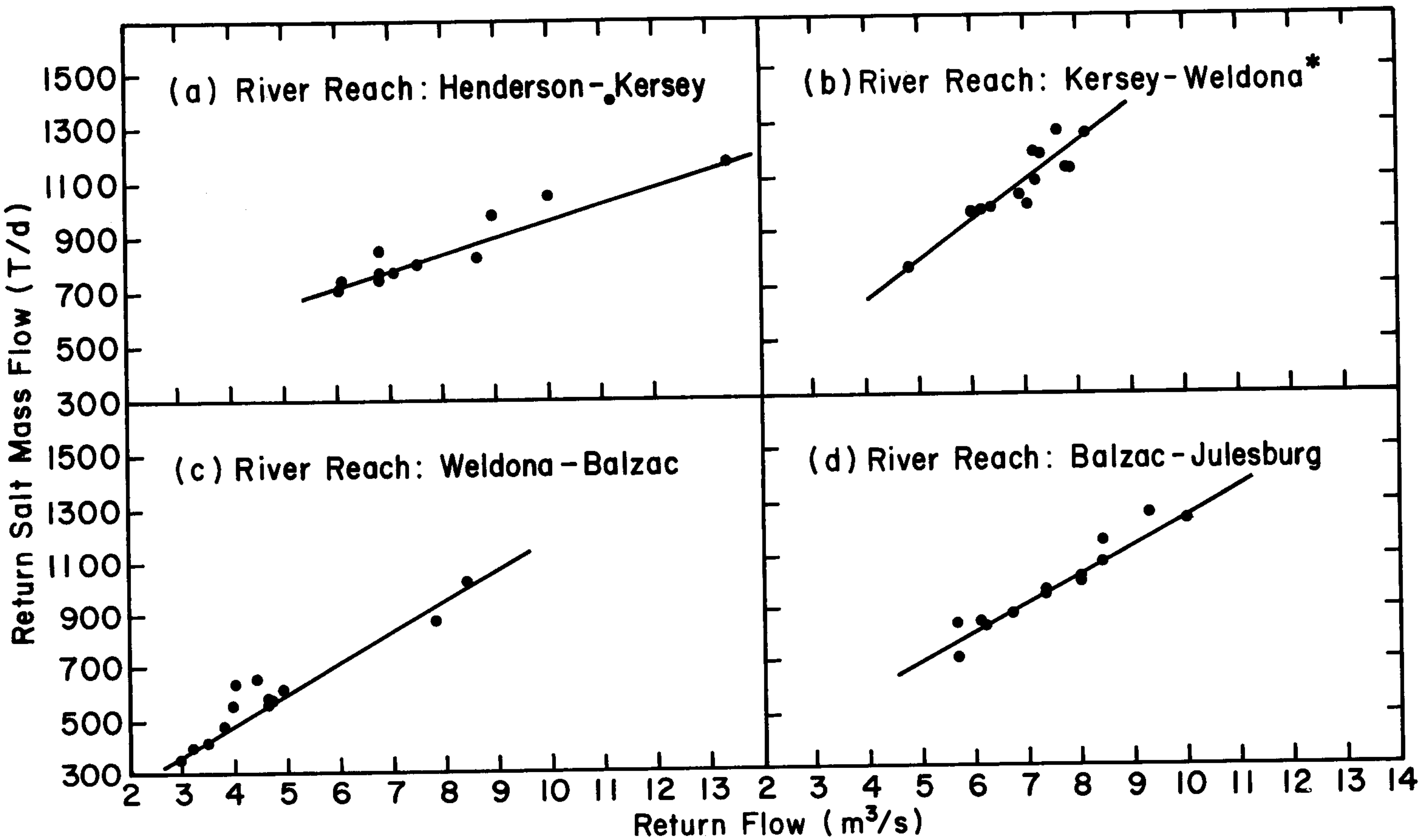


Figure 4-17. Computed return salt mass flow averaged by year associated with computed return flows in four river reaches, South Platte River between Henderson and Julesburg, water years 1965-77 (*based on modified data included in Table F-4).

as described in Section 3.3; the data are given in tabular form in Appendix F. The plots show a linear relationship between return salt mass flow and return flow. But it should be noted that because of the computational procedure, a relationship between return salt mass flow and return flow is expected. The in-stream salt mass flows, the major components in the mass balance, are functions of streamflow for each station, which forces the linear relationships seen in Figure 4-17. Thus these plots do not establish a relationship between two independent parameters. They are presented for convenience in further analyses, since they are the only means available for estimating salt mass flows in return flows. The linear relationship is consistent, however, with the assertion of Riley and Jurinak (1979) that the salt loading from an agricultural system on a long term basis is proportional to the percolating water that passes through the system. These functional relationships could be used in conjunction with a hydrologic model in the simulation of salt flows for the system. Thus salt flows associated with modified development conditions (e.g., new irrigation lands are developed) could be estimated. It should be noted that the relationship is different for each reach.

Figures 4-18, 4-19, 4-20, and 4-21 show the same relationship for each of the four reaches, respectively, but with seasonal resolution. The graphs show different slopes for each season but there seems to be no consistent seasonal trends in comparing the slopes for corresponding seasons. The use of the seasonal relationships could improve the sensitivity of a simulation model.

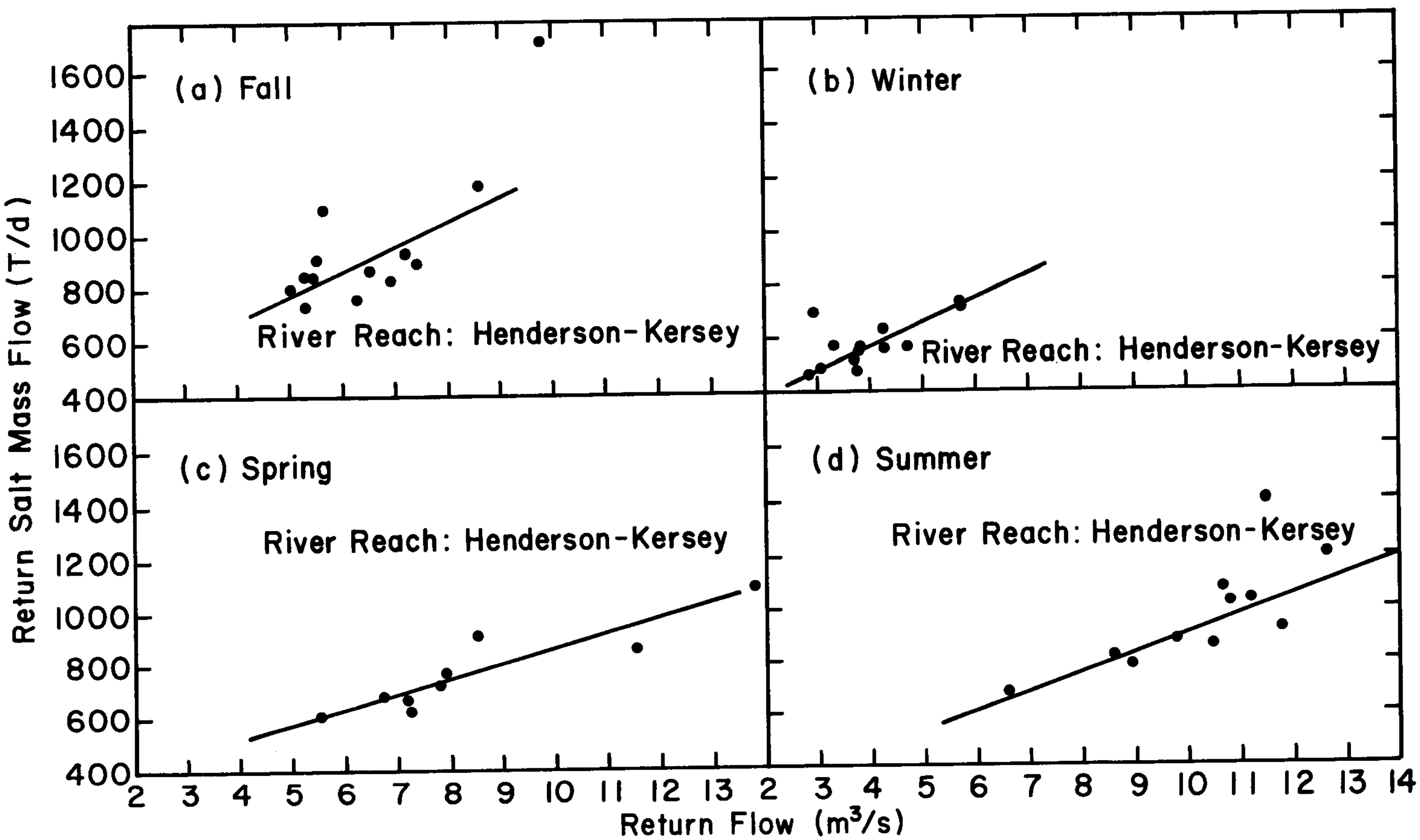


Figure 4-18. Computed return salt mass flows averaged by season associated with computed return flows, South Platte River between Henderson and Kersey, water years 1965-77.

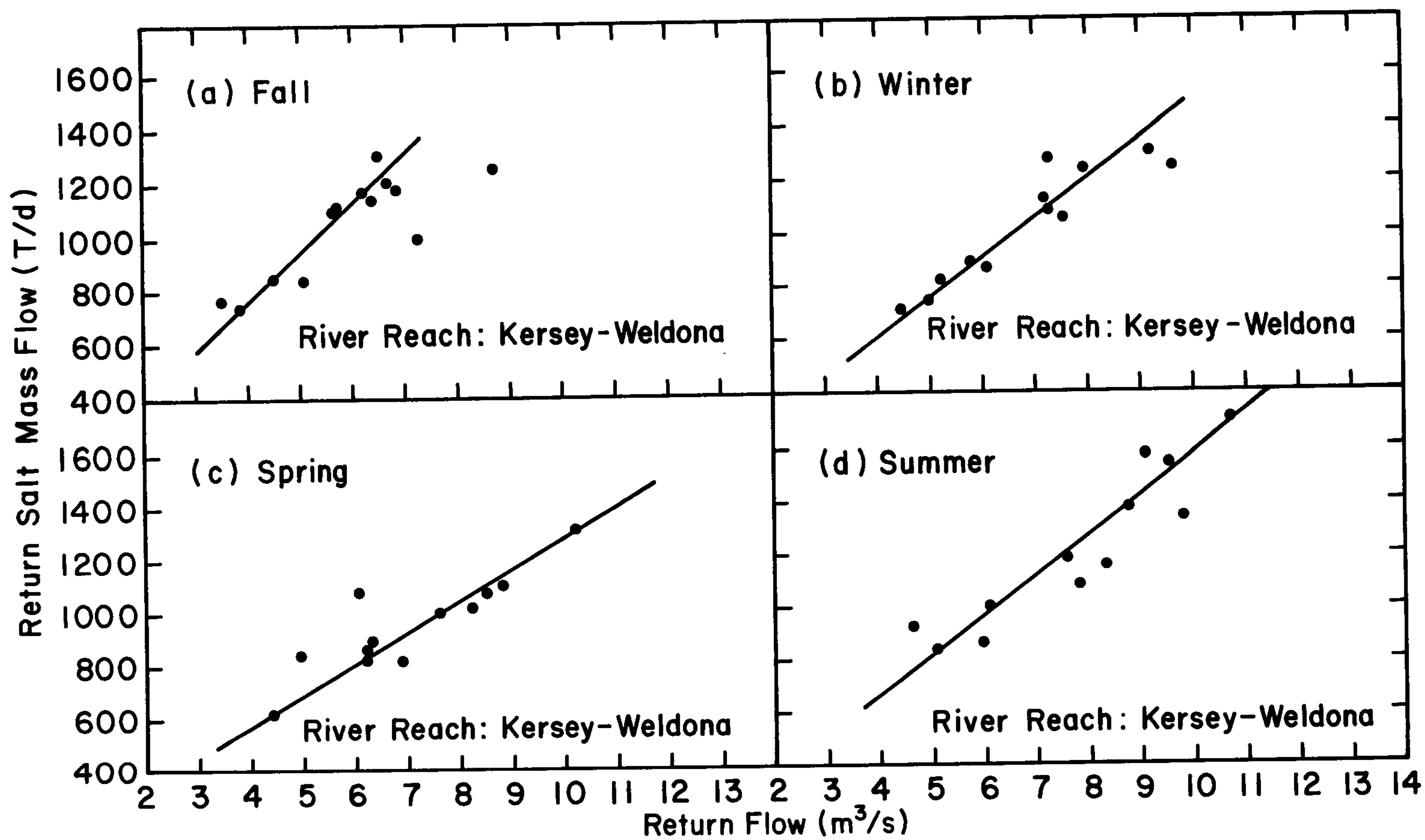


Figure 4-19. Computed return salt mass flow averaged by season associated with computed return flows, South Platte River between Kersey and Weldona, water years 1965-77 (based on modified data contained in Table F-4).

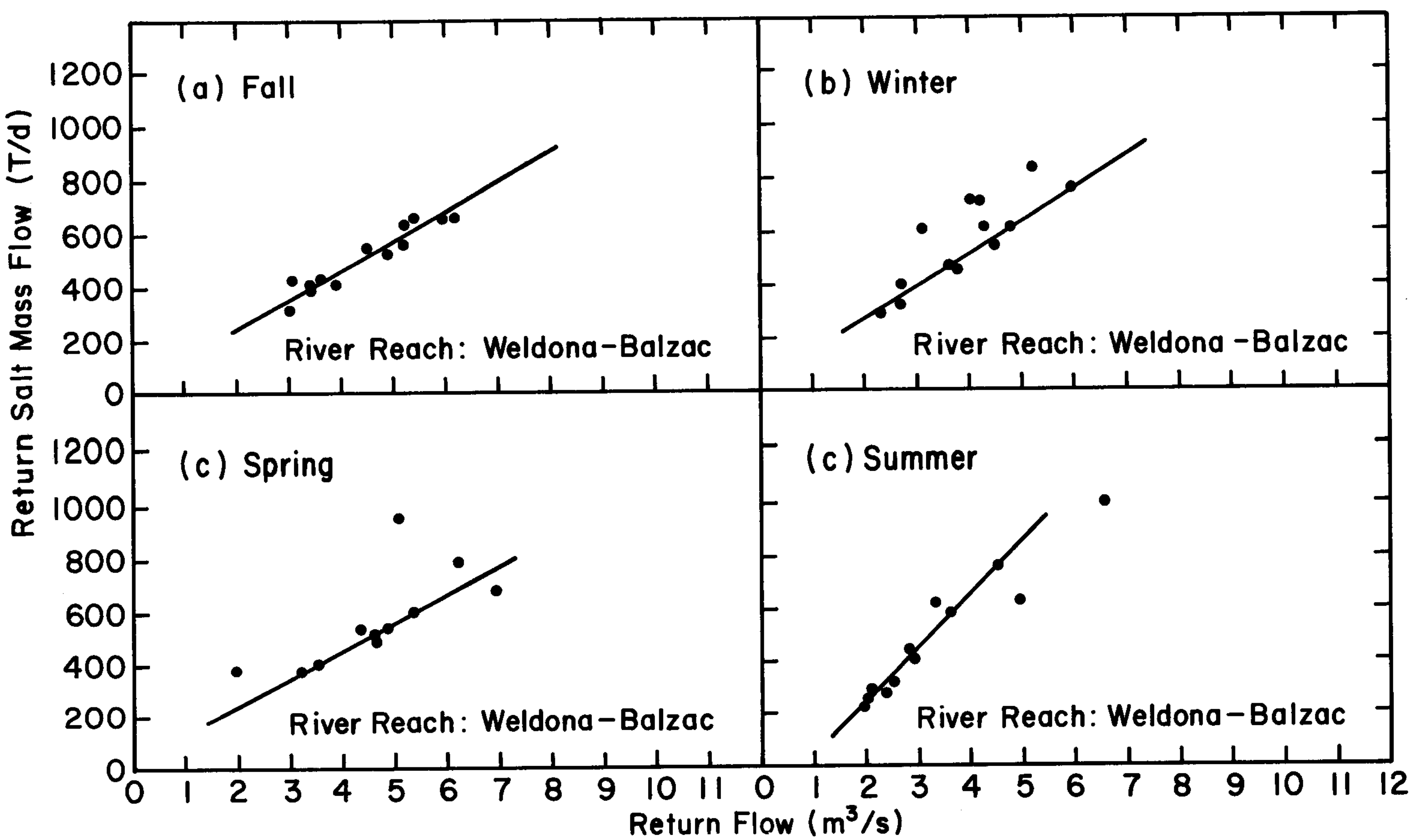


Figure 4-20. Computed return salt mass flows averaged by season associated with computed return flows, South Platte River between Weldona and Balzac, water years 1965-77.

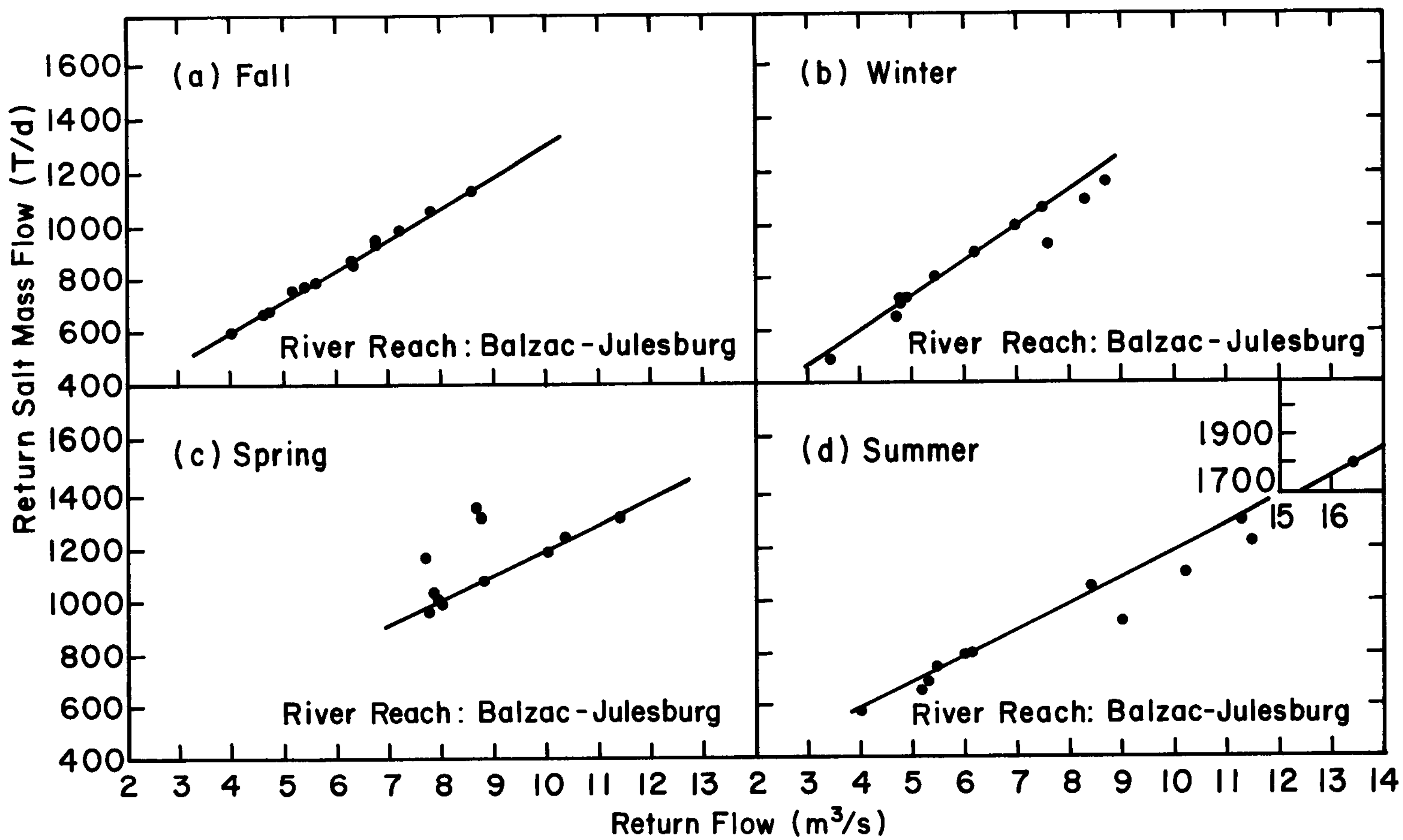


Figure 4-21. Computed return salt mass flows averaged by season associated with computed return flows, South Platte River between Balzac and Julesburg, water years 1965-77.

Chapter 5

SUMMARY AND CONCLUSIONS

5.1 Summary

1. The results of this study show a need to predict the effect of new water developments upon the salinity regime of the lower South Platte River between Henderson and Julesburg.

2. This work demonstrates how river salinity may be characterized, both in terms of time and space variations. In addition, the role of factors, such as return flows, diversions and point source discharges, which shape this characterization, has been ascertained.

3. A thorough testing of established relationships:

   1) TDS versus EC

   2) Salt flow mass versus streamflow

has been accomplished. This testing was necessary prior to their utilization in this work. These relationships have been ascertained for eight river stations and for fifteen years of data. Reference is in Section 4.1.

4. The total dissolved solids-specific electrical conductance relationship has been developed for each river station so that the larger EC data base can be used for the in-stream salinity characterization as total dissolved solids.

5. The log-log form of the regression model between salt mass flow and streamflow has proven to explain the variation in in-stream

salinity flow mass found in the lower South Platte River between Henderson and Julesburg.

6. Seasonal variations in the coefficients of the salt mass flow versus streamflow relationship was significant. They can be obtained by dividing the data base into seasons and developing regression lines for each season.

7. The seasonal regression lines developed for each river station have been used to compute its daily salt mass flow using daily flow as argument. The computed salt mass values were then averaged over the month, the season and the year, for the 1965-79 water year period, to analyze the salt transport characteristics of the system. From these data distance profiles of river flow, TDS, and salt mass flow were prepared. Reference is in Section 4.2.

8. The results of the salt transport characterization show that a high increase in river salt transport occurs between Henderson and Kersey, but a sharp decrease follows between Kersey and Weldona. The losses of salt to the land persist to Balzac, whereas from Balzac to Julesburg the stream experiences a slight gain of salt. This latter gain, however, does not compensate the previous losses, so there is a net loss of salt between Kersey and Julesburg. This loss amounts to an average of 380 metric tons of total dissolved solids per day.

9. The pattern of salt mass flow described above is consistent year after year, and season after season, for all flow conditions, irrespective of the fact that the salt concentration increases continuously in the downstream direction.

10. Finally, the in-stream salt mass flow variations along the river have been interpreted in terms of the salt flows to and from the

stream, by means of a materials balance analysis. This was done based upon the results of the in-stream salinity characterization and simplifying assumptions regarding the salinity associated with diversion flows and the point source discharges. The diffuse return flows to each reach and their associated salinity concentration levels were thus obtained as the residual of all other known flows to and from the reach. The materials balance was done for four river reaches, for a thirteen year period, with monthly, seasonal and annual resolution.

11. The results of the materials balance analysis show how leaching from the land contributes to higher in-stream salt transport in the Henderson-Kersey and Balzac-Julesburg reaches. In the Henderson-Kersey reach, the three tributaries, i.e. the St. Vrain Creek, the Big Thompson River and the Cache River, are shown to contribute also significantly to the reach salt gain. Salt mass flows associated with the diversion flows are shown to exceed consistently those associated with return flows in Kersey-Weldona, Weldona-Balzac reaches. Finally a linear relationship between salt mass and return flow has been shown to be warranted. This relationship varies from reach to reach and from season to season.

5.2 Conclusions

1. A methodology has been demonstrated to characterize a river salinity regime. Fifteen years of daily and monthly flow and salinity data have been reduced in terms of monthly, seasonal, and annual statistical characterizations representative of the salinity behavior of the river.

2. The profiles of river salt mass flow have been interpreted in terms of the external interacting flows reach by reach.

3. The reach by reach materials balance analysis provides the basis for development of a simulation model. This could be used for predictive purposes, e.g. to assess the effects of Narrows Dam on existing salinity regime.

4. The analyses made show that salinity is a concern in the lower South Platte River not only because high concentrations are carried by the streamflows, but also because an accumulation of salt in the land is taking place in certain reaches.

5. These findings stress the need for careful consideration to be given on how new water resource developments will affect the salinity behavior of the system.

6. The results obtained in this study can be used thus as a basis for management.

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APPENDIX A

PLOTS OF TOTAL DISSOLVED SOLIDS VERSUS SPECIFIC ELECTRICAL CONDUCTANCE FOR NINE RIVER STATIONS IN THE SOUTH PLATTE RIVER BASIN

These plots were developed to convert measured EC data to equivalent TDS data. They include plots of both "TDS as residue" versus EC and "TDS as sum of constituents" versus EC. Original data were taken from published USGS records for the 1963-1979 water year period. Figure A-9 contains data for the Cache La Poudre River at the mouth of the canyon. It is included for reference purposes.

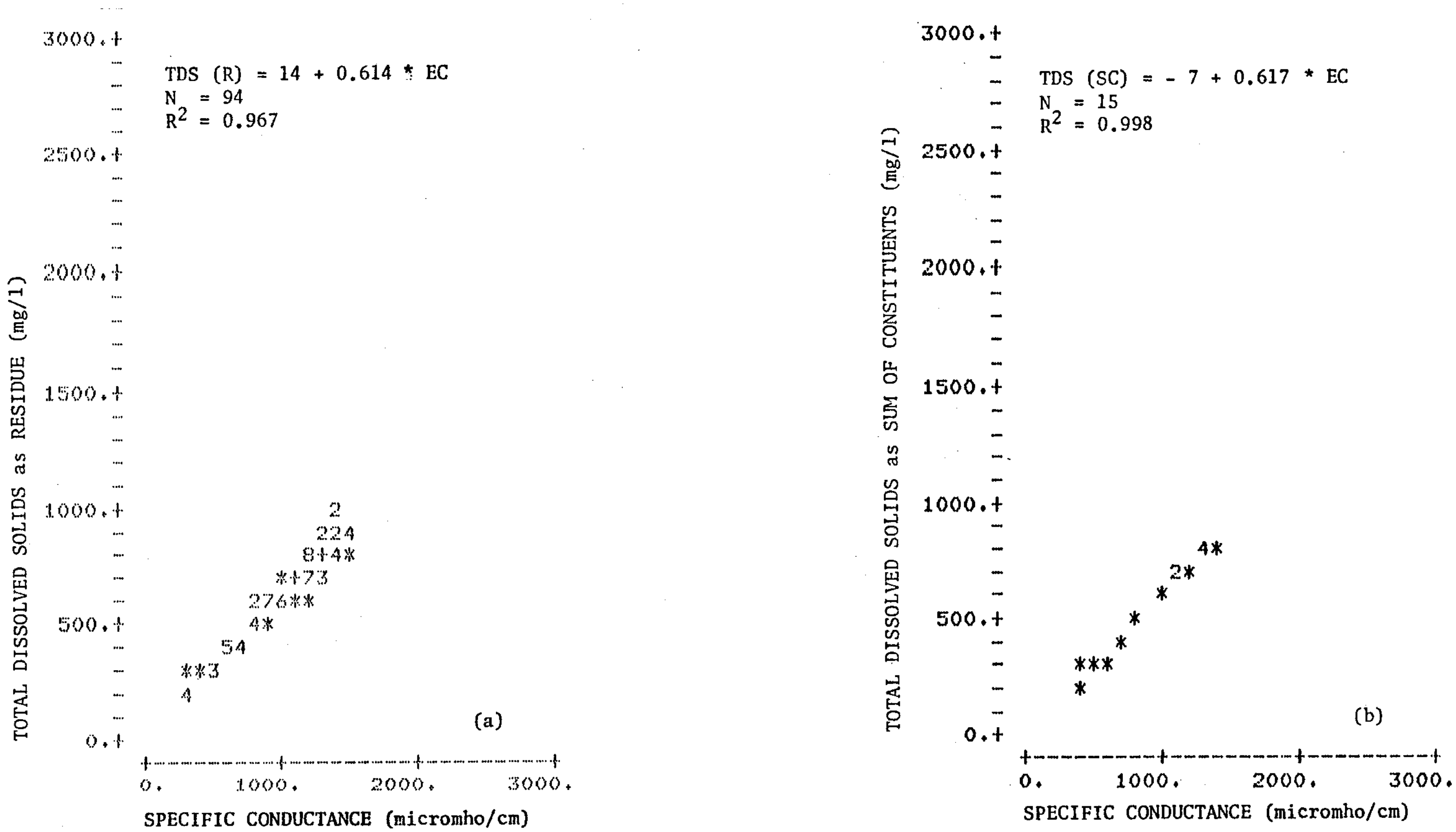

Figure A-1. Total dissolved solids - specific conductance data used in regression analysis, South Platte River at Henderson.

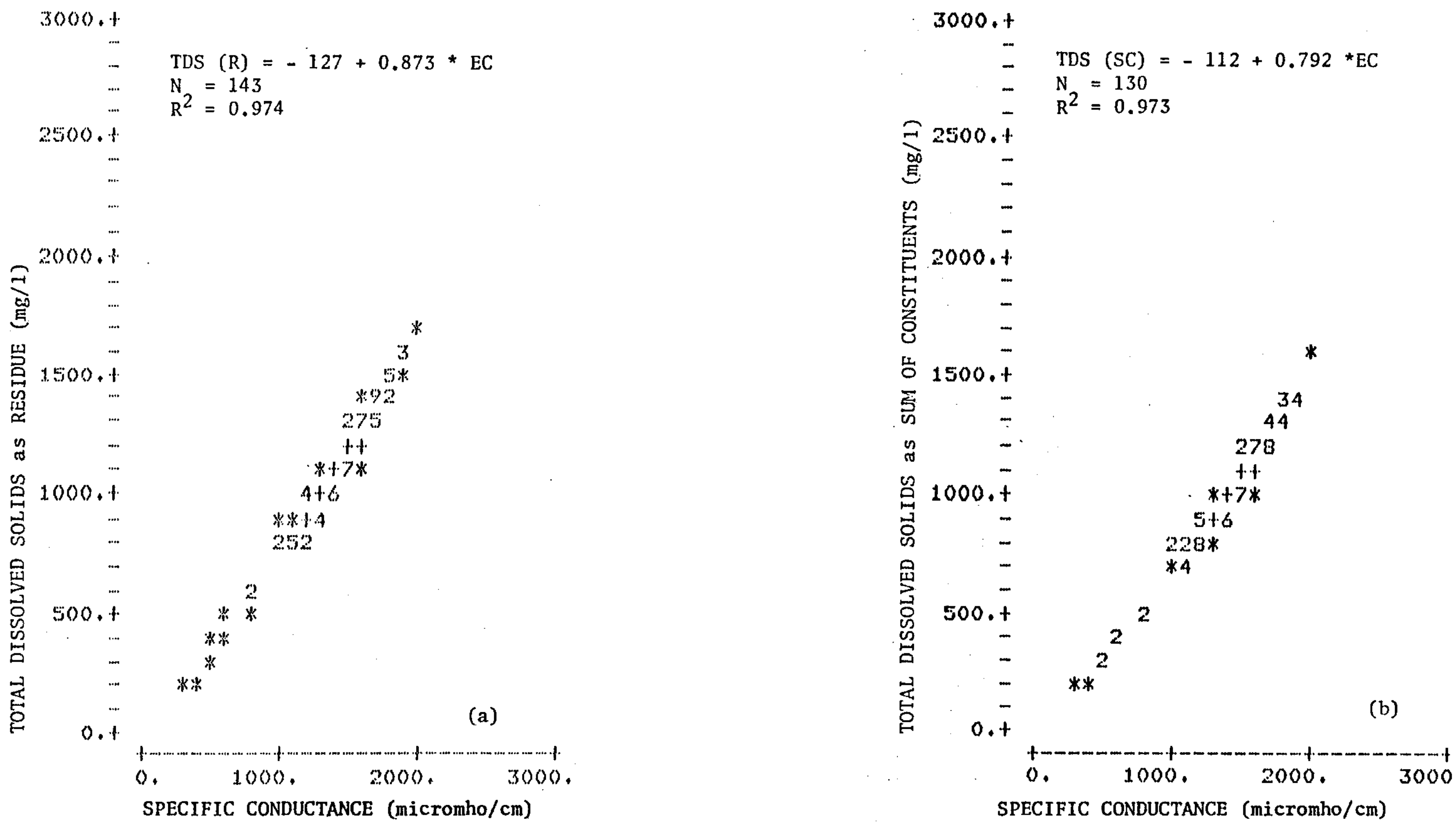

Figure A-2. Total dissolved solids - specific conductance data used in regression analysis, St. Vrain Creek near Platteville.

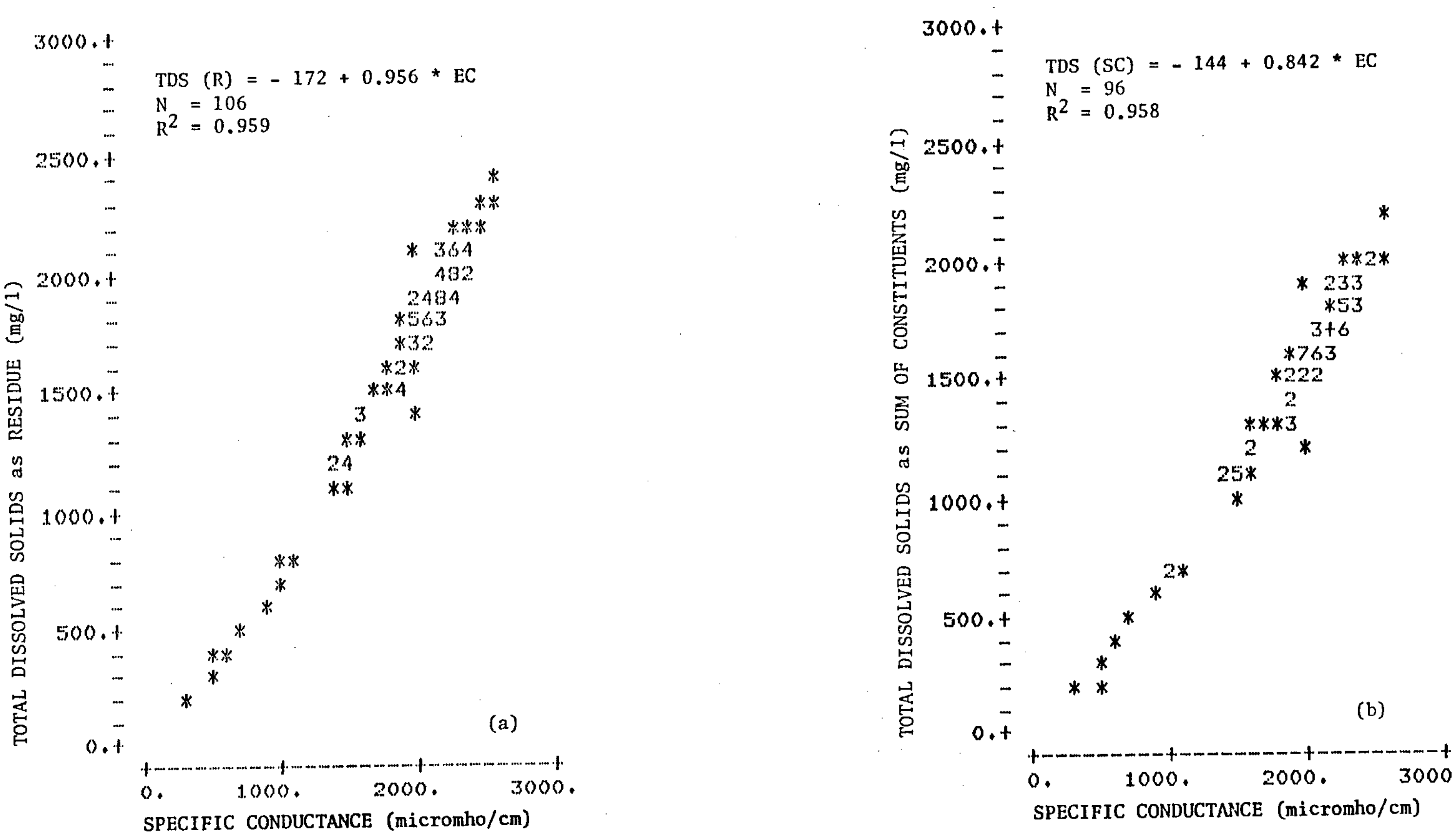

Figure A-3. Total dissolved solids - specific conductance data used in regression analysis, Big Thompson River near La Salle.

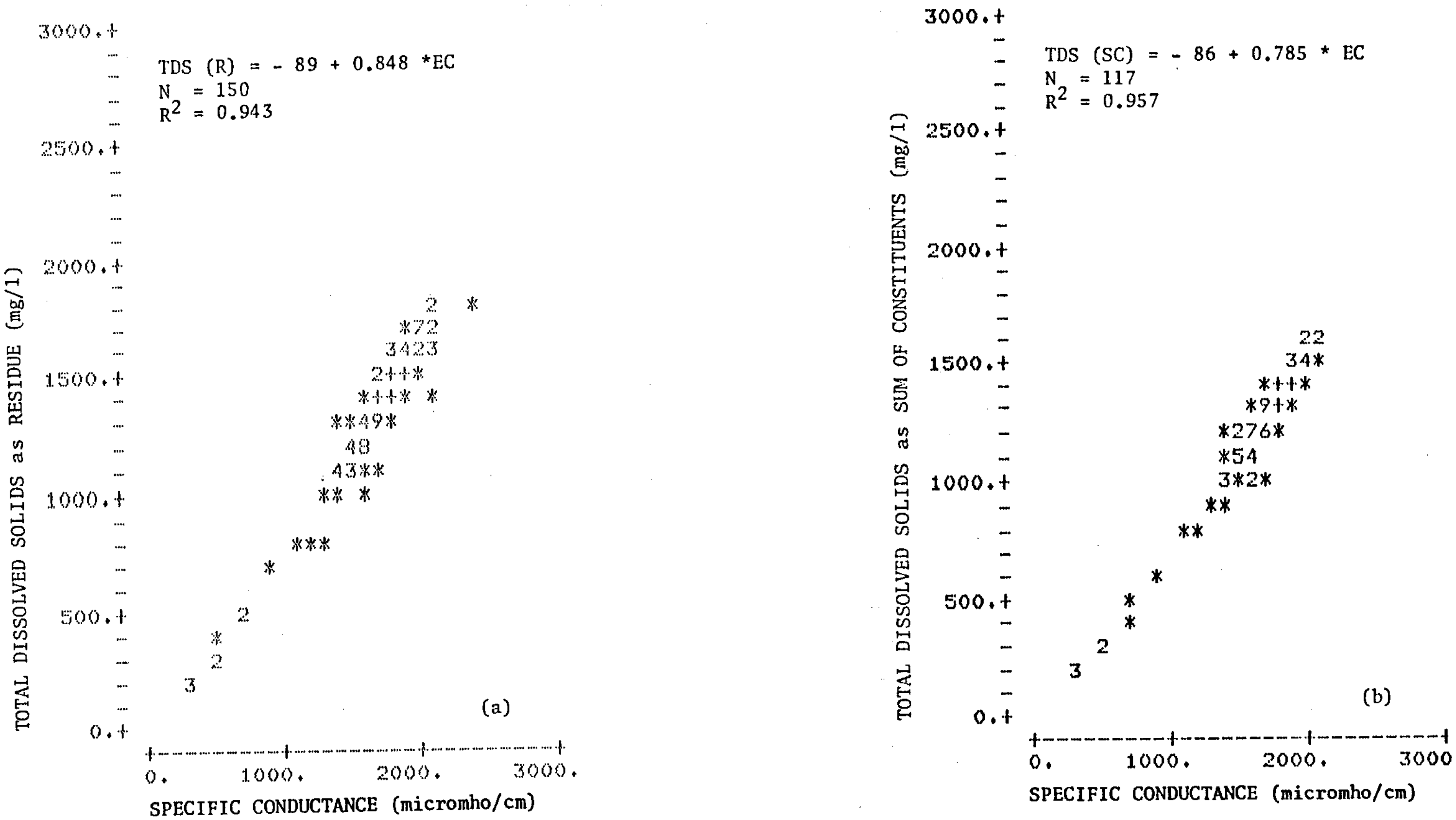

Figure A-4. Total dissolved solids - specific conductance data used in regression analysis, Cache La Poudre River near Greeley.

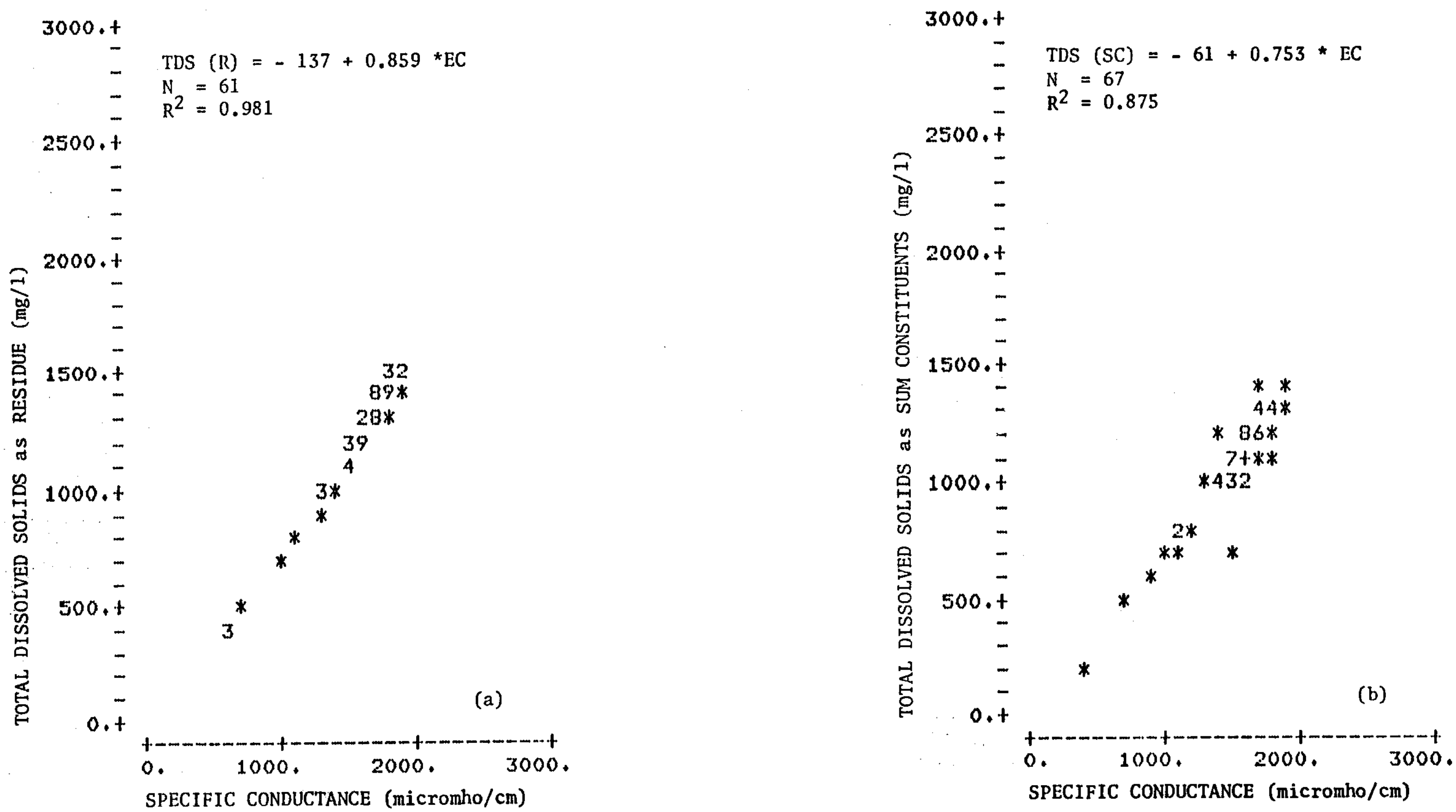

Figure A-5. Total dissolved solids - specific conductance data used in regression analysis, South Platte River near Kersey.

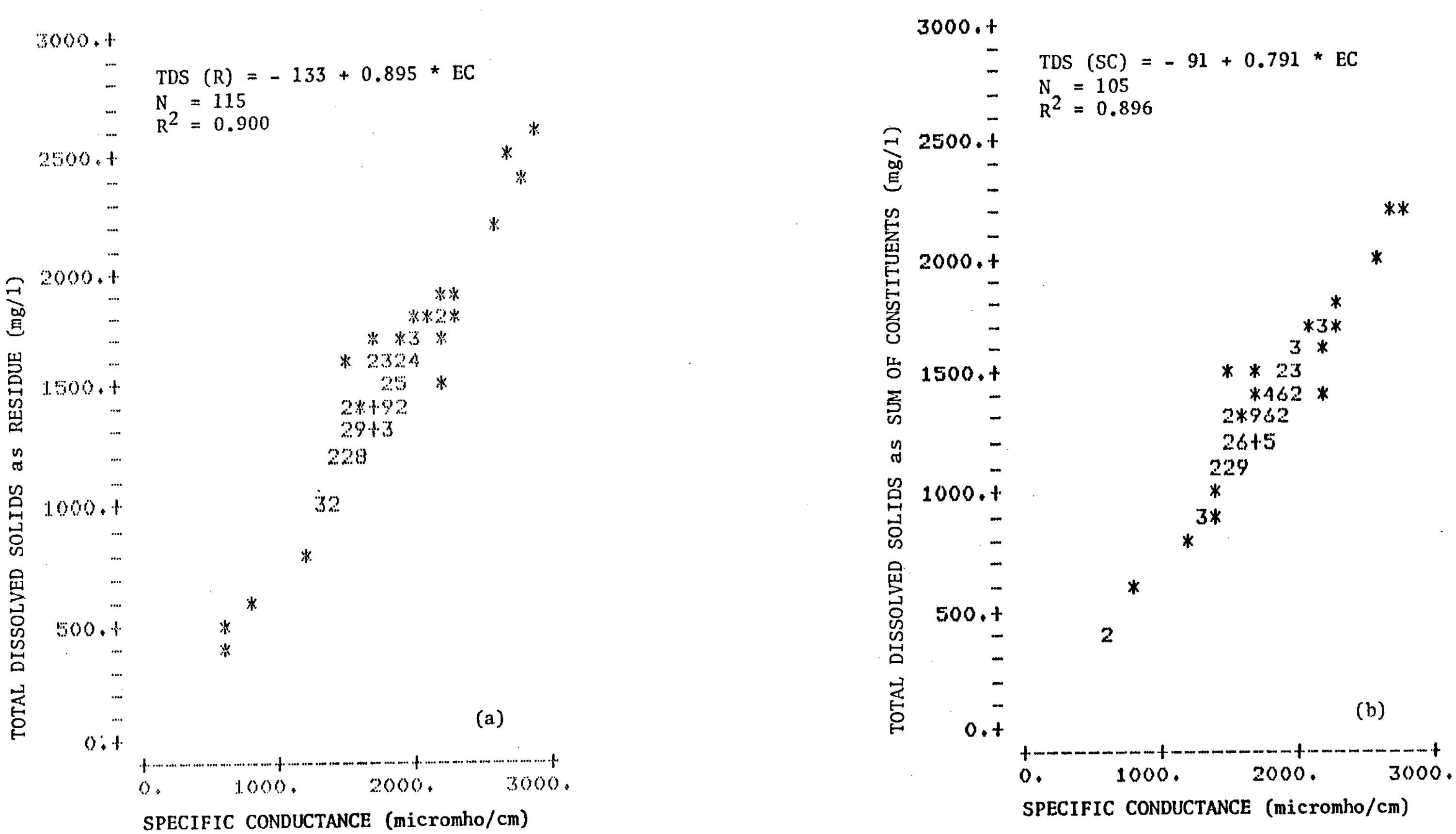

Figure A-6. Total dissolved solids - specific conductance data used in regression analysis, South Platte River near Weldona.

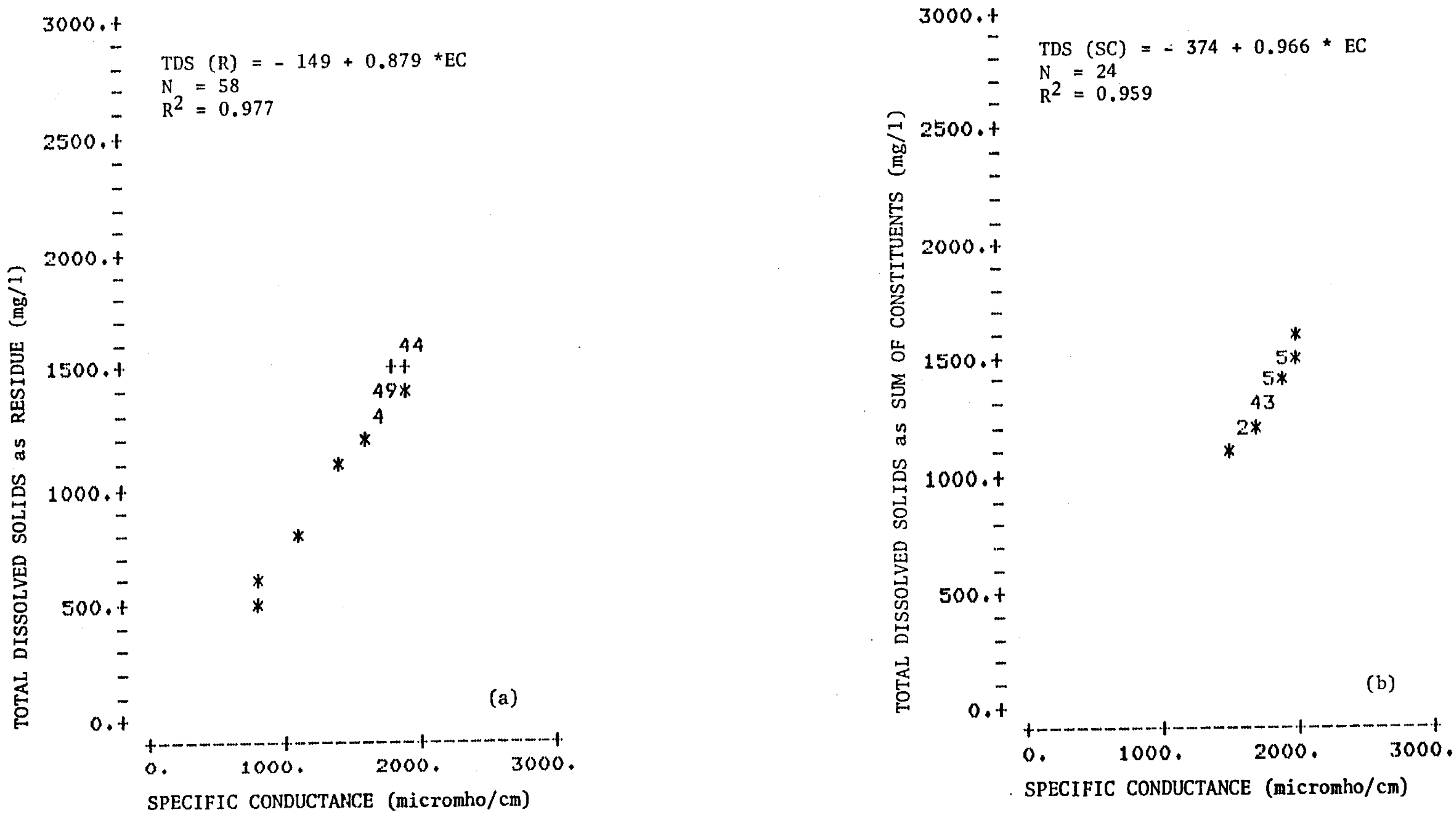

Figure A-7. Total dissolved solids - specific conductance data used in regression analysis, South Platte River at Balzac.

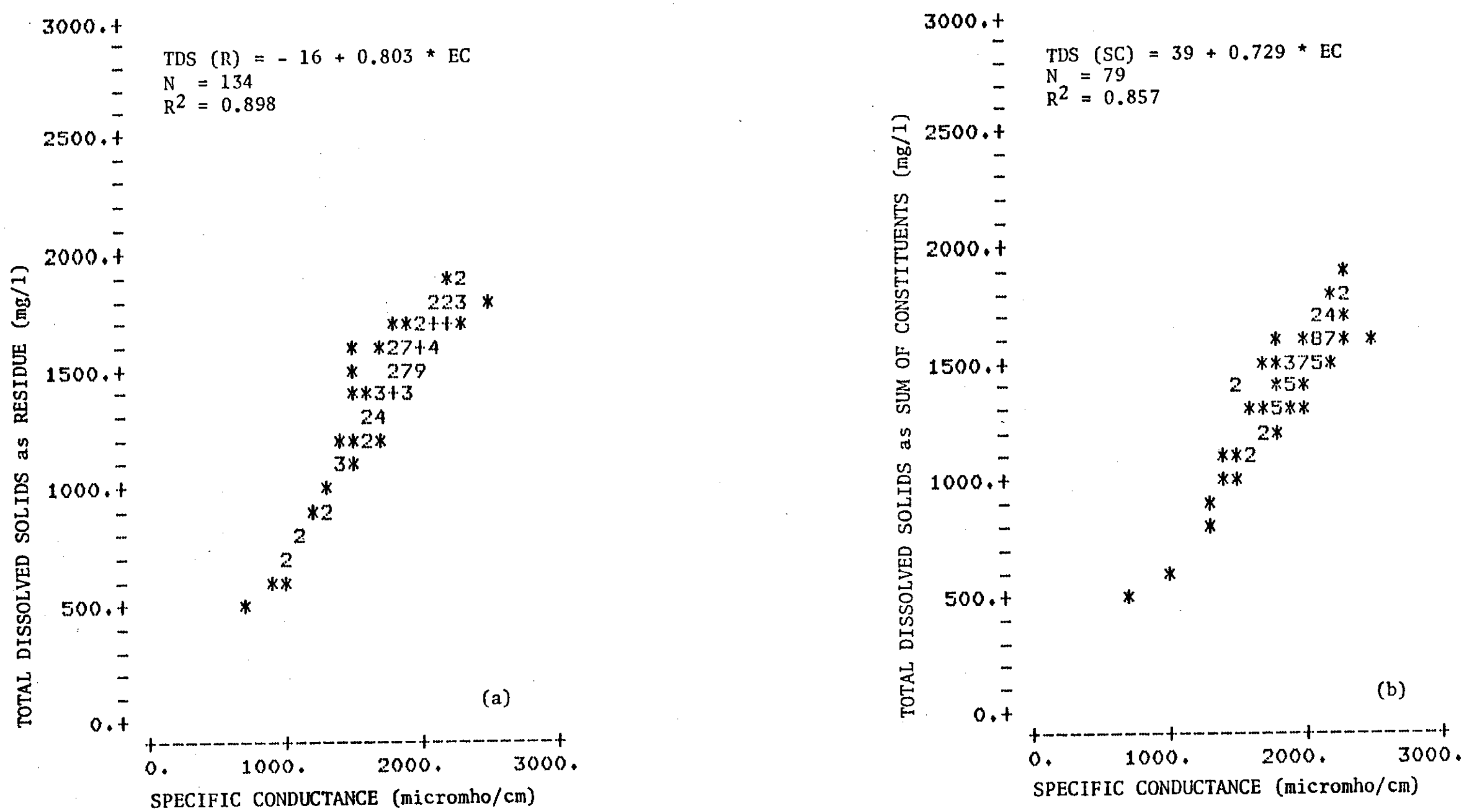

Figure A-8. Total dissolved solids - specific conductance data used in regression analysis, South Platte River at Julesburg.

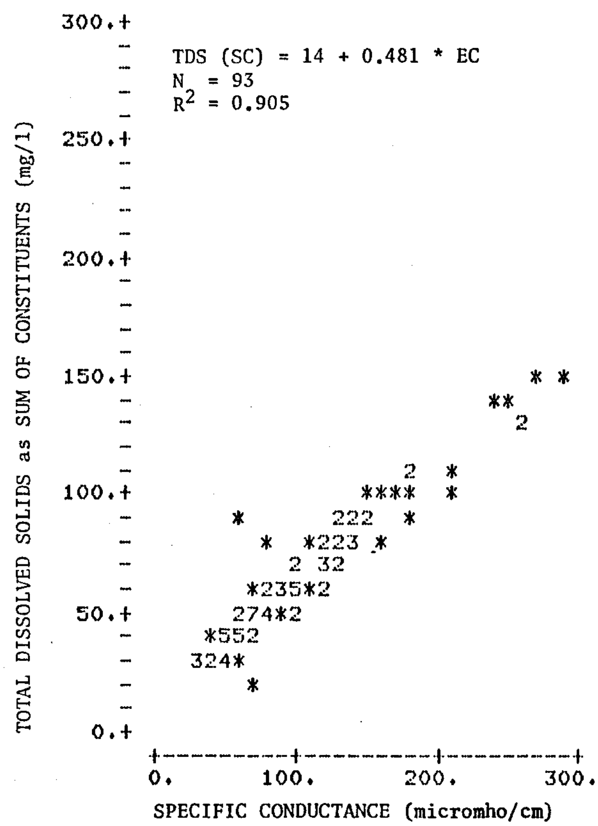

Figure A-9. Total dissolved solids - specific conductance data used in regression analysis, Cache La Poudre River at mouth of canyon.

APPENDIX B

PLOTS OF SALT MASS VERSUS FLOW FOR NINE RIVER STATIONS IN THE SOUTH PLATTE RIVER BASIN

Plots of log (salt mass) versus log (flow) are shown by season for each of five stations in the South Platte River and for four tributary stations. The regression equations obtained were used in calculating salt transport in the river. Table B-9 is included for reference purposes; the data for this plot were taken from a station on the Cache La Poudre River at the mouth of the canyon, prior to the influence of any return flows.

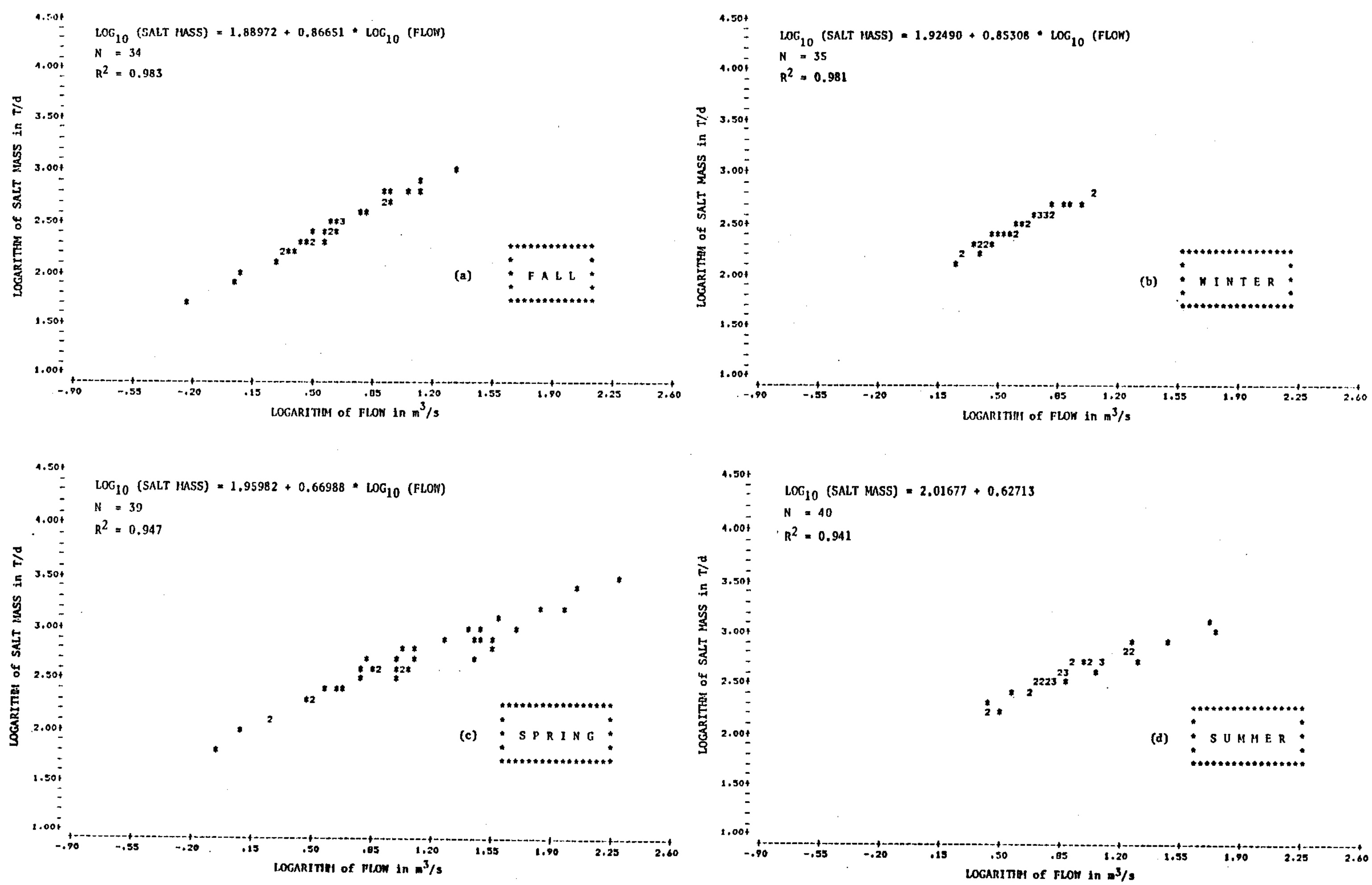

Figure B-1. Salinity mass - flow data used in regression analysis, South Platte River at Henderson.

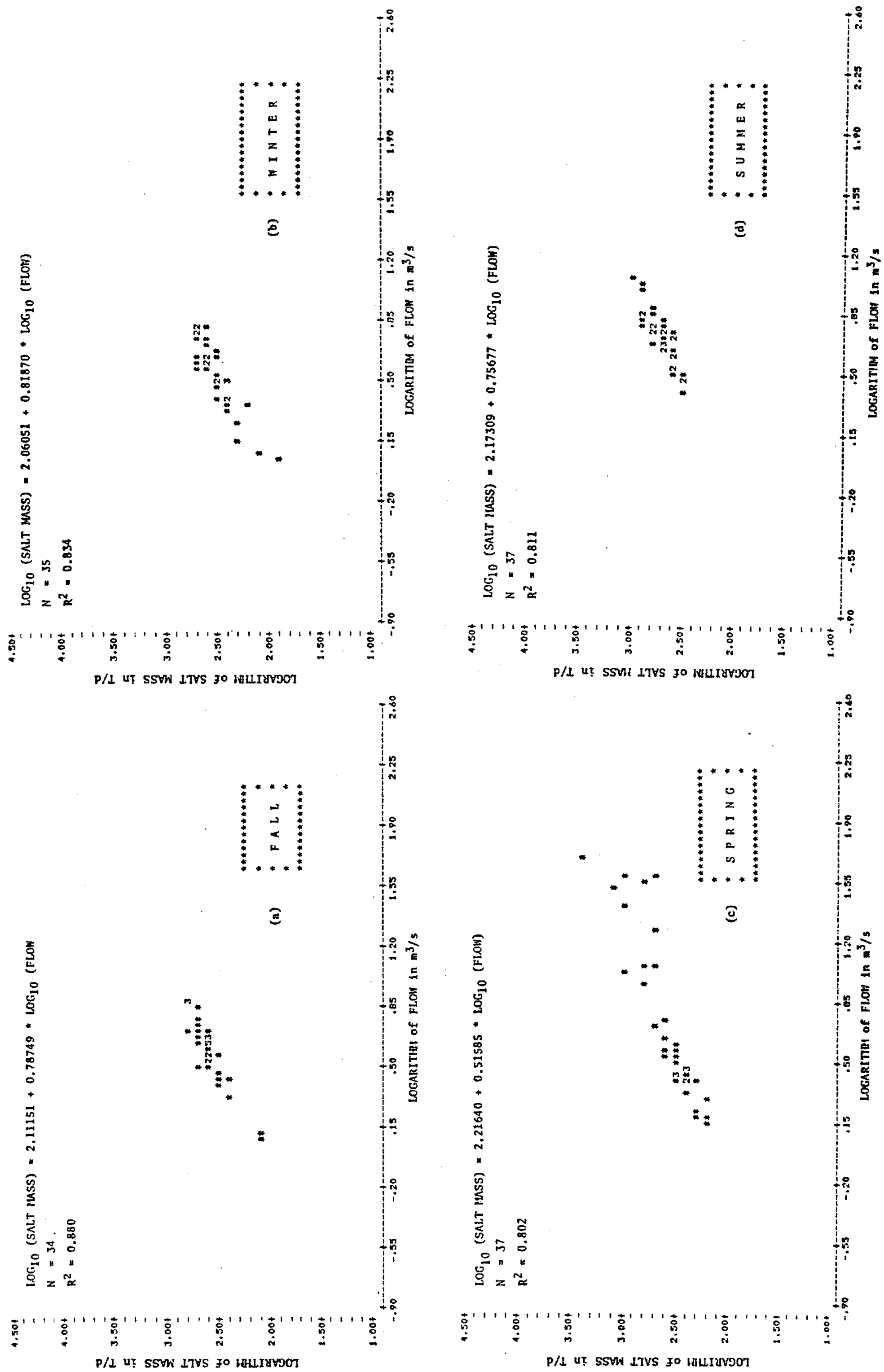

Figure B-2. Salinity mass - flow data used in regression analysis, St. Vrain Creek near Platteville.

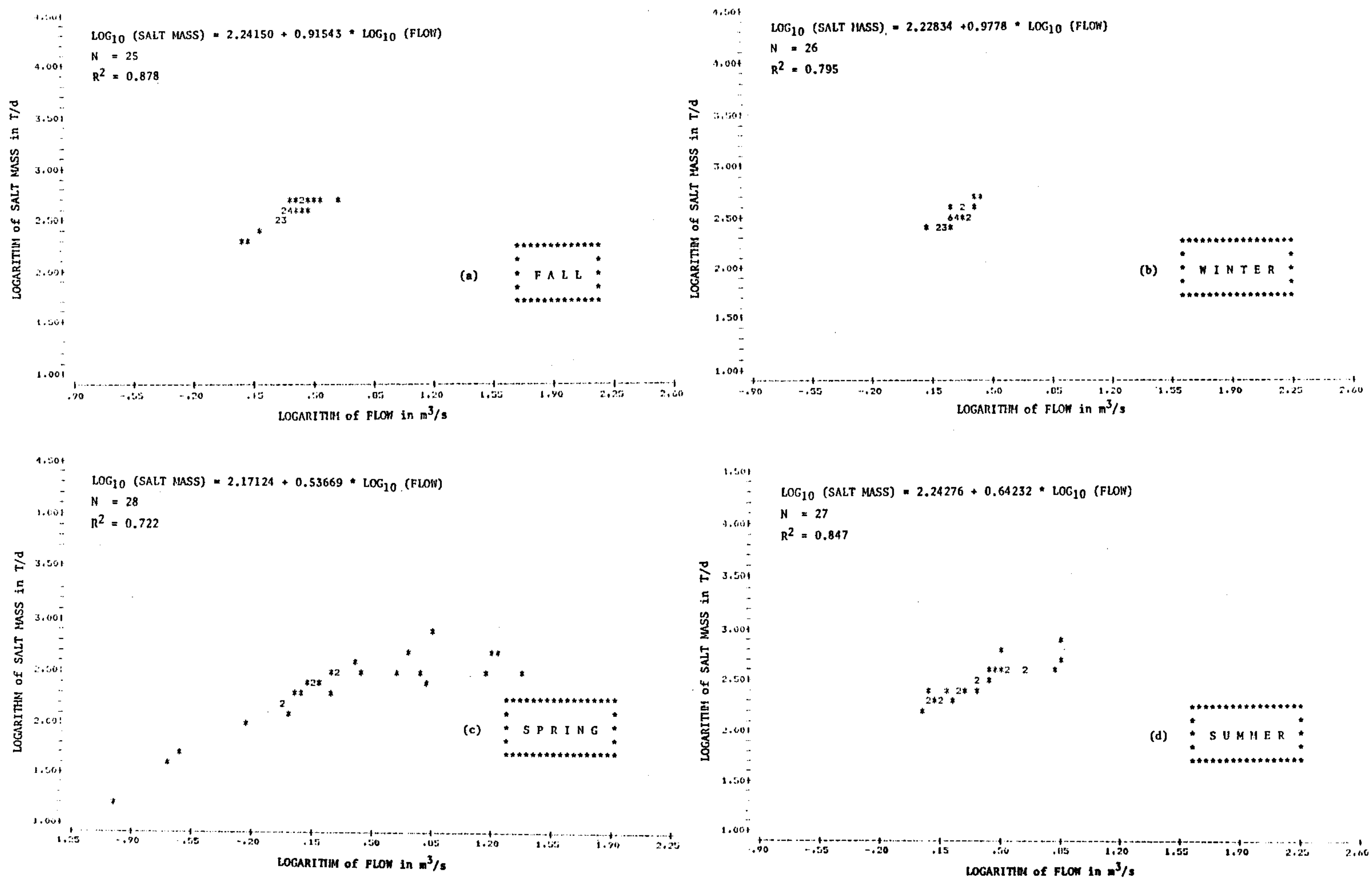

Figure B-3. Salinity mass - flow data used in regression analysis, Big Thompson River near La Salle.

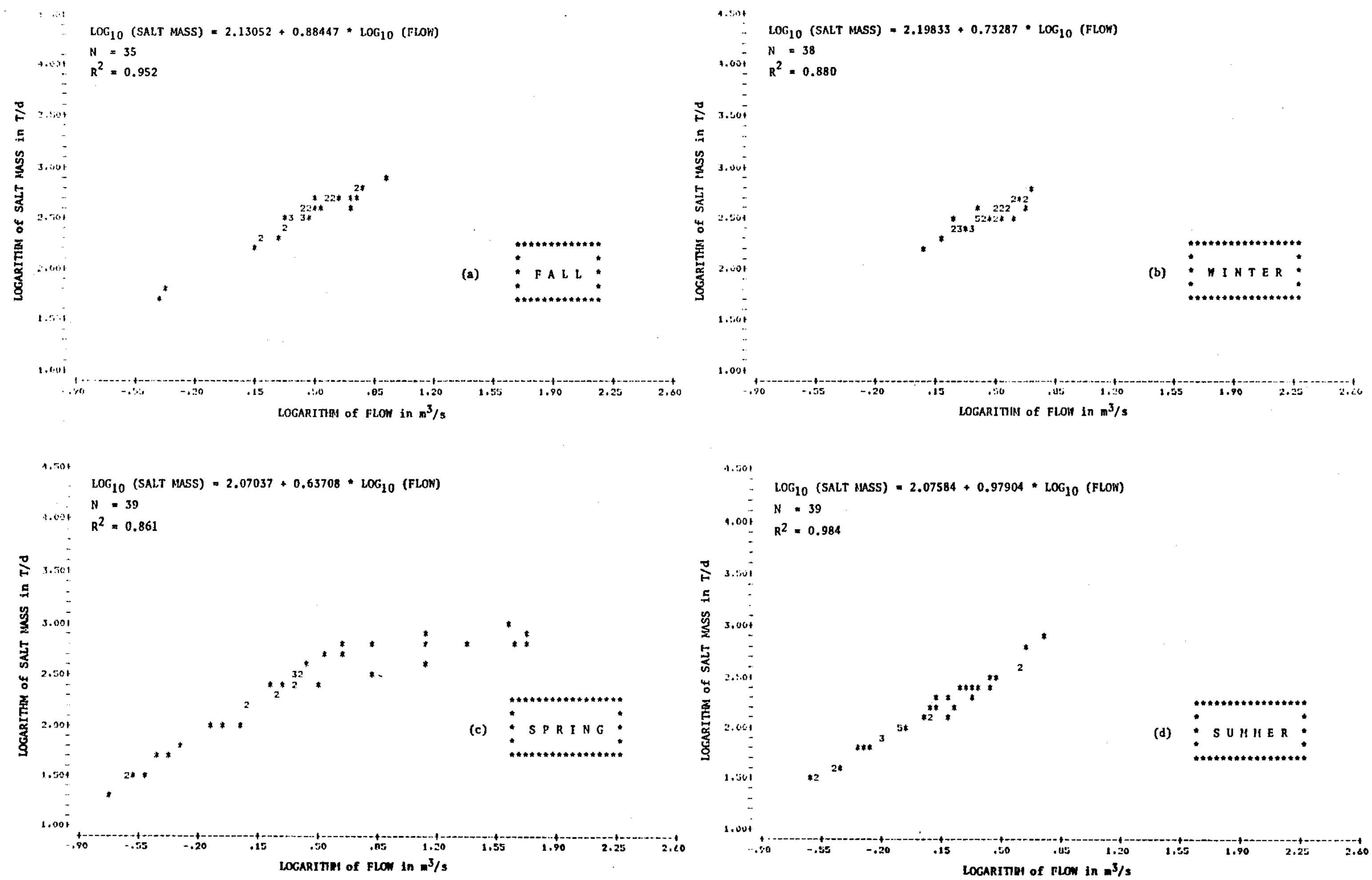

Figure B-4. Salinity mass - flow data used in regression analysis, Cache La Poudre River near Greeley.

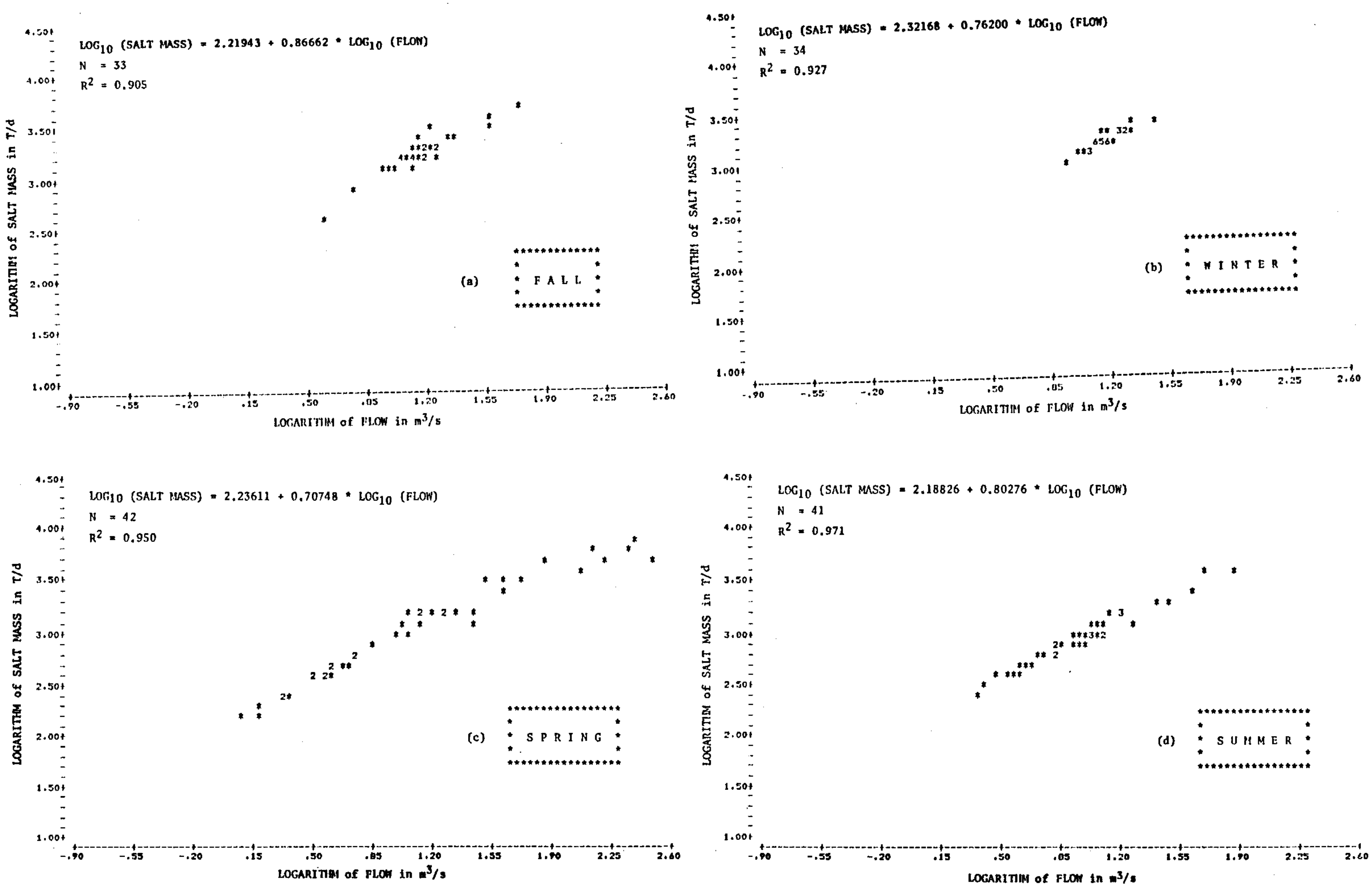

Figure B-5. Salinity mass - flow data used in regression analysis, South Platte River near Kersey.

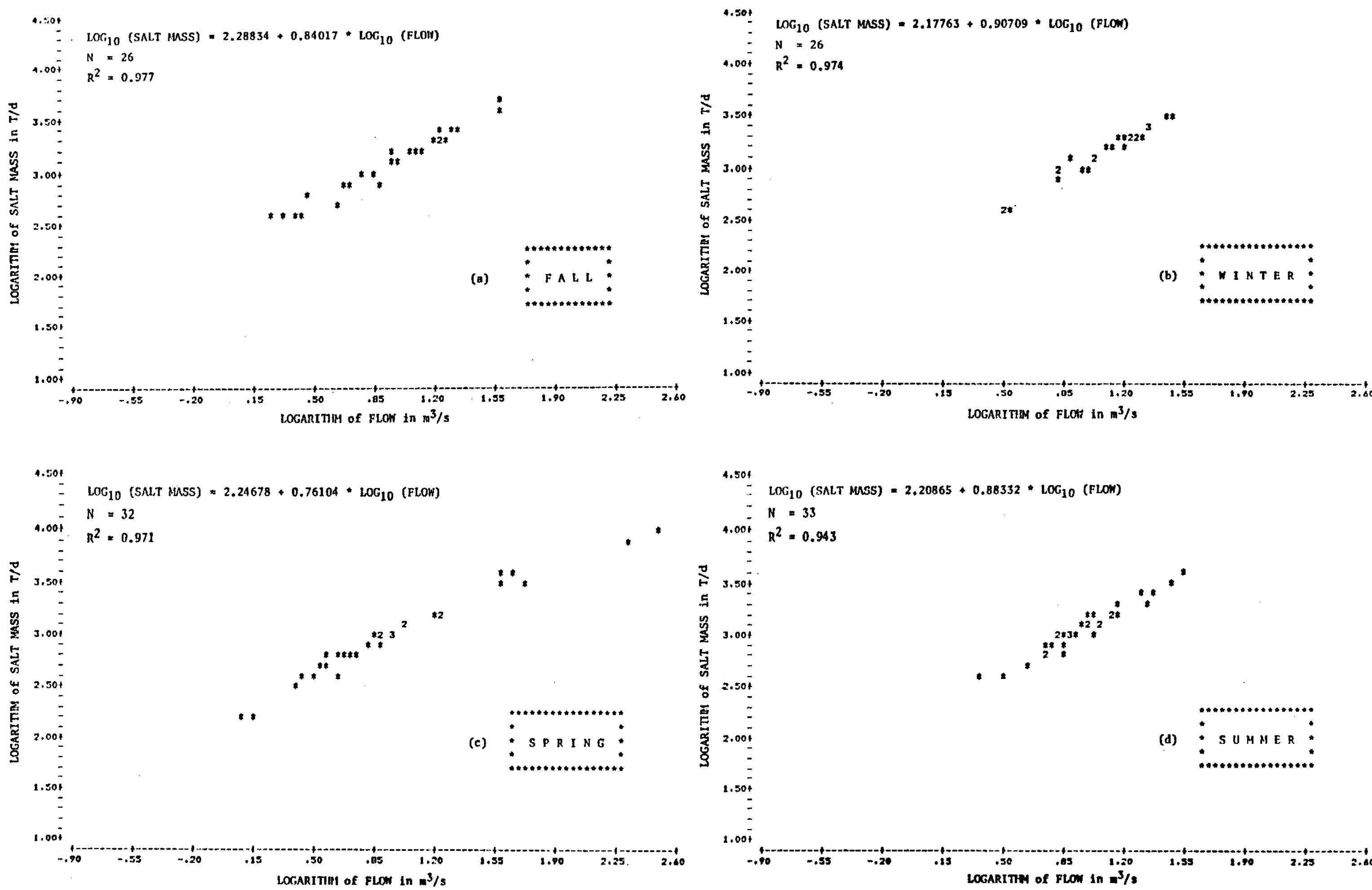

Figure B-6. Salinity mass - flow data used in regression analysis, South Platte River near Weldona.

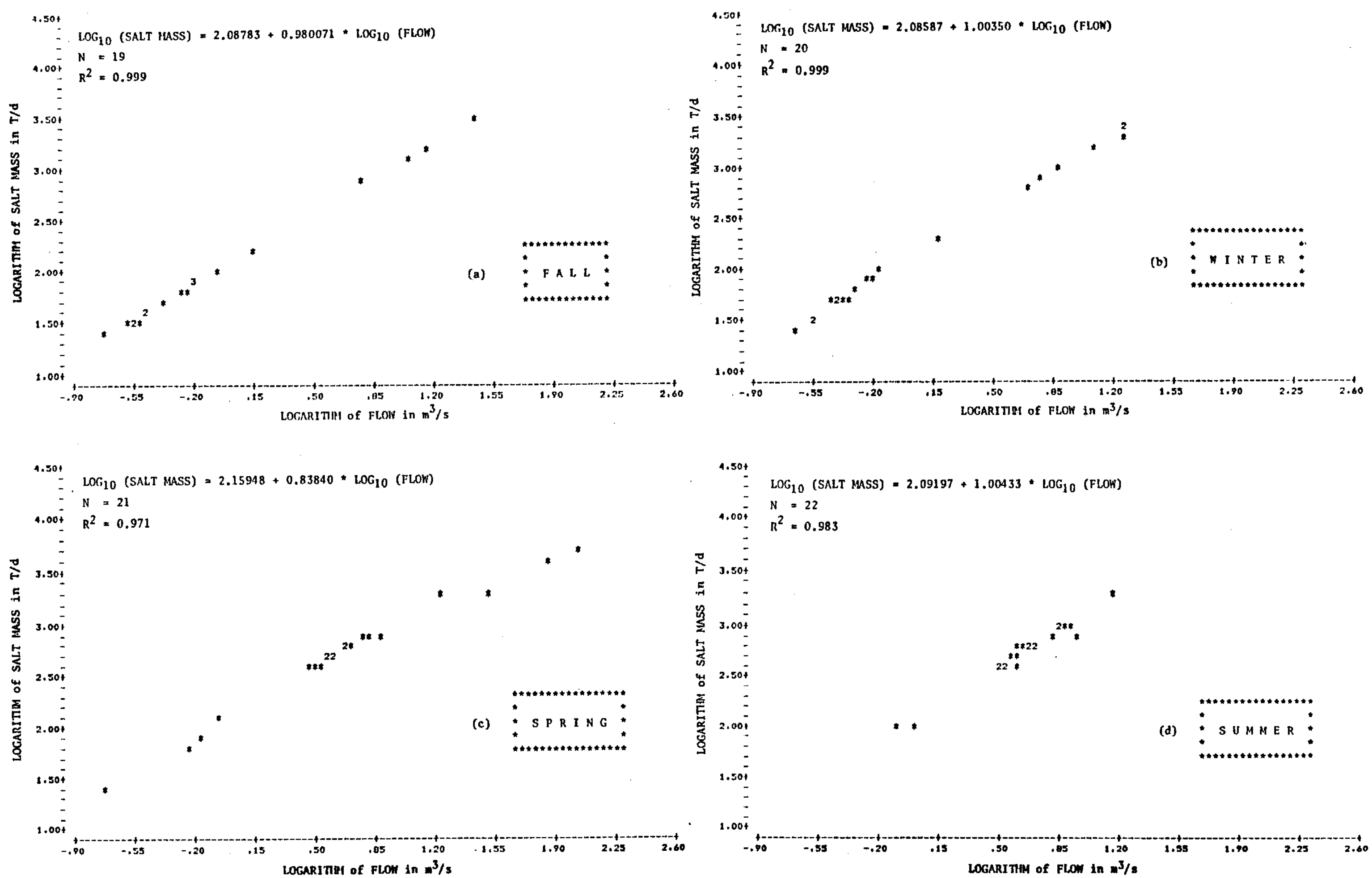

Figure B-7. Salinity mass - flow data used in regression analysis, South Platte River at Balzac.

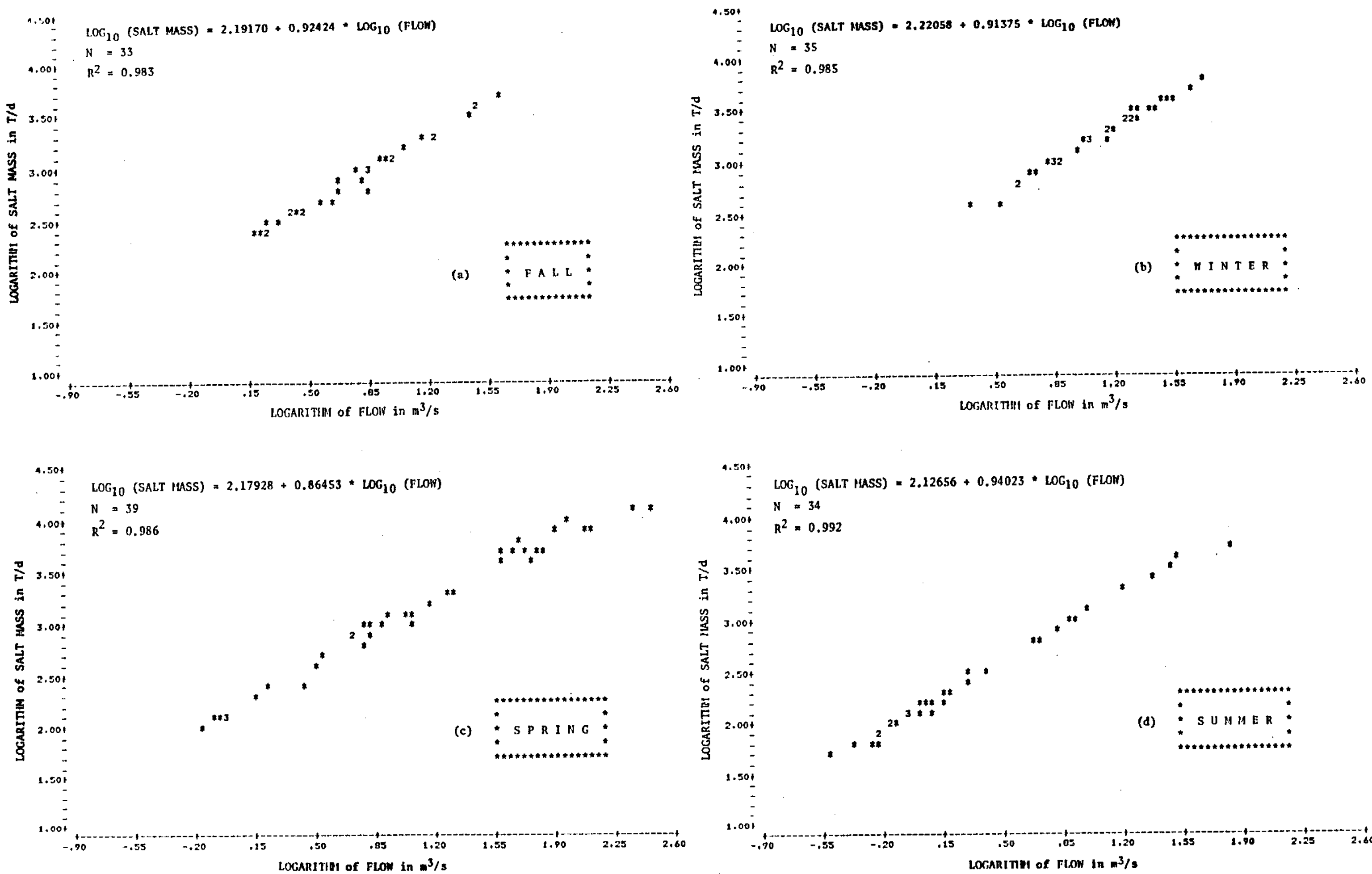

Figure B-8. Salinity mass - flow data used in regression analysis, South Platte River at Julesburg.

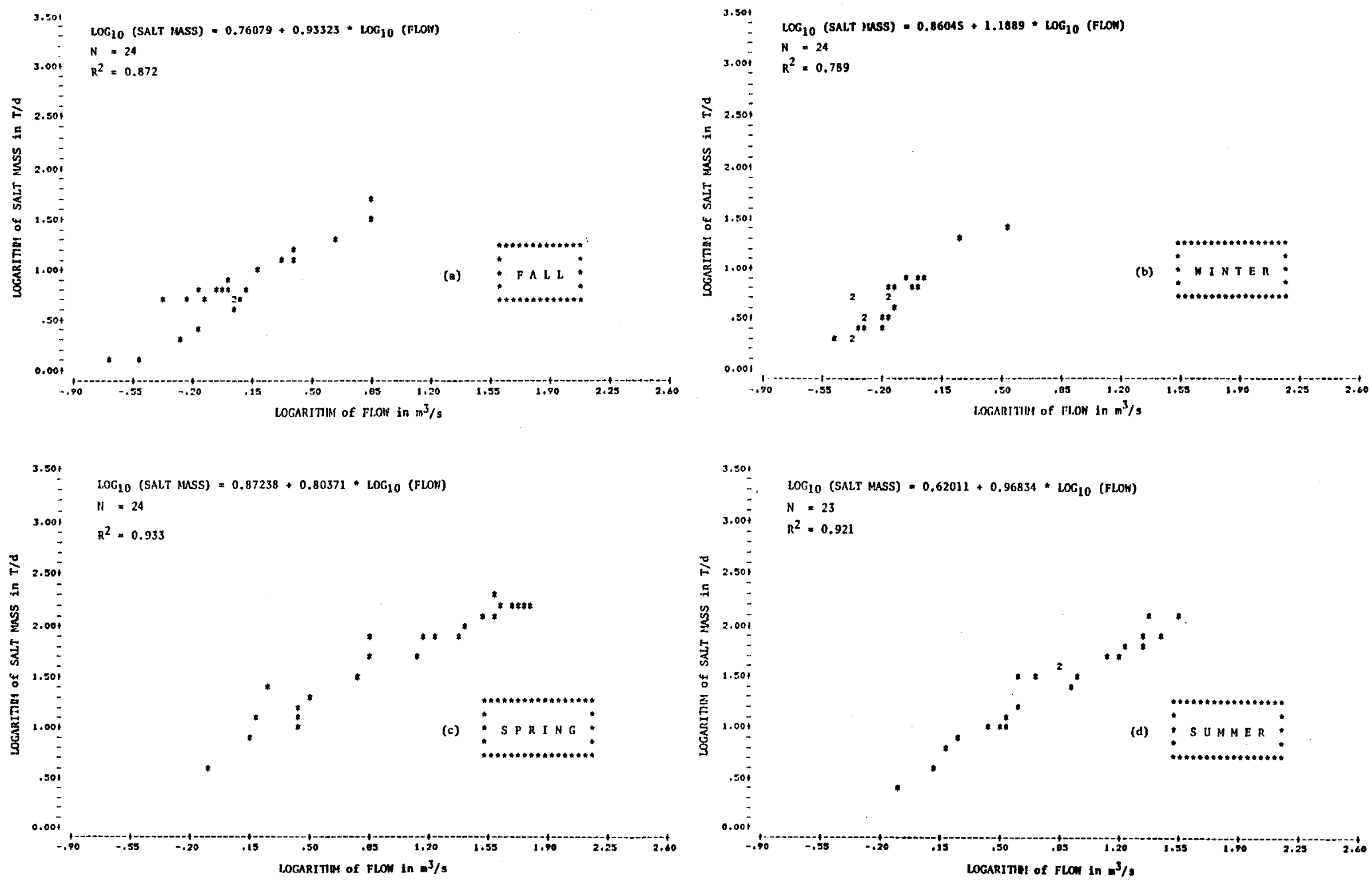

Figure B-9. Salinity mass - flow data used in regression analysis, Cache La Poudre River at mouth of canyon.

APPENDIX C

COMPARISON BETWEEN OBSERVED AND COMPUTED SALT FLOWS IN THE SOUTH PLATTE RIVER AT JULESBURG

Table C-1 compares computed in-stream salt mass flows at Julesburg by season for the period 1965-79, by two regression equations. The computed salt mass flows were obtained using Equation (4-2), i.e., log (salt mass) = A + B log (flow). The A and B coefficients were obtained by regression analysis using two sets of 1965-79 data (e.g., daily samples and monthly grab samples for columns C.1 and C.2, respectively). Observed averages are shown for reference. Comparisons of observed and computed salt mass flows shows the residuals obtained in using the regression functions. Table C-2 shows the same type of comparisons as given in Table C-1, but on an annual basis.

Table C-3 shows monthly average flows and TDS, and monthly flow weighted average TDS compared with computed values. Tables C-4 and C-5 show the same information for season and annual bases, respectively.

Table C-1. Comparison between computed seasonal transport of salt in the South Platte River at Julesburg, using C.1 and C.2 regression equations. Observed seasonal averages are shown for reference.

WATER YEAR	FALL SALT MASS (T/d)			WINTER SALT MASS (T/d)			SPRING SALT MASS (T/d)			SUMMER SALT MASS (T/d)		
	OBSERVED	COMPUTED		OBSERVED	COMPUTED		OBSERVED	COMPUTED		OBSERVED	COMPUTED	
		C.1	C.2		C.1	C.2		C.1	C.2		C.1	C.2
65	198	206	210	480	502	506	2781	3191	3009	2255	2183	2322
66	3585	3580	3501	2808	2816	2854	561	533	529	331	311	324
67	724	724	724	783	792	799	1529	1484	1437	1242	1430	1522
68	731	695	695	1407	1329	1344	559	510	507	1046	1222	1302
69	806	751	751	1127	1049	1059	3927	4525	4315	702	802	851
70	2322	2302	2260	3970	3839	3895	5751	6046	5779	764	836	885
71	1956	1958	1931	3146	3139	3182	4041	4320	4151	452	426	448
72	1469	1461	1447	1801	1821	1843	522	499	496	266	239	249
73	778	742	741	3008	2937	2977	9084	10474	9919	1128	1257	1331
74	3260	3501	3423	3737	3843	3898	1779	1392	1354	285	283	296
75	657	746	745	1309	1567	1585	1847	1983	1925	309	321	336
76	957	957	952	1880	1880	1903	361	361	360	103	103	106
77	396	358	362	1055	1038	1048	804	693	685	183	164	170
78	397	384	388	692	675	681	444	418	416	84	80	83
79	379	371	375	1188	1137	1149	4124	4361	4170	1578	1336	1415
Mean	1241.0	1249.1	1233.7	1892.7	1890.9	1914.9	2540.9	2719.3	2603.5	715.2	732.9	776.0
St.Dv.	1066.1	1101.6	1073.1	1146.7	1138.9	1156.7	2478.9	2845.1	2693.4	626.8	627.7	669.1

Observed is measured EC converted to TDS, times measured flow, as daily mean for year, using daily data.
C.1 Computed is calculated salt mass made using salt mass-flow regression lines for each season, derived from 15 years of daily records, using daily flow as argument.
C.2 Computed is calculated salt mass made using salt mass-flow regression lines for each season, derived from monthly grab sample data, using daily flow as argument.
T/d is metric tons of total dissolved solids per day.

Table C-2. Comparison between computed annual transport of salt in the South Platte River at Julesburg, using C.1 and C.2 regression equations. Observed annual averages are shown for reference.

WATER YEAR	SALT MASS (T/d)		
	OBSERVED	COMPUTED	
		C.1	C.2
65	1427	1519	1511
66	1824	1813	1805
67	1066	1104	1117
68	937	941	964
69	1635	1776	1738
70	3186	3240	3189
71	2391	2453	2420
72	1012	1002	1005
73	3488	3840	3730
74	2265	2255	2243
75	1028	1151	1145
76	822	822	827
77	602	556	559
78	397	382	385
79	1818	1801	1777
Mean	1593.2	1643.7	1627.7
St.Dev.	915.0	977.5	948.4

Observed is measured EC converted to TDS, times measured flow, as daily mean for year, using daily data.
C.1 Computed is calculated salt mass made using salt mass-flow regression lines for each season, derived from 15 years of daily records, using daily flow as argument.
C.2 Computed is calculated salt mass made using salt mass-flow regression lines for each season, derived from monthly grab sample data, using daily flow as argument.
T/d is metric tons of total dissolved solids per day.

Table C-3. Monthly average flows and TDS, and monthly flow weighted average TDS compared with computed values, water years 1965-79, South Platte River at Julesburg.

M O N T H L Y   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL MONTHLY AVERAGE FLOW (CMS)	ACTUAL MONTHLY AVERAGE TDS (MG/L)	ACTUAL MONTHLY F.W.AV. TDS (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.2)** (MG/L)
			OCTOBER		
65	.7	1593.9	1593.3	1798.4	1850.0
66	32.9	1376.6	1376.4	1413.9	1380.6
67	3.9	1615.4	1612.8	1612.8	1620.6
68	3.0	1597.5	1604.5	1639.6	1653.4
69	3.8	1596.5	1597.4	1615.5	1623.9
70	4.8	1594.9	1590.6	1591.7	1594.8
71	12.1	1538.7	1531.4	1504.1	1488.7
72	9.8	1486.1	1481.6	1521.9	1510.2
73	2.8	1633.5	1636.4	1647.1	1662.6
74	39.7	1293.1	1293.4	1397.4	1361.3
75	3.8	1436.4	1437.5	1614.3	1622.5
76	3.9	1620.0	1612.3	1612.3	1620.0
77	2.1	1776.0	1772.6	1676.0	1698.1
78	2.7	1728.3	1733.2	1644.5	1659.4
79	2.5	1725.0	1710.8	1650.6	1667.0
			NOVEMBER		
65	1.4	1619.9	1619.2	1719.5	1751.8
66	27.6	1457.7	1449.4	1427.2	1396.7
67	5.4	1589.6	1578.4	1578.4	1578.7
68	4.9	1650.5	1674.6	1582.7	1583.9
69	5.7	1645.1	1669.5	1571.6	1570.3
70	22.2	1496.6	1478.5	1444.1	1416.8
71	16.4	1493.4	1483.8	1475.1	1453.9
72	11.9	1542.6	1540.3	1506.0	1451.0
73	4.6	1644.6	1658.5	1594.3	1598.1
74	27.4	1347.2	1343.5	1429.6	1399.5
75	3.8	1432.6	1438.2	1609.2	1616.3
76	5.6	1585.5	1574.2	1574.2	1573.6
77	1.8	1864.4	1861.9	1694.6	1721.0
78	2.4	1659.3	1656.7	1662.0	1680.9
79	2.4	1703.0	1697.6	1665.5	1695.1

*C.1 is salt mass-flow regression lines for each season derived from 15 years of daily records were used in these computations.

**C.2 is salt mass-flow regression lines for each season derived from monthly grab sample data were used in these computations.

Table C-3. (continued).

WATER YEAR	ACTUAL MONTHLY AVERAGE FLOW (CMS)	ACTUAL MONTHLY AVERAGE TDS (MG/L)	ACTUAL MONTHLY F.W.AV. TDS (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.2)** (MG/L)
			DECEMBER		
65	2.1	1661.8	1663.5	1669.8	1690.6
66	26.6	1465.6	1463.5	1432.3	1402.7
67	6.5	1567.3	1562.8	1562.6	1555.7
68	7.5	1673.7	1670.8	1550.1	1544.3
69	6.8	1781.2	1774.8	1558.7	1554.7
70	28.3	1431.7	1425.4	1427.0	1396.5
71	17.5	1444.2	1440.6	1470.5	1449.4
72	12.0	1536.6	1526.6	1503.1	1437.5
73	9.1	1719.5	1627.7	1520.4	1508.6
74	18.4	1368.3	1362.0	1462.2	1438.4
75	8.9	1337.2	1334.7	1533.0	1523.5
76	12.2	1510.0	1499.2	1499.2	1482.5
77	3.4	1863.8	1853.0	1625.4	1636.0
78	3.0	1701.9	1704.2	1639.9	1653.8
79	2.9	1666.4	1661.0	1643.3	1557.9
			JANUARY		
65	2.5	1636.4	1630.8	1759.8	1772.3
66	21.7	1457.7	1448.4	1451.5	1470.7
67	6.7	1650.6	1644.6	1615.3	1631.2
68	10.9	1731.0	1692.0	1536.4	1553.5
69	8.3	1768.7	1760.4	1584.9	1601.5
70	44.3	1438.5	1408.1	1357.0	1377.9
71	21.4	1542.1	1451.9	1444.8	1464.2
72	11.2	1551.9	1546.6	1543.2	1560.7
73	18.9	1579.1	1526.0	1465.3	1484.3
74	35.3	1346.8	1305.6	1386.2	1406.6
75	13.3	1297.3	1288.9	1519.2	1337.1
76	16.3	1509.6	1491.6	1481.6	1500.2
77	4.5	1826.0	1788.1	1665.0	1679.8
78	3.6	1676.3	1569.2	1705.4	1719.2
79	4.4	1827.5	1789.9	1658.2	1673.1
			FEBRUARY		
65	4.5	1658.2	1650.2	1670.4	1685.1
66	29.2	1414.9	1411.4	1416.6	1436.5
67	6.5	1626.4	1626.1	1620.8	1636.6
68	9.2	1649.1	1649.1	1571.4	1588.2
69	7.5	1727.1	1729.1	1599.7	1615.9
70	34.1	1442.6	1436.1	1395.6	1415.9
71	29.6	1415.1	1414.2	1415.2	1435.2
72	18.5	1463.8	1425.8	1465.0	1484.0
73	27.1	1440.3	1436.9	1426.4	1446.1
74	30.9	1367.2	1365.2	1410.0	1430.0
75	16.0	1251.9	1241.4	1491.9	1510.4
76	12.9	1530.3	1520.2	1520.2	1538.2
77	6.5	1692.1	1653.2	1619.6	1635.4
78	5.2	1683.8	1676.2	1653.0	1668.1
79	15.0	1596.0	1514.4	1481.8	1500.5

Table C-3. (continued).

M O N T H L Y   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL MONTHLY AVERAGE FLOW (CMS)	ACTUAL MONTHLY AVERAGE TDS (MG/L)	ACTUAL MONTHLY F.W.AV. TDS (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.2)** (MG/L)
			MARCH		
65	3.3	1615.9	1617.6	1717.2	1730.8
66	17.6	1485.2	1454.6	1468.0	1436.9
67	3.8	1558.4	1561.8	1699.9	1713.9
68	9.5	1594.4	1588.8	1559.8	1576.9
69	7.0	1650.6	1652.2	1609.0	1625.1
70	17.5	1532.8	1529.0	1479.2	1497.9
71	25.6	1438.7	1438.2	1434.4	1454.0
72	12.6	1525.2	1520.7	1524.6	1542.4
73	25.1	1476.8	1474.0	1435.0	1454.6
74	28.8	1460.2	1435.8	1417.3	1437.2
75	6.9	1318.8	1306.3	1599.1	1615.4
76	14.2	1518.8	1505.6	1505.6	1523.8
77	11.5	1513.3	1491.2	1526.4	1544.1
78	5.4	1764.6	1748.5	1638.8	1654.2
79	6.8	1708.9	1711.0	1607.1	1623.2
			APRIL		
65	1.7	1609.4	1622.6	1588.6	1599.0
66	8.1	1458.3	1457.7	1334.0	1315.5
67	1.2	1593.5	1592.4	1685.1	1706.9
68	6.4	1537.5	1554.0	1335.5	1318.6
69	3.2	1594.0	1596.5	1467.1	1485.5
70	58.2	1220.9	1204.0	1046.7	1005.3
71	24.7	1434.8	1362.2	1152.6	1117.2
72	3.8	1569.1	1567.7	1427.5	1420.1
73	45.1	1397.8	1380.1	1079.0	1039.9
74	32.9	1571.8	1567.9	1120.3	1084.2
75	14.8	1533.5	1502.0	1225.0	1197.5
76	4.2	1454.4	1438.6	1436.6	1431.8
77	9.5	1700.0	1668.5	1304.2	1283.9
78	2.1	1731.9	1743.4	1559.9	1566.7
79	8.4	1756.2	1752.8	1327.3	1309.0
			MAY		
65	1.3	1466.0	1332.8	1597.9	1610.3
66	1.9	1555.7	1528.1	1575.1	1583.7
67	2.3	1579.4	1626.2	1528.1	1531.4
68	3.1	1537.4	1540.6	1486.7	1485.2
69	58.7	1135.8	912.2	998.0	953.9
70	47.7	1123.5	1015.7	1048.5	1007.5
71	31.5	877.4	869.5	990.3	945.2
72	2.9	1550.1	1556.3	1494.6	1494.0
73	243.2	778.2	689.5	870.6	819.2
74	4.3	1321.4	1272.9	1367.4	1354.1
75	6.7	1294.4	1200.6	1297.9	1278.0
76	2.6	1573.3	1501.1	1501.1	1501.5
77	4.8	1377.1	1460.1	1348.4	1333.3
78	1.7	1718.2	1693.4	1587.2	1597.5
79	20.4	1406.1	1272.7	1166.2	1134.0

Table C-3. (continued).

M O N T H L Y   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL MONTHLY AVERAGE FLOW (CMS)	ACTUAL MONTHLY AVERAGE TDS (MG/L)	ACTUAL MONTHLY F.W.AV. TDS (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.2)** (MG/L)
			JUNE		
65	125.1	1125.1	745.1	857.9	806.7
66	3.2	1519.7	1485.1	1468.9	1465.6
67	43.2	1210.4	1110.1	1077.0	1037.9
68	3.0	1561.6	1513.5	1472.4	1469.6
69	99.1	980.7	781.4	944.7	897.4
70	104.8	880.0	779.8	950.5	903.4
71	25.8	1053.1	1011.5	1149.5	1115.7
72	5.5	1452.4	1364.9	1348.8	1333.4
73	103.7	866.4	804.6	967.3	921.0
74	4.7	1302.8	1161.7	1313.2	1295.3
75	38.9	934.0	880.3	1091.4	1053.3
76	1.4	1679.0	1621.5	1621.5	1635.8
77	3.8	1454.3	1371.5	1406.9	1397.7
78	6.5	1526.8	1387.9	1334.7	1317.7
79	124.1	881.8	832.8	946.7	899.3
			JULY		
65	28.5	1188.7	1074.0	1156.4	1232.3
66	2.2	1443.8	1399.0	1399.0	1458.6
67	39.7	1106.6	983.5	1146.5	1223.0
68	.9	1551.9	1489.1	1496.0	1547.9
69	20.7	1213.3	990.0	1156.8	1232.5
70	16.4	1210.3	980.9	1179.6	1254.0
71	2.2	1325.0	1299.5	1403.9	1463.2
72	.9	1519.0	1514.6	1503.4	1554.8
73	9.6	1197.0	1093.0	1258.5	1328.2
74	.8	1346.3	1346.8	1520.6	1570.5
75	2.2	1392.1	1305.8	1399.6	1459.2
76	.7	1544.2	1538.6	1538.6	1587.0
77	1.1	1562.3	1515.9	1476.1	1529.7
78	.9	1636.6	1629.9	1506.8	1557.9
79	9.1	1320.6	1236.9	1236.2	1307.1
			AUGUST		
65	24.3	1343.4	1310.1	1166.6	1241.9
66	1.4	1456.3	1474.0	1459.9	1514.8
67	1.4	1456.3	1436.0	1457.5	1512.6
68	30.4	1439.2	854.9	1109.0	1187.3
69	1.3	1446.5	1438.1	1462.1	1516.9
70	1.6	1407.6	1409.0	1445.7	1501.8
71	.7	1440.8	1437.1	1530.8	1579.9
72	1.2	1536.9	1497.0	1422.2	1479.7
73	3.4	1116.2	1055.2	1356.8	1419.7
74	.8	1394.7	1397.6	1520.1	1570.1
75	2.2	1294.2	1230.5	1393.6	1453.6
76	.5	1569.3	1561.8	1561.8	1609.1
77	1.5	1649.3	1649.9	1444.5	1500.7
78	.5	1577.3	1580.9	1571.4	1616.9
79	19.6	1566.0	1589.6	1179.9	1254.4

Table C-3. (continued).

M O N T H L Y R E S U L T S . ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL MONTHLY AVERAGE FLOW (CMS)	ACTUAL MONTHLY AVERAGE TDS (MG/L)	ACTUAL MONTHLY F.W.AV. TDS (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED MONTHLY F.W.AV. TDS(C.2)** (MG/L)
			SEPTEMBER		
65	11.4	1381.3	1363.2	1243.4	1314.1
66	4.3	1532.1	1515.0	1348.5	1412.1
67	1.1	1540.8	1542.9	1483.6	1536.6
68	5.4	1628.0	1647.9	1327.7	1392.8
69	1.1	1539.1	1553.8	1480.8	1534.0
70	5.6	1480.5	1454.3	1297.1	1364.1
71	8.6	1451.9	1391.9	1249.2	1319.5
72	4.0	1581.4	1560.7	1341.1	1405.1
73	23.0	1143.4	1105.4	1186.5	1260.8
74	5.7	1392.5	1372.2	1321.1	1386.7
75	3.8	1352.6	1397.5	1353.9	1417.0
76	1.3	1513.2	1432.7	1432.7	1489.7
77	1.3	1694.4	1695.0	1456.9	1512.0
78	.4	1688.0	1690.3	1596.3	1639.5
79	9.2	1347.5	1311.3	1281.2	1349.5

Table C-4. Seasonal average flows and TDS, and seasonal flow weighted average TDS compared with computed values, water years 1965-79, South Platte River at Julesburg.

S E A S O N A L   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL SEASONAL AVERAGE FLOW (CMS)	ACTUAL SEASONAL AVERAGE TDS (MG/L)	ACTUAL SEASONAL F.W.AV. TDS (MG/L)	ESTIMATED SEASONAL F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED SEASONAL F.W.AV. TDS(C.2)** (MG/L)
			FALL		
65	1.4	1625.3	1637.9	1706.9	1736.5
66	29.1	1433.0	1426.0	1423.7	1392.5
67	5.3	1590.8	1580.6	1580.6	1581.4
68	5.1	1640.4	1659.1	1577.8	1578.0
69	5.5	1674.6	1696.8	1576.5	1576.4
70	18.4	1507.9	1460.7	1448.2	1421.9
71	15.3	1492.1	1479.8	1481.0	1461.0
72	11.2	1521.6	1519.1	1509.6	1495.4
73	5.5	1666.1	1637.5	1562.1	1559.2
74	28.5	1335.1	1324.1	1421.6	1390.1
75	5.5	1401.7	1381.7	1568.9	1567.2
76	7.2	1571.7	1538.5	1538.5	1530.4
77	2.5	1834.4	1831.9	1656.6	1674.4
78	2.7	1696.9	1700.1	1647.9	1663.6
79	2.6	1698.0	1688.0	1652.3	1668.9
			WINTER		
65	3.4	1636.1	1634.3	1709.1	1722.9
66	22.6	1453.9	1437.9	1441.9	1461.4
67	5.6	1611.3	1618.9	1636.8	1652.2
68	9.9	1658.5	1645.3	1554.3	1571.5
69	7.6	1715.1	1716.4	1597.1	1613.4
70	31.9	1472.2	1440.3	1392.9	1413.2
71	25.4	1467.0	1433.4	1430.5	1450.1
72	14.0	1515.3	1488.8	1505.2	1523.4
73	23.6	1500.7	1475.1	1440.3	1459.8
74	31.7	1392.2	1364.5	1403.2	1423.3
75	11.9	1290.6	1272.7	1523.9	1541.7
76	14.5	1519.2	1500.3	1500.3	1518.7
77	7.6	1676.6	1606.9	1580.1	1596.7
78	4.7	1709.0	1703.0	1661.3	1676.1
79	8.5	1714.6	1617.4	1547.6	1564.9

*C.1 is salt mass-flow regression lines for each season derived from 15 years of daily records were used in these computations.

**C.2 is salt mass-flow regression lines for each season derived from monthly grab sample data were used in these computations.

Table C-4. (continued).

S E A S O N A L   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL SEASONAL AVERAGE FLOW (CMS)	ACTUAL SEASONAL AVERAGE TDS (MG/L)	ACTUAL SEASONAL F.W.AV. TDS (MG/L)	ESTIMATED SEASONAL F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED SEASONAL F.W.AV. TDS(C.2)** (MG/L)
			SPRING		
65	42.2	1400.9	762.7	875.2	825.4
66	4.4	1511.7	1474.9	1402.8	1392.6
67	15.4	1462.4	1148.9	1115.6	1080.1
68	4.2	1545.4	1541.0	1406.1	1356.4
69	53.7	1235.7	846.3	975.3	930.1
70	70.0	1075.3	950.9	999.6	955.5
71	47.8	1119.0	978.5	1046.1	1005.1
72	4.1	1524.2	1474.4	1408.9	1399.5
73	131.9	1011.6	797.1	919.1	870.4
74	13.8	1397.8	1491.8	1167.7	1136.0
75	20.0	1254.4	1068.8	1147.6	1114.2
76	2.8	1569.0	1490.5	1490.5	1489.6
77	6.0	1509.0	1550.5	1337.4	1320.8
78	3.4	1659.6	1510.7	1422.4	1414.8
79	50.6	1348.7	943.3	997.6	953.8
			SUMMER		
65	21.5	1303.6	1213.9	1175.3	1230.1
66	2.6	1476.8	1474.9	1382.5	1443.4
67	14.2	1366.1	1012.7	1165.3	1240.6
68	12.3	1538.8	984.2	1149.8	1225.5
69	7.8	1398.1	1042.1	1189.8	1262.9
70	7.9	1364.9	1119.3	1224.6	1296.1
71	3.8	1405.4	1376.7	1297.0	1363.8
72	2.0	1545.4	1541.2	1381.7	1442.5
73	11.9	1152.3	1097.1	1222.6	1294.5
74	2.4	1377.6	1372.2	1355.5	1427.5
75	2.7	1346.2	1326.6	1377.3	1432.6
76	.8	1542.5	1487.6	1487.6	1540.1
77	1.3	1634.7	1626.6	1457.6	1512.7
78	.6	1633.4	1629.2	1543.7	1591.5
79	12.7	1412.1	1438.5	1217.5	1289.7

Table C-5. Annual average flow and TDS, and annual flow weighted average TDS compared to computed values water years 1965-79, South Platte River at Julesburg.

A N N U A L   R E S U L T S   ALL DAYS HAVE BEEN CONSIDERED. MISSING TDS VALUES HAVE BEEN ESTIMATED USING C.1 REGRESSION LINES.

WATER YEAR	ACTUAL ANNUAL AVERAGE FLOW (CMS)	ACTUAL ANNUAL AVERAGE TDS (MG/L)	ACTUAL ANNUAL F.W.AV. TDS (MG/L)	ESTIMATED ANNUAL F.W.AV. TDS(C.1)* (MG/L)	ESTIMATED ANNUAL F.W.AV. TDS(C.2)** (MG/L)
65	17.1	1490.9	966.0	1028.0	1022.4
66	14.7	1468.8	1436.4	1427.2	1421.0
67	10.1	1507.2	1221.4	1265.1	1280.5
68	7.9	1595.6	1372.9	1378.9	1412.9
69	18.6	1505.5	1017.5	1105.0	1081.8
70	31.9	1355.2	1155.9	1175.6	1157.1
71	23.0	1371.0	1203.2	1234.3	1217.8
72	7.8	1526.7	1501.0	1486.2	1491.8
73	43.1	1332.6	936.6	1031.3	1001.7
74	19.1	1375.8	1372.5	1366.3	1358.9
75	10.0	1323.6	1189.9	1332.6	1325.1
76	6.3	1550.7	1509.9	1509.9	1519.6
77	4.3	1664.0	1621.1	1497.3	1505.5
78	2.8	1674.6	1641.4	1581.0	1591.1
79	18.6	1542.9	1131.0	1120.3	1106.0

*C.1 is salt mass-flow regression lines for each season derived from 15 years of daily records were used in these computations.

**C.2 is salt mass-flow regression lines for each season derived from monthly grab sample data were used in these computations.

APPENDIX D

MEAN VALUES OF FLOW AND SALT MASS FLOW AND FLOW WEIGHTED MEAN TOTAL DISSOLVED SOLIDS FOR ANNUAL, SEASONAL, AND MONTHLY TIME INTERVALS, WATER YEARS 1965-79, FOR EIGHT RIVER STATIONS IN THE SOUTH PLATTE RIVER BASIN

Tables D-1, D-2, and D-3 were computed from published USGS daily flow records for the period 1965-79. Table D-1 was used in constructing the distance profile plots of annual averages, shown in Figures 4-4, 4-5, and 4-6. Table D-2 was used to construct the fifteen distance profile plots of seasonal averages, Figure D-1. Table D-3 was added for reference in event analysis using monthly resolution is of interest.

Figures D-1 to D-15 show distance profile plots of mean daily flow, flow weighted mean daily total dissolved solids, and mean daily salt mass flow all averaged over the four seasons. The seasonal profiles are grouped by water years for the period 1965-79. They are included to show additional resolution, which is not seen in the annual plots.

Table D-1. Mean daily flow, flow weighted average of total dissolved solids, and mean daily salt mass flow averaged over each water year, 1965-79, for eight stations in South Platte River Basin.

WATER YEAR	RIVER POINT 1	2	3	4	5	6	7	8
MEAN ANNUAL FLOW (CMS) :								
65	16.33	8.35	1.97	4.36	31.76	17.86	16.92	17.14
66	6.62	3.87	1.79	2.07	13.88	12.38	10.88	14.65
67	8.15	6.58	1.74	3.17	19.95	9.61	6.75	10.14
68	7.36	4.23	1.63	2.04	12.65	6.94	2.92	7.87
69	15.68	9.59	2.45	2.48	35.05	20.00	14.72	18.60
70	27.72	9.91	3.77	5.04	49.08	37.01	35.69	31.54
71	14.87	8.98	4.65	7.03	36.92	29.08	23.41	23.00
72	10.18	4.82	2.01	3.77	18.15	11.26	7.11	7.80
73	30.12	9.01	4.25	6.12	62.54	47.63	39.35	43.08
74	15.34	5.48	2.98	4.80	26.79	21.07	17.54	19.06
75	12.13	6.37	3.05	4.14	23.91	15.17	10.41	9.99
76	9.29	4.16	2.55	2.39	16.72	9.81	5.87	6.31
77	7.34	3.29	1.92	1.94	12.91	6.55	2.84	4.32
78	7.76	5.93	2.48	3.60	18.00	8.56	3.58	2.84
79	13.49	9.05	4.61	7.67	41.24	26.63	19.99	18.57
FLOW WEIGHTED MEAN ANNUAL SALINITY (MG/L) :								
65	362.76	722.65	1478.33	724.97	744.98	1014.12	1016.57	1022.36
66	629.69	1110.44	1862.98	1345.37	1223.37	1363.34	1380.58	1421.00
67	553.50	804.46	1634.33	971.92	937.79	1240.25	1223.93	1280.50
68	553.63	1074.20	1747.77	1254.33	1187.21	1459.23	1393.79	1412.95
69	344.92	560.28	1199.14	1071.22	669.66	849.66	878.79	1081.80
70	379.88	726.67	1188.49	909.26	775.51	960.27	1004.60	1157.15
71	507.00	726.85	987.17	810.05	835.93	1043.64	1107.42	1217.78
72	539.16	1004.80	1688.82	1110.46	1084.72	1358.59	1381.25	1491.34
73	311.30	685.38	968.28	790.19	585.55	902.33	914.42	1001.66
74	514.52	970.56	1484.03	1006.45	982.67	1225.96	1305.32	1358.88
75	476.70	880.64	1276.76	1028.31	964.81	1216.60	1229.05	1325.12
76	545.53	1091.78	1471.21	1312.26	1131.30	1405.16	1390.14	1519.60
77	594.49	1159.20	1649.44	1385.20	1209.90	1469.81	1412.32	1505.53
78	563.05	820.25	1315.64	884.58	993.55	1293.92	1286.49	1591.12
79	439.99	682.74	949.24	682.90	699.84	947.24	1000.85	1105.98
MEAN ANNUAL SALINITY MASS (T/D) :								
65	511.76	521.21	251.31	272.92	2044.15	1564.77	1486.24	1514.12
66	360.09	370.93	287.36	240.47	1467.30	1458.85	1297.58	1800.28
67	389.91	457.19	245.02	266.49	1516.72	1029.57	713.96	1121.73
68	352.29	392.92	245.46	221.50	1297.17	875.17	351.34	960.83
69	497.15	464.21	253.38	229.65	2028.20	1468.32	1117.34	1738.94
70	909.71	622.10	387.57	396.27	3221.24	3070.99	3098.05	3193.34
71	651.25	564.12	397.01	491.94	2666.71	2622.44	2239.80	2420.20
72	474.26	418.42	293.03	361.59	1701.41	1321.69	848.94	1005.36
73	811.67	533.49	355.43	417.51	3164.22	3301.75	3108.58	3728.32
74	682.08	459.64	381.89	417.62	2273.65	2231.97	1978.12	2237.37
75	499.47	484.76	336.09	368.15	1993.47	1594.23	1105.91	1143.62
76	437.93	392.11	323.81	271.40	1634.56	1190.60	700.22	828.45
77	377.15	329.16	273.29	232.23	1349.12	831.67	346.76	561.32
78	377.45	420.27	282.11	274.88	1545.35	956.59	357.84	389.96
79	512.74	533.96	377.99	452.35	2493.44	2179.53	1728.60	1774.75

1 = South Platte River at Henderson
2 = St. Vrain Creek near Platteville
3 = Big Thompson River near La Salle
4 = Cache La Poudre River near Greeley
5 = South Platte River near Kersey
6 = South Platte River near Weldona
7 = South Platte River at Balzac
8 = South Platte River at Julesburg

Table D-2. Mean daily flow, flow weighted average of total dissolved solids, and mean daily salt mass flow averaged over each seasons, 1965-79, for eight stations in South Platte River Basin.

WATER YEAR	MEAN SEASONAL FLOW (CMS)				FLOW WEIGHTED MEAN SEASONAL SALINITY (MG/L)				MEAN SEASONAL SALINITY MASS (T/D)			
	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
	RIVER POINT : 1 - SOUTH PLATTE RIVER AT HENDERSON											
65	2.95	5.00	26.44	30.79	772.03	758.97	302.45	311.88	196.69	327.72	690.99	823.60
66	8.91	4.35	6.48	6.69	654.32	781.12	557.36	569.84	503.73	293.43	311.97	329.25
67	5.37	5.22	9.86	12.12	716.12	763.24	474.04	456.98	332.02	344.50	403.73	479.48
68	3.70	4.01	10.32	11.40	750.45	792.05	476.66	476.75	239.70	274.10	424.87	469.57
69	3.45	2.56	46.55	14.18	756.54	847.52	257.47	439.73	225.67	197.70	1035.44	538.91
70	18.47	10.20	62.15	20.04	604.44	688.04	262.20	380.61	964.41	606.08	1408.07	659.11
71	12.31	12.27	20.02	14.87	640.35	671.35	380.81	431.93	681.27	711.61	659.55	554.86
72	8.77	6.44	14.02	11.46	671.08	737.25	419.75	473.85	508.28	410.17	505.59	468.99
73	6.37	9.20	83.98	21.06	695.18	697.93	225.01	372.59	384.55	554.77	1632.58	676.01
74	11.71	16.45	21.69	11.62	643.98	639.89	373.67	470.51	651.36	909.59	700.28	472.22
75	7.98	5.82	15.64	18.96	673.07	746.50	404.59	371.87	463.88	375.68	546.95	609.30
76	6.29	6.72	9.98	14.13	699.04	734.69	474.62	438.66	379.96	426.66	409.16	535.37
77	6.53	5.78	9.50	7.54	693.88	743.88	491.11	537.67	391.64	371.62	390.07	350.40
78	5.09	5.25	10.78	9.90	719.22	757.30	453.20	500.43	316.16	343.24	422.13	428.02
79	6.19	5.76	26.07	15.89	697.29	751.95	326.90	412.70	373.20	374.01	736.42	566.75
	RIVER POINT : 2 - ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE											
65	2.25	2.20	12.11	16.73	1257.60	1151.07	444.99	794.07	244.98	219.19	465.45	1148.06
66	5.10	3.83	2.43	4.08	1051.89	1037.55	1204.75	1195.01	463.57	343.71	252.84	421.74
67	2.49	1.98	9.22	12.55	1229.86	1170.90	531.82	861.65	264.59	200.18	423.68	934.37
68	3.71	4.23	3.76	5.23	1128.89	1019.11	979.20	1146.52	361.96	372.12	318.21	519.11
69	3.50	2.52	26.76	5.61	1133.05	1122.74	318.51	1096.58	342.29	244.37	736.54	531.35
70	8.31	5.16	18.83	7.33	950.56	985.55	431.97	1043.17	682.55	433.62	702.53	660.52
71	6.45	4.18	18.39	6.91	1005.03	1024.06	431.31	1069.48	559.80	369.53	685.40	638.84
72	5.03	4.05	5.32	4.87	1059.82	1025.55	785.22	1168.18	460.58	359.25	360.30	491.34
73	4.63	4.46	20.35	6.62	1073.77	1010.62	395.74	1080.05	429.19	389.54	695.40	618.07
74	4.69	4.93	6.34	5.96	1075.48	995.40	739.03	1111.49	436.19	423.67	407.31	572.74
75	4.78	3.95	9.32	7.42	1071.26	1033.89	580.25	1051.30	442.37	352.67	467.20	673.72
76	4.80	3.35	3.03	5.42	1070.29	1061.47	1089.60	1130.36	443.52	307.31	285.50	529.03
77	3.67	3.06	2.50	3.91	1134.12	1084.06	1203.46	1209.09	359.24	286.53	260.54	408.55
78	2.95	2.93	12.06	5.79	1187.19	1092.04	521.61	1113.97	302.39	276.05	543.25	557.53
79	4.04	3.72	20.71	7.75	1107.24	1047.08	402.24	1032.07	386.56	336.25	719.84	630.90
	RIVER POINT : 3 - BIG THOMPSON RIVER AT MOUTH, NEAR LA SALLE											
65	1.93	1.45	2.39	2.10	1906.49	1941.32	887.69	1435.70	317.69	243.55	183.01	260.06
66	3.26	1.99	.61	1.27	1825.09	1927.38	1956.02	1817.04	514.47	371.29	103.79	[illegible]
67	1.88	1.34	1.28	2.42	1911.71	1944.72	1315.98	1416.48	311.13	[illegible]	[illegible]	[illegible]
68	2.10	1.60	1.45	1.35	1893.97	1937.61	1320.41	1754.51	343.20	287.68	[illegible]	205.20
69	1.76	1.41	5.08	1.55	1919.84	1942.95	610.02	1630.53	291.73	236.98	267.54	213.04
70	3.11	2.29	7.21	2.49	1832.70	1922.12	596.74	1418.60	492.50	379.97	371.70	305.76
71	2.47	2.00	11.00	3.16	1868.60	1927.77	520.60	1323.37	398.33	333.51	494.07	360.30
72	2.75	1.97	1.60	1.71	1851.82	1928.11	1196.68	1612.87	439.47	322.17	165.43	238.43
73	1.89	2.06	10.61	2.45	1906.65	1926.52	504.15	1445.49	311.02	342.72	482.33	306.52
74	3.63	2.17	2.96	3.12	1806.49	1924.27	555.35	1259.36	566.40	360.57	248.41	350.29
75	2.24	1.75	4.60	3.58	1883.09	1933.70	753.58	1248.55	364.67	252.22	299.69	385.45
76	2.35	1.78	1.32	4.70	1875.50	1932.87	1462.41	1039.11	382.95	237.45	[illegible]	446.21
77	2.26	1.65	.68	3.06	1832.76	1935.93	1546.32	1261.46	357.51	275.42	[illegible]	333.33
78	1.57	1.43	3.87	3.05	1937.18	1940.75	818.59	1331.51	263.75	314.53	[illegible]	350.74
79	2.14	2.03	11.05	3.23	1886.24	1926.80	483.24	1302.97	347.47	337.63	461.42	[illegible]

Table D-2. (continued).

WATER YEAR	MEAN SEASONAL FLOW (CMS) FALL	WINTER	SPRING	SUMMER	FLOW WEIGHTED MEAN SEASONAL SALINITY (MG/L) FALL	WINTER	SPRING	SUMMER	MEAN SEASONAL SALINITY MASS (T/D) FALL	WINTER	SPRING	SUMMER

RIVER POINT : 4 - CACHE LA POUDRE RIVER NEAR GREELEY

WATER YEAR	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	2.13	1.88	11.91	1.54	1427.33	1540.73	387.87	1357.56	262.40	250.72	399.34	150.40
66	3.08	3.31	.87	1.04	1371.53	1320.78	1321.99	1363.83	364.59	377.43	98.82	122.49
67	1.78	1.72	6.39	2.81	1447.53	1581.07	518.04	1326.78	223.22	234.37	285.92	321.96
68	2.69	2.18	2.40	.92	1394.11	1473.70	850.76	1379.86	322.36	278.19	176.50	109.68
69	2.57	2.10	4.40	.86	1398.26	1496.98	615.49	1378.87	310.90	272.12	233.93	102.60
70	4.26	3.75	9.85	2.34	1318.10	1280.38	484.37	1352.36	485.41	414.65	412.24	273.36
71	4.74	3.41	16.51	3.48	1301.86	1314.81	451.96	1337.50	532.71	386.94	644.83	402.57
72	5.04	3.89	4.40	1.76	1294.41	1263.69	664.85	1355.78	563.25	423.54	252.95	206.69
73	2.55	3.46	15.01	3.48	1399.06	1306.77	439.08	1338.86	308.70	390.44	569.35	402.62
74	5.48	4.10	7.25	2.37	1281.42	1245.14	550.36	1352.25	606.27	441.01	346.00	276.93
75	4.20	3.38	6.72	2.29	1321.43	1315.75	592.29	1340.63	479.31	384.47	343.72	265.18
76	3.14	2.70	1.32	1.92	1367.91	1400.28	1056.34	1340.39	370.90	326.49	166.18	222.07
77	3.26	2.28	.77	1.44	1356.30	1464.94	1365.36	1337.56	381.50	288.92	91.26	165.93
78	2.26	2.50	8.51	1.15	1421.30	1430.06	515.40	1371.03	277.58	308.90	378.79	136.11
79	2.71	2.56	21.60	3.84	1383.66	1413.89	391.48	1333.14	323.73	312.83	730.53	442.31

RIVER POINT : 5 - SOUTH PLATTE RIVER NEAR KERSEY

WATER YEAR	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	11.13	13.59	57.43	44.77	1382.78	1302.44	474.58	764.08	1329.48	1528.79	2354.96	2955.56
66	28.43	16.27	4.66	6.12	1220.57	1246.11	1198.35	1156.06	2998.18	1751.49	482.34	632.68
67	13.00	13.94	27.95	24.88	1356.40	1295.62	631.71	863.17	1523.44	1555.96	1525.75	1855.49
68	15.00	15.74	11.58	8.31	1335.49	1258.74	923.20	1150.91	1731.01	1712.17	923.76	826.71
69	14.60	12.84	101.91	11.11	1337.81	1320.68	448.23	1064.41	1687.87	1444.90	3946.33	1022.03
70	42.07	24.67	101.97	23.67	1150.71	1128.96	495.33	924.40	4218.79	2406.61	4363.76	1890.51
71	29.85	26.46	72.74	18.80	1218.05	1110.72	543.15	971.41	3141.34	2539.51	3413.60	1577.72
72	23.86	19.58	17.39	11.81	1255.60	1185.83	749.55	1055.93	2588.03	2013.20	1126.06	1374.97
73	18.30	22.87	184.75	24.73	1297.12	1150.93	399.57	918.91	2050.95	2273.95	6384.89	1963.04
74	28.19	30.56	33.46	15.05	1226.37	1071.62	675.12	1025.81	2587.32	2829.87	1551.55	1334.06
75	22.13	17.71	34.17	21.62	1267.15	1223.31	647.84	943.68	2423.14	1871.35	1512.53	1752.80
76	20.26	20.23	10.44	15.97	1283.24	1155.93	962.28	980.08	2246.53	2072.79	868.09	1352.02
77	19.36	15.39	7.13	9.74	1290.51	1263.29	1056.44	1078.27	2158.15	1679.61	650.52	907.73
78	14.32	15.11	32.51	10.16	1341.72	1269.05	671.09	1122.48	1659.83	1657.09	1884.31	985.70
79	18.27	17.58	106.59	22.70	1294.80	1221.39	462.57	927.80	2043.91	1855.40	4259.92	1819.83

RIVER POINT : 6 - SOUTH PLATTE RIVER NEAR WELDONA

WATER YEAR	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	4.26	3.98	35.47	27.62	1758.39	1514.12	718.08	1204.89	647.13	520.19	2200.34	2375.62
66	25.36	13.95	3.57	6.60	1323.87	1348.97	1459.80	1487.76	2900.75	1625.54	453.02	344.50
67	4.04	5.34	13.89	15.12	1777.47	1487.48	930.38	1252.93	620.03	586.77	1116.27	1633.71
68	5.14	10.15	5.80	6.74	1692.96	1401.21	1314.02	1490.16	751.32	1229.39	858.06	867.26
69	3.80	5.89	62.65	7.82	1790.92	1463.27	659.75	1444.60	588.76	744.96	3571.18	975.52
70	25.44	21.98	82.62	18.19	1330.21	1300.68	678.71	1305.37	2923.84	2469.69	4844.66	2051.98
71	19.35	23.13	56.07	17.94	1397.80	1299.76	732.18	1301.52	2337.16	2597.06	3547.30	2017.74
72	15.50	13.56	7.53	8.06	1419.56	1353.37	1150.56	1452.29	1901.28	1595.96	788.06	1011.42
73	9.32	22.32	136.10	23.19	1563.88	1303.89	586.98	1274.10	1259.19	2514.35	6902.22	2552.79
74	28.77	20.32	20.66	14.51	1295.62	1310.64	954.30	1354.49	3220.99	2301.28	1703.70	1597.68
75	11.02	11.79	21.61	16.24	1520.53	1375.55	885.82	1332.35	1447.73	1401.47	1653.92	1470.13
76	11.16	11.19	6.16	10.72	1505.97	1385.27	1274.29	1394.93	1451.57	1339.92	678.07	1231.53
77	5.56	9.98	4.77	3.95	1658.86	1397.79	1357.86	1499.95	797.11	1204.30	559.10	770.91
78	4.44	6.61	14.65	8.55	1750.34	1446.93	593.12	1451.11	670.98	826.71	1257.15	1071.31
79	9.95	11.02	64.31	21.31	1540.25	1375.63	673.35	1271.01	1324.70	1303.97	3741.20	2340.20

Table D-2. (continued).

WATER YEAR	MEAN SEASONAL FLOW (CMS) FALL	WINTER	SPRING	SUMMER	FLOW WEIGHTED MEAN SEASONAL SALINITY (MG/L) FALL	WINTER	SPRING	SUMMER	MEAN SEASONAL SALINITY MASS (T/D) FALL	WINTER	SPRING	SUMMER
RIVER POINT : 7 - SOUTH PLATTE RIVER AT BALZAC												
65	2.46	.42	40.71	23.99	1376.05	1406.29	729.89	1454.12	292.27	51.61	2567.26	3014.39
66	21.02	14.67	2.28	5.53	1331.73	1425.03	1400.81	1442.66	2418.57	1806.65	275.80	583.27
67	.55	.62	13.02	12.76	1417.71	1412.17	981.69	1451.10	67.36	75.34	1103.97	1599.51
68	.58	3.10	3.66	4.24	1413.83	1419.44	1314.10	1440.27	83.65	379.73	415.39	527.72
69	.60	.52	50.84	6.99	1413.13	1407.77	788.25	1446.15	72.58	63.01	3462.75	973.49
70	15.00	22.80	89.19	16.09	1334.46	1426.63	760.76	1449.21	1729.32	2910.06	5862.38	2014.22
71	10.03	21.85	50.12	11.89	1348.05	1425.94	840.00	1446.77	1168.35	2632.46	3637.51	1485.92
72	5.95	12.66	4.98	4.95	1363.29	1423.73	1235.14	1442.00	702.21	1556.97	531.44	617.17
73	3.44	18.89	117.40	18.06	1370.05	1425.31	736.37	1449.81	406.57	2326.12	7469.43	2262.19
74	19.94	24.29	16.71	9.47	1332.45	1426.52	1018.31	1445.27	2283.66	2992.39	1469.85	1183.09
75	3.37	7.35	18.72	12.25	1377.81	1421.96	983.01	1446.98	400.79	902.60	1530.04	1531.08
76	3.62	8.86	5.20	5.86	1369.39	1422.48	1244.48	1443.23	428.01	1099.51	559.36	730.35
77	.95	3.45	2.84	4.13	1406.66	1418.85	1363.48	1441.49	116.66	422.66	334.47	514.79
78	.72	.89	7.05	5.63	1408.83	1410.71	1133.24	1441.43	87.97	108.72	690.49	701.06
79	1.78	5.59	54.96	17.69	1391.55	1421.03	759.46	1450.50	213.60	686.76	3796.57	2217.30
RIVER POINT : 8 - SOUTH PLATTE RIVER AT JULESBURG												
65	1.41	3.40	42.24	21.49	1736.51	1722.89	825.42	1250.08	210.81	506.43	3012.53	2321.08
66	29.10	22.65	4.37	2.60	1392.50	1461.35	1392.55	1443.45	3501.12	2859.28	525.33	324.52
67	5.26	5.62	15.43	14.21	1581.39	1652.19	1090.14	1240.59	718.33	802.02	1439.78	1523.29
68	5.12	9.89	4.15	12.33	1578.02	1571.47	1396.44	1225.32	698.13	1342.28	500.35	1308.26
69	5.45	7.61	53.73	7.77	1576.41	1513.40	930.11	1262.93	742.94	1060.39	4317.63	849.07
70	18.37	31.92	69.98	7.90	1421.87	1413.21	955.53	1296.05	2257.21	3856.96	5777.66	894.93
71	13.32	25.41	47.80	3.79	1460.98	1450.12	1005.09	1363.84	1934.31	3193.72	4151.05	447.13
72	11.25	13.95	4.07	2.02	1495.41	1523.42	1399.53	1442.50	1453.24	1836.72	492.43	251.57
73	5.50	23.58	131.88	11.90	1559.18	1459.76	870.44	1294.52	740.63	2974.33	9918.54	1332.59
74	28.32	31.70	13.84	2.38	1390.10	1423.30	1136.00	1427.54	3425.55	3998.46	1358.51	243.49
75	5.49	11.94	19.97	2.70	1567.21	1541.69	1114.16	1438.60	744.02	1550.31	1922.11	335.21
76	7.25	14.54	2.76	.83	1530.40	1518.66	1489.60	1540.05	959.29	1908.01	334.97	110.95
77	2.45	7.56	6.01	1.33	1674.35	1596.72	1320.81	1512.66	354.57	1043.48	685.82	173.26
78	2.70	4.73	3.38	.59	1663.60	1676.14	1414.75	1591.64	388.57	684.47	412.39	80.59
79	2.59	8.54	50.62	12.67	1668.94	1564.87	953.82	1289.66	372.95	1155.21	4171.63	1411.71

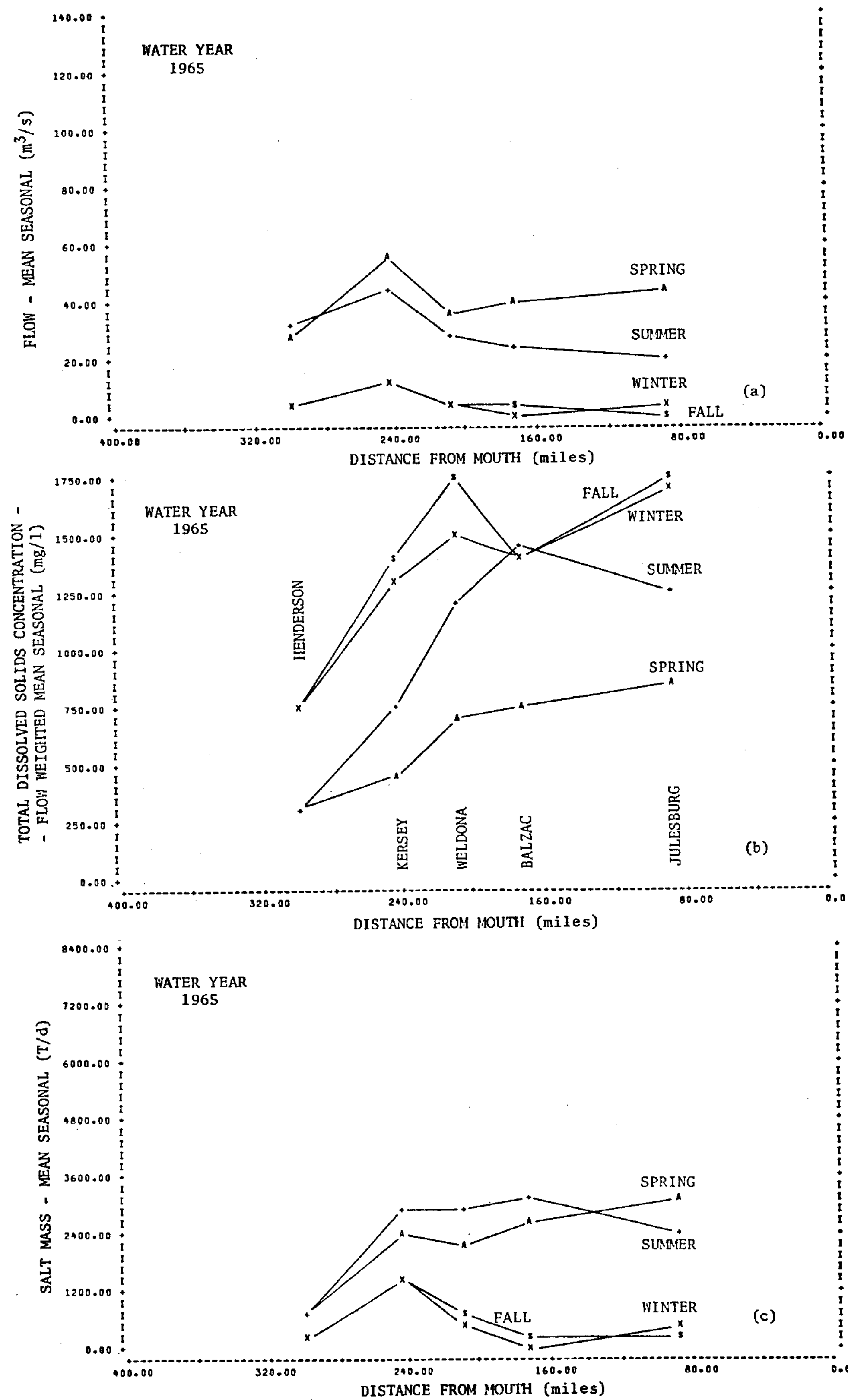

Figure D-1. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1965.

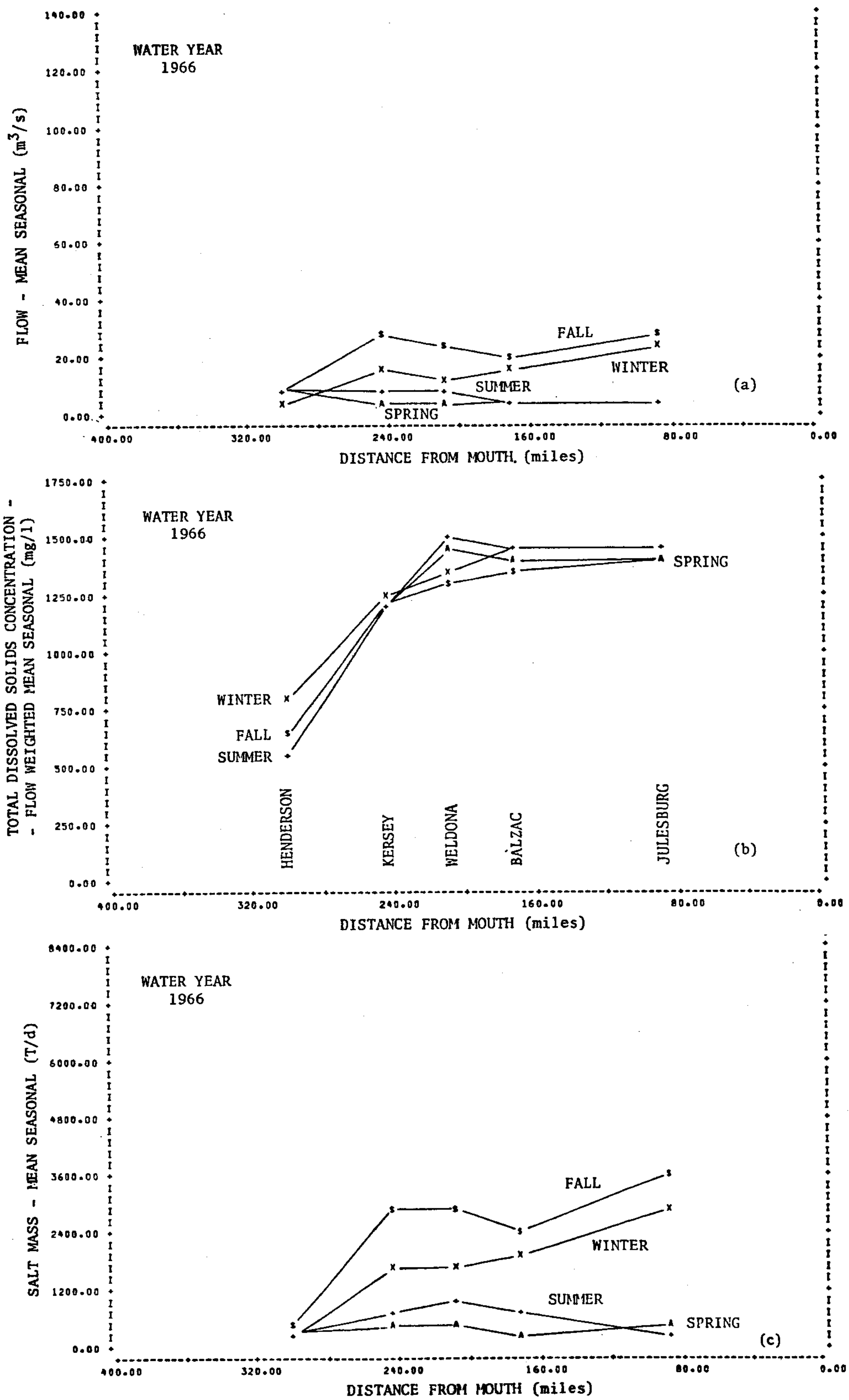

Figure D-2. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1966.

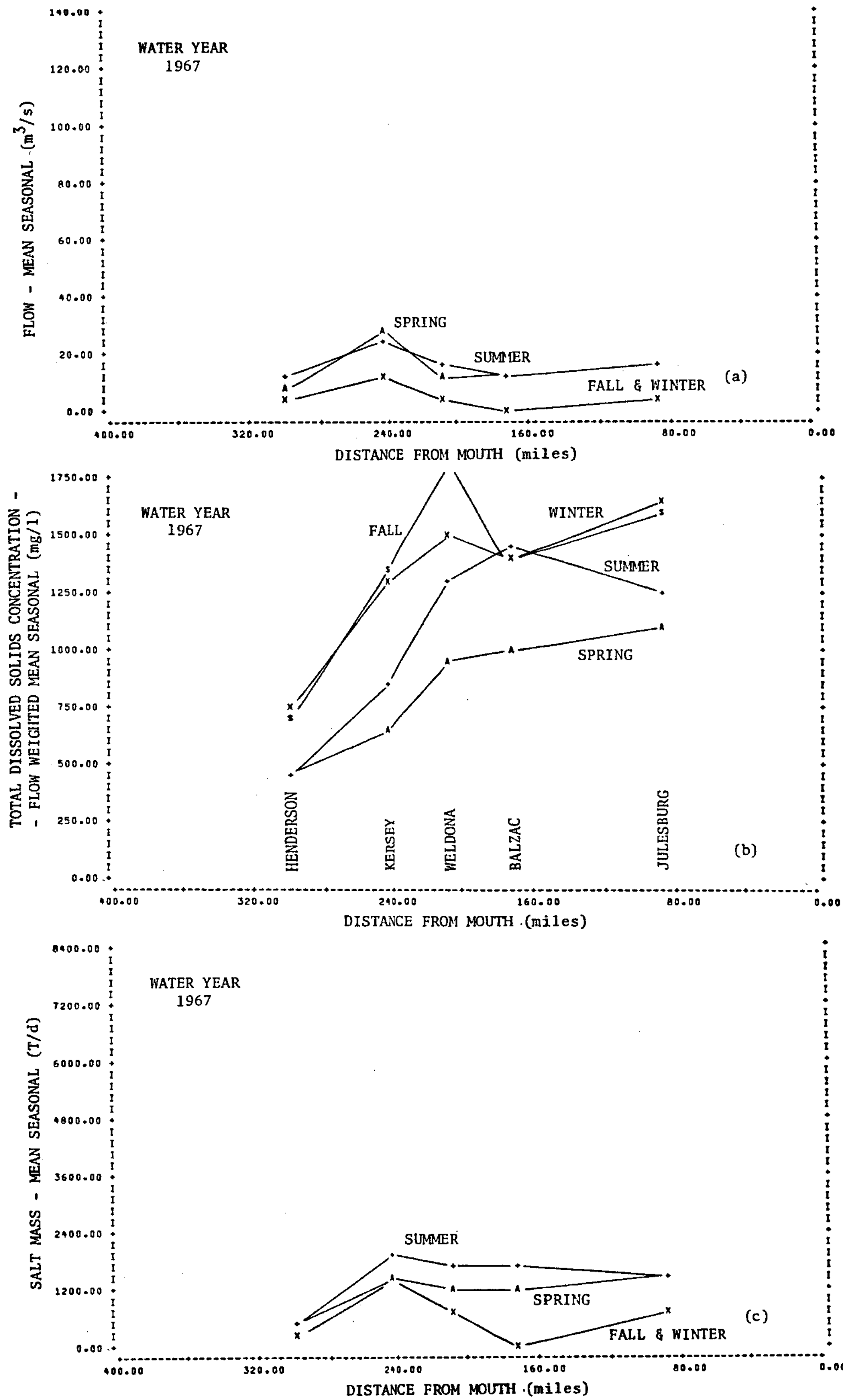

Figure D-3. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1967.

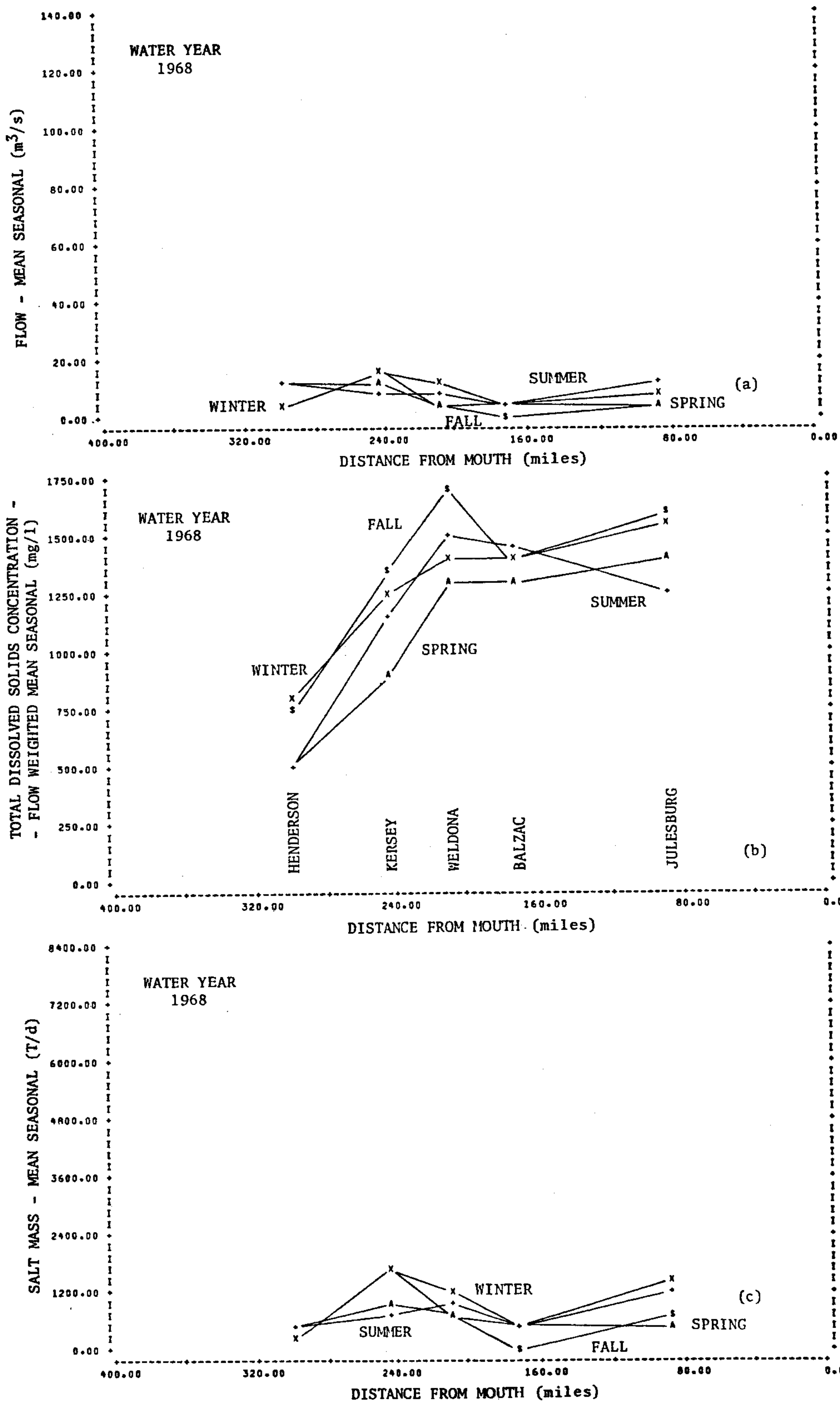

Figure D-4. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1968.

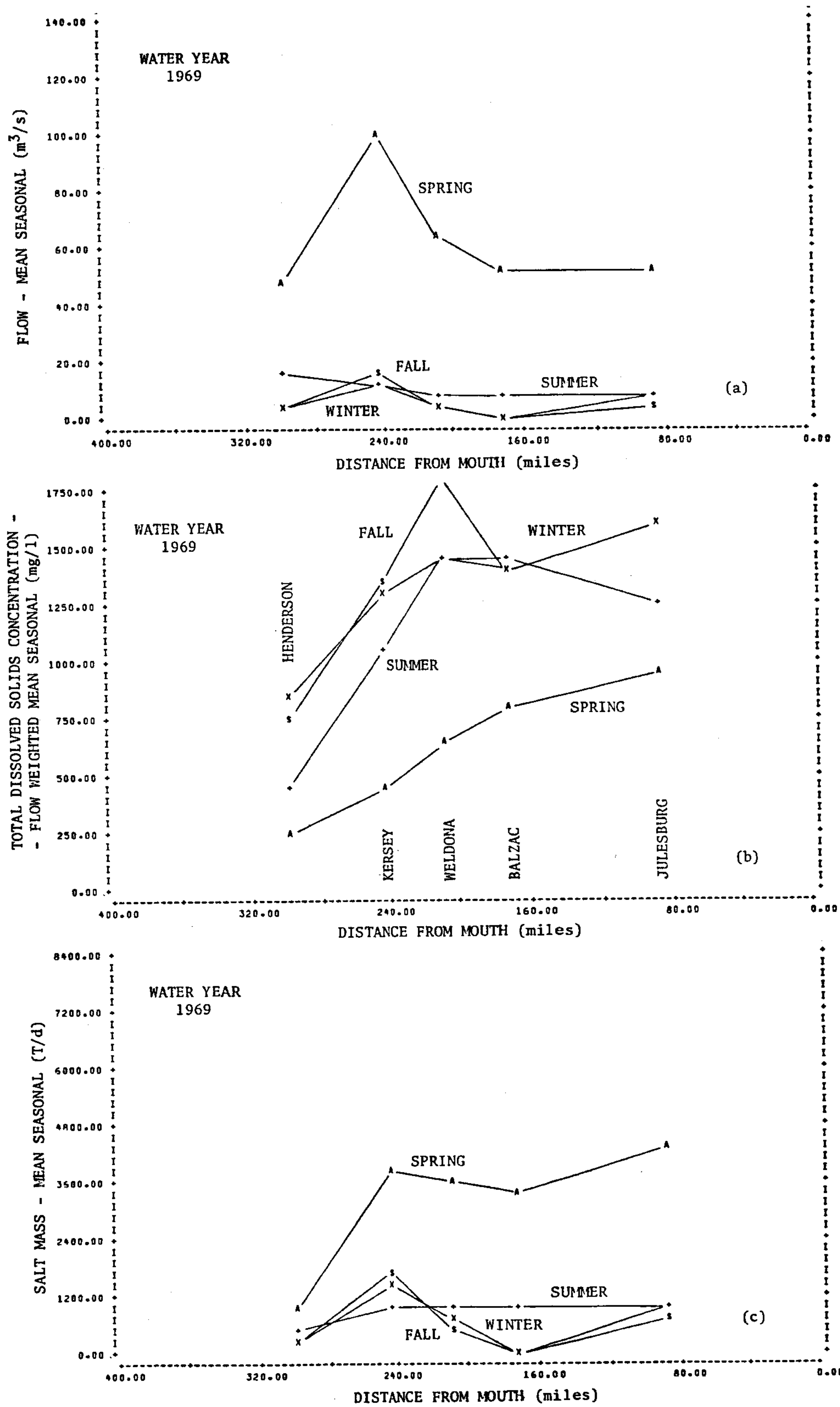

Figure D-5. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1969.

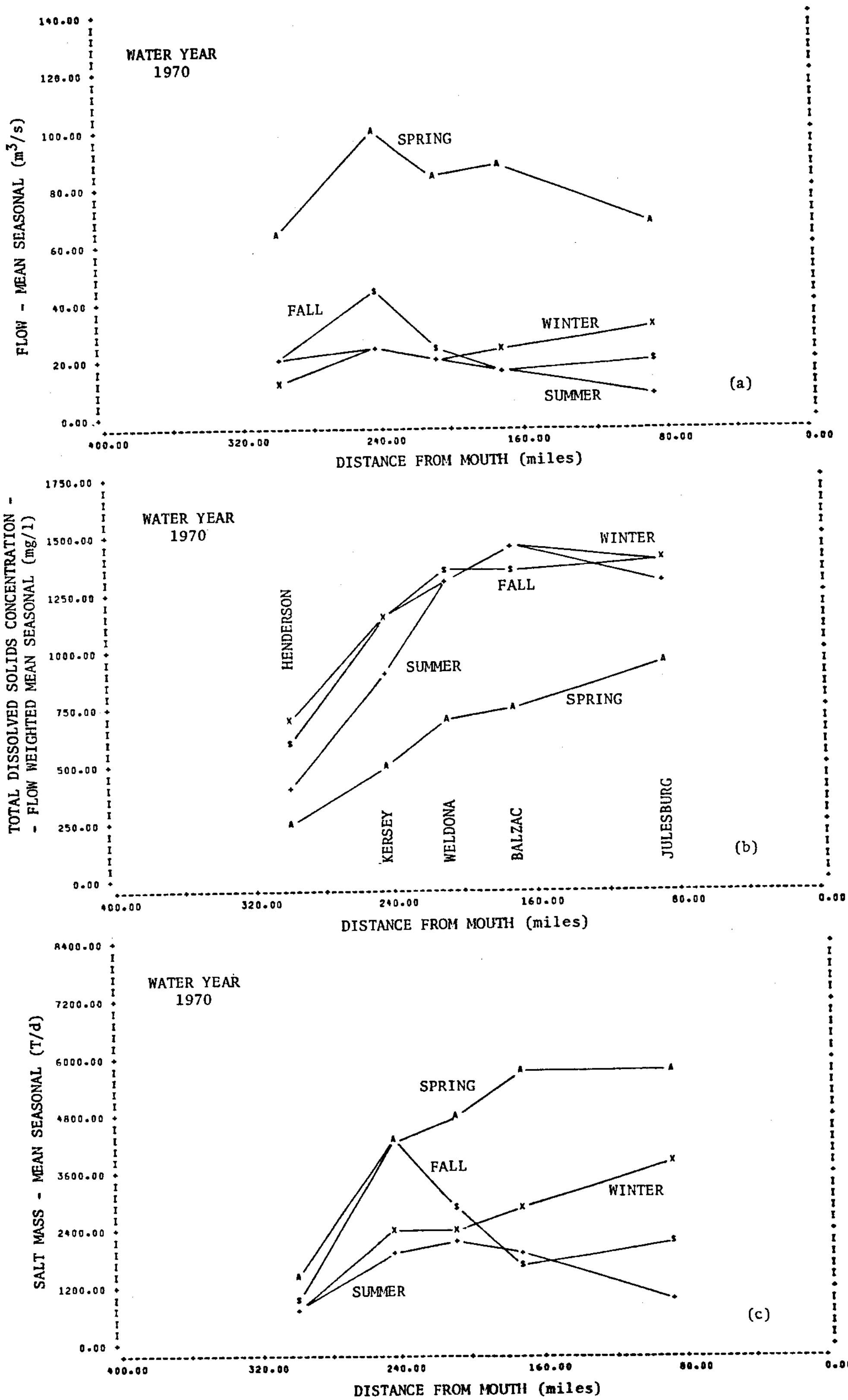

Figure D-6. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1970.

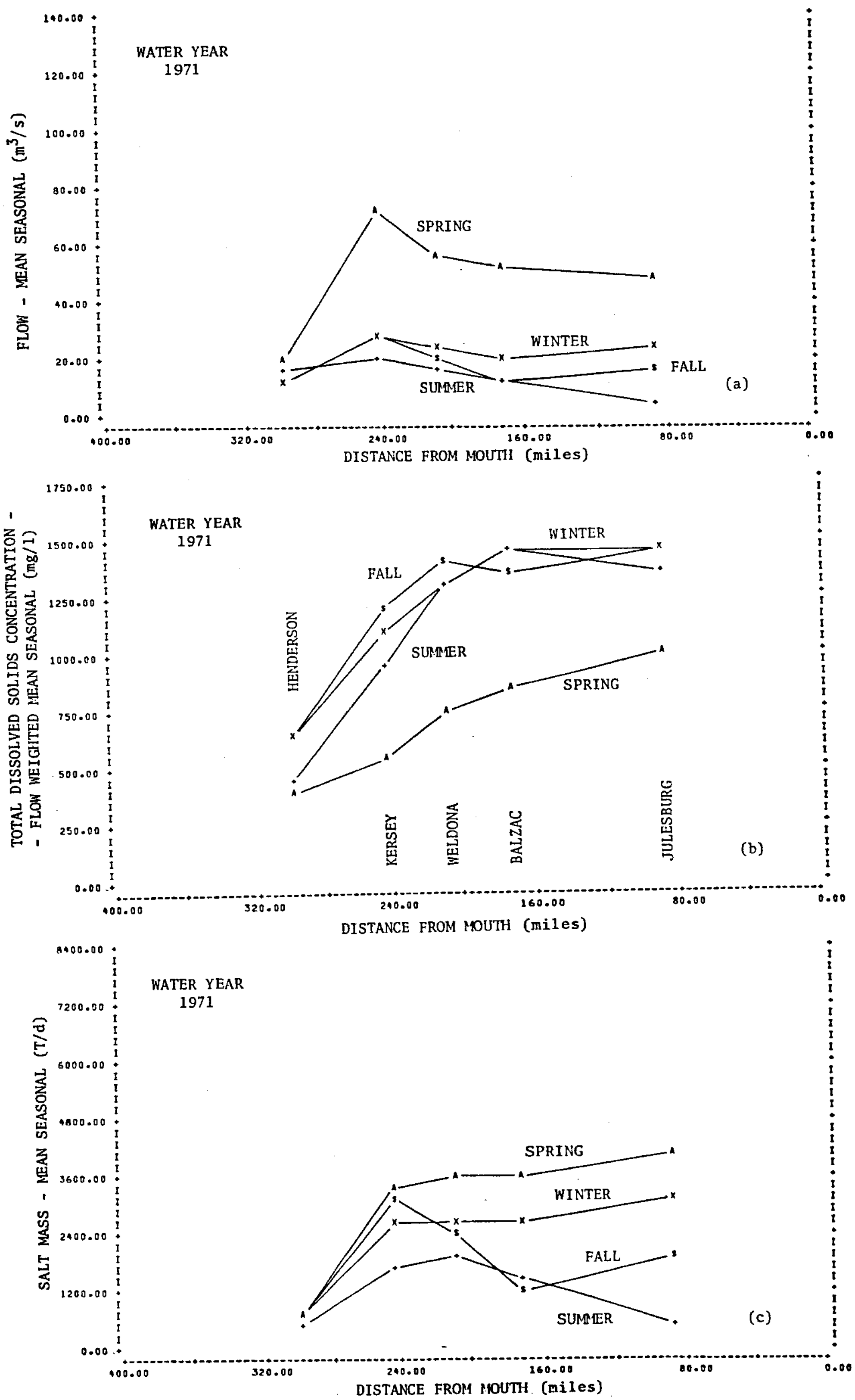

Figure D-7. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1971.

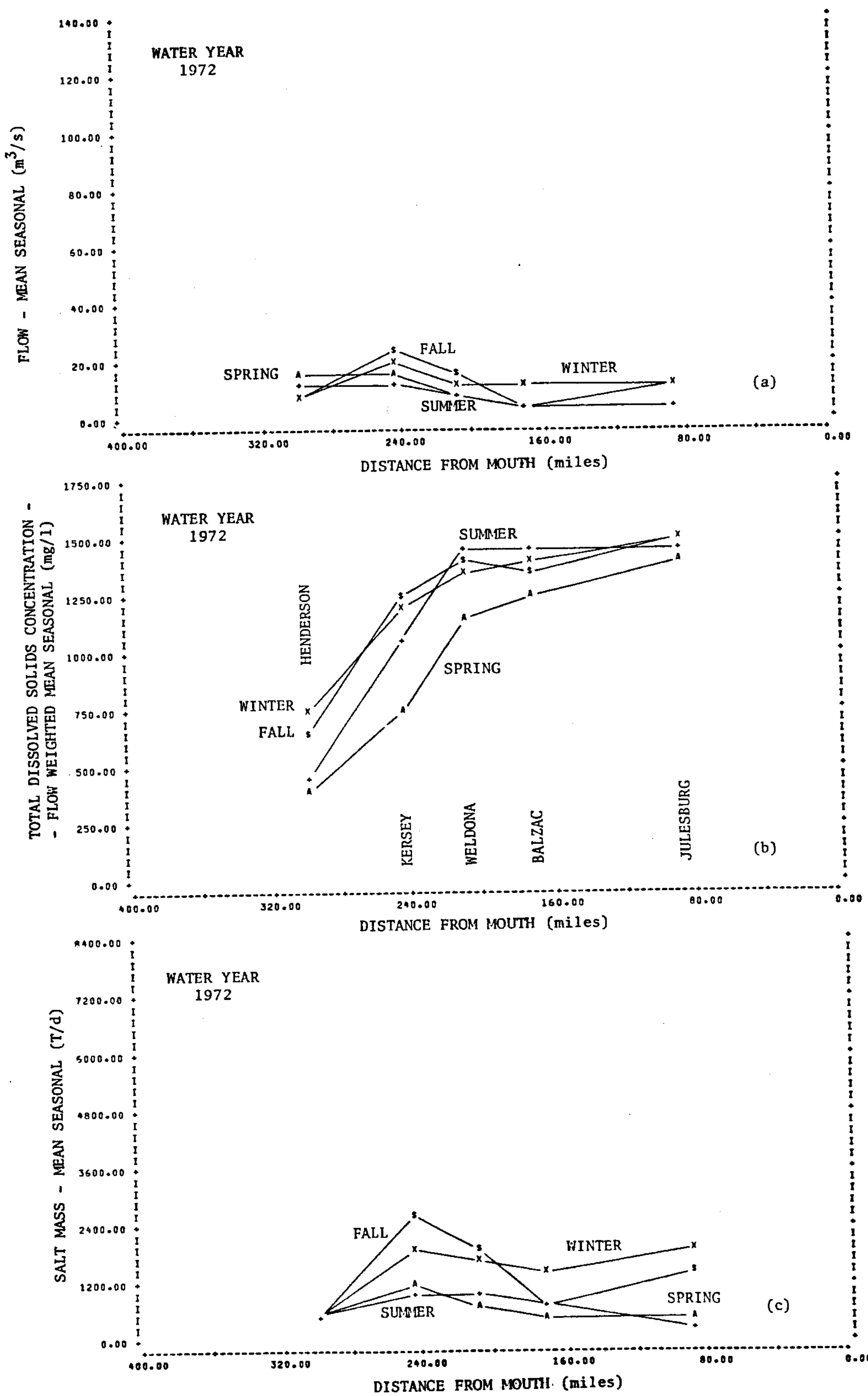

Figure D-8. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1972.

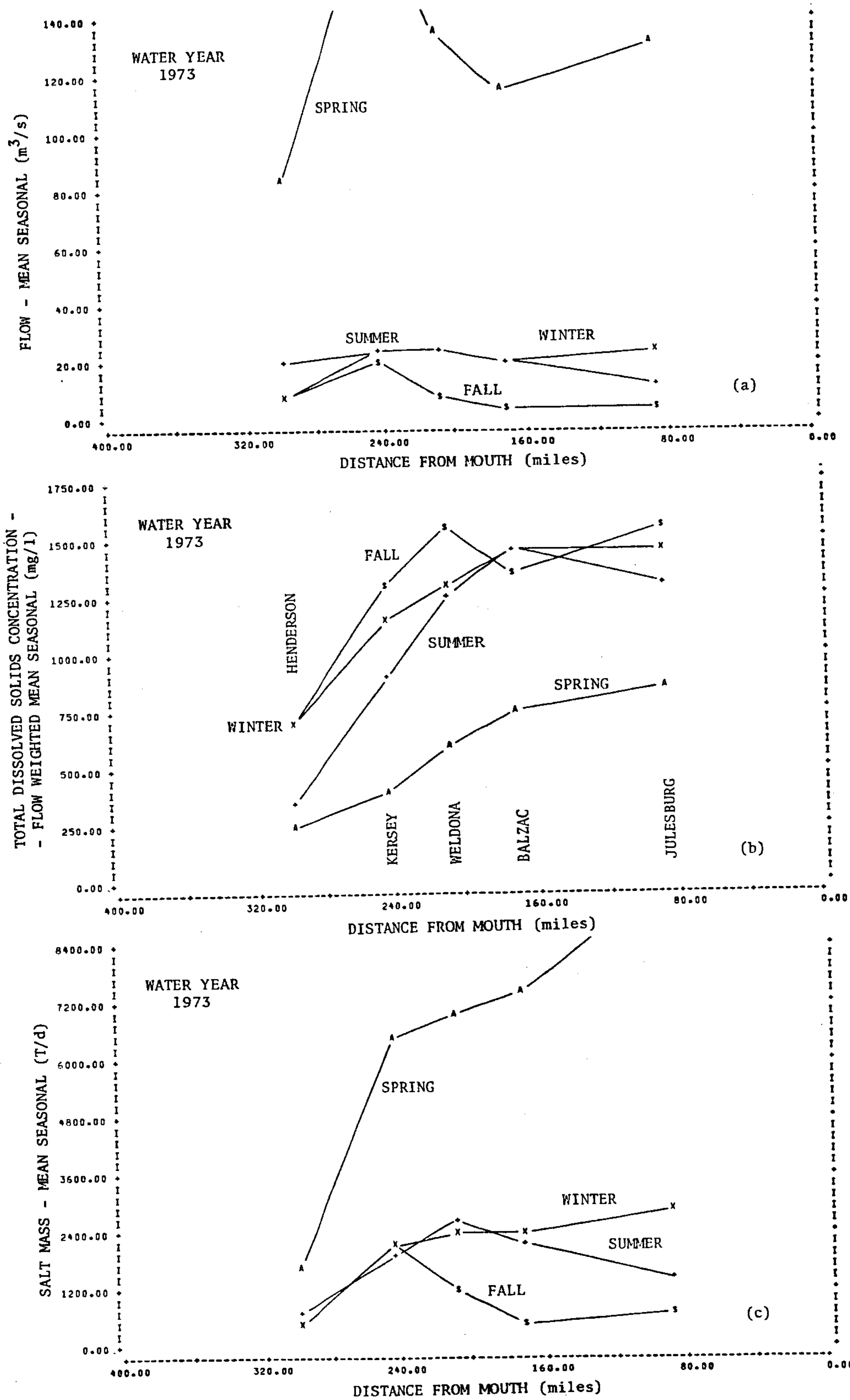

Figure D-9. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1973.

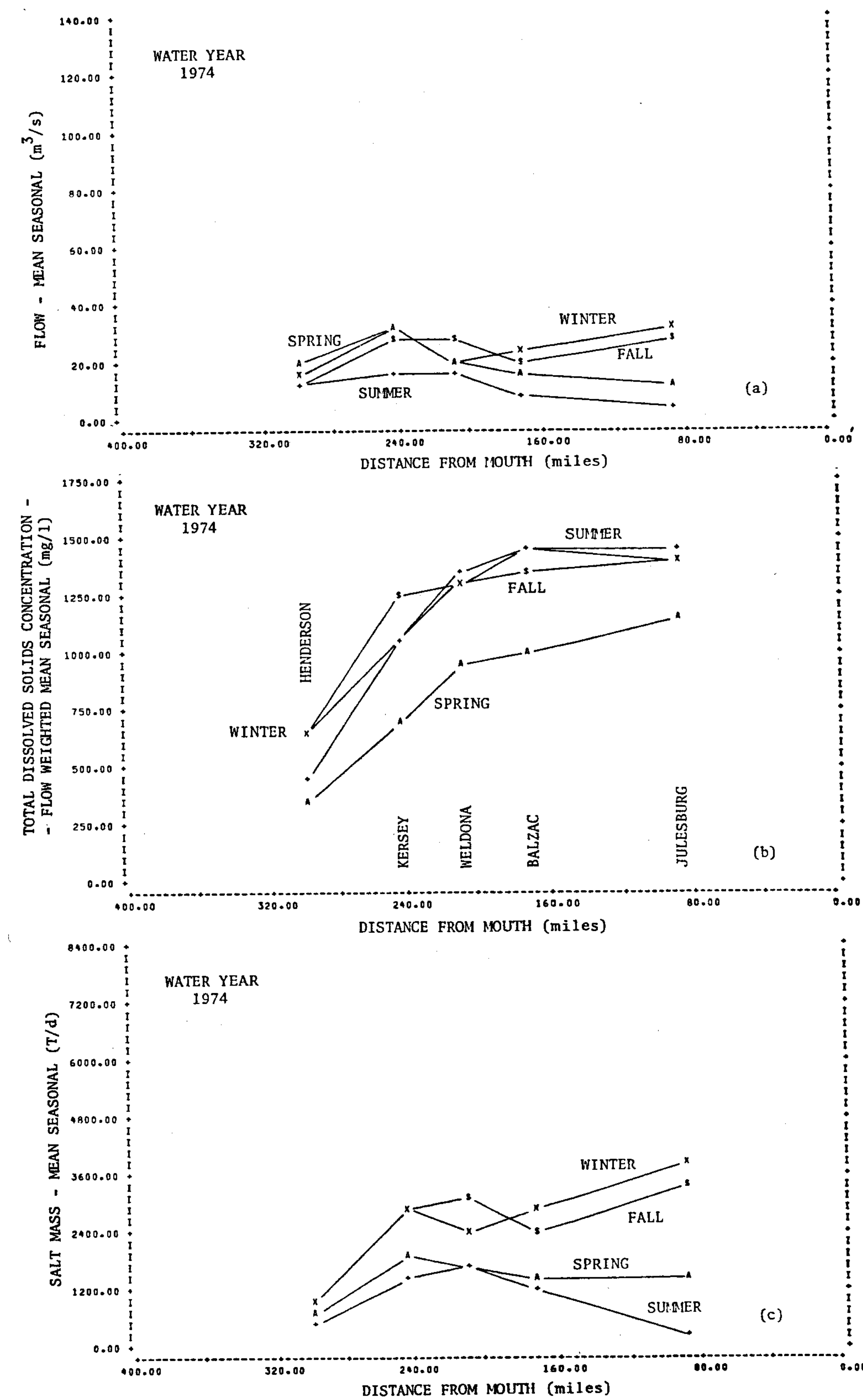

Figure D-10. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1974.

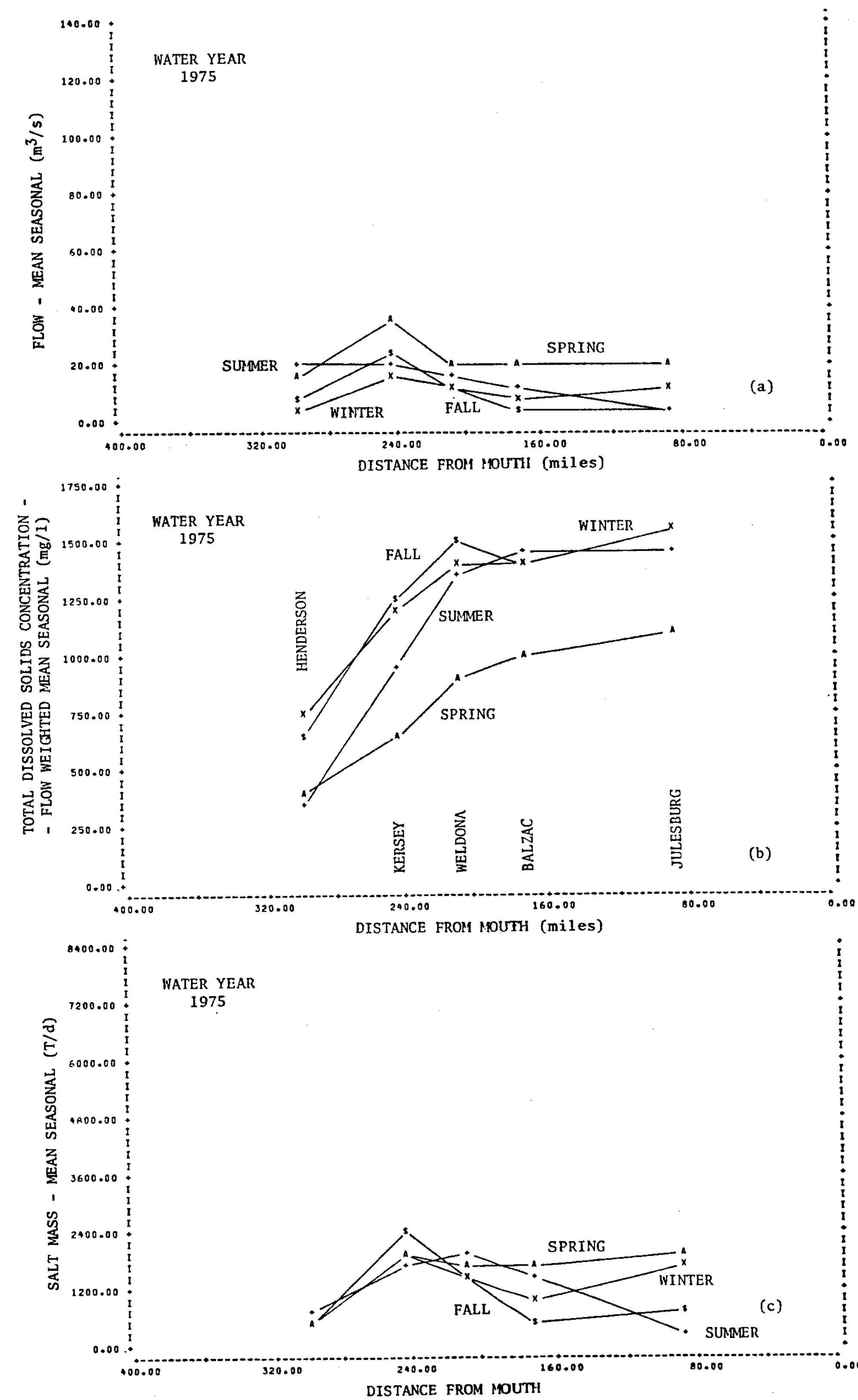

Figure D-11. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1975.

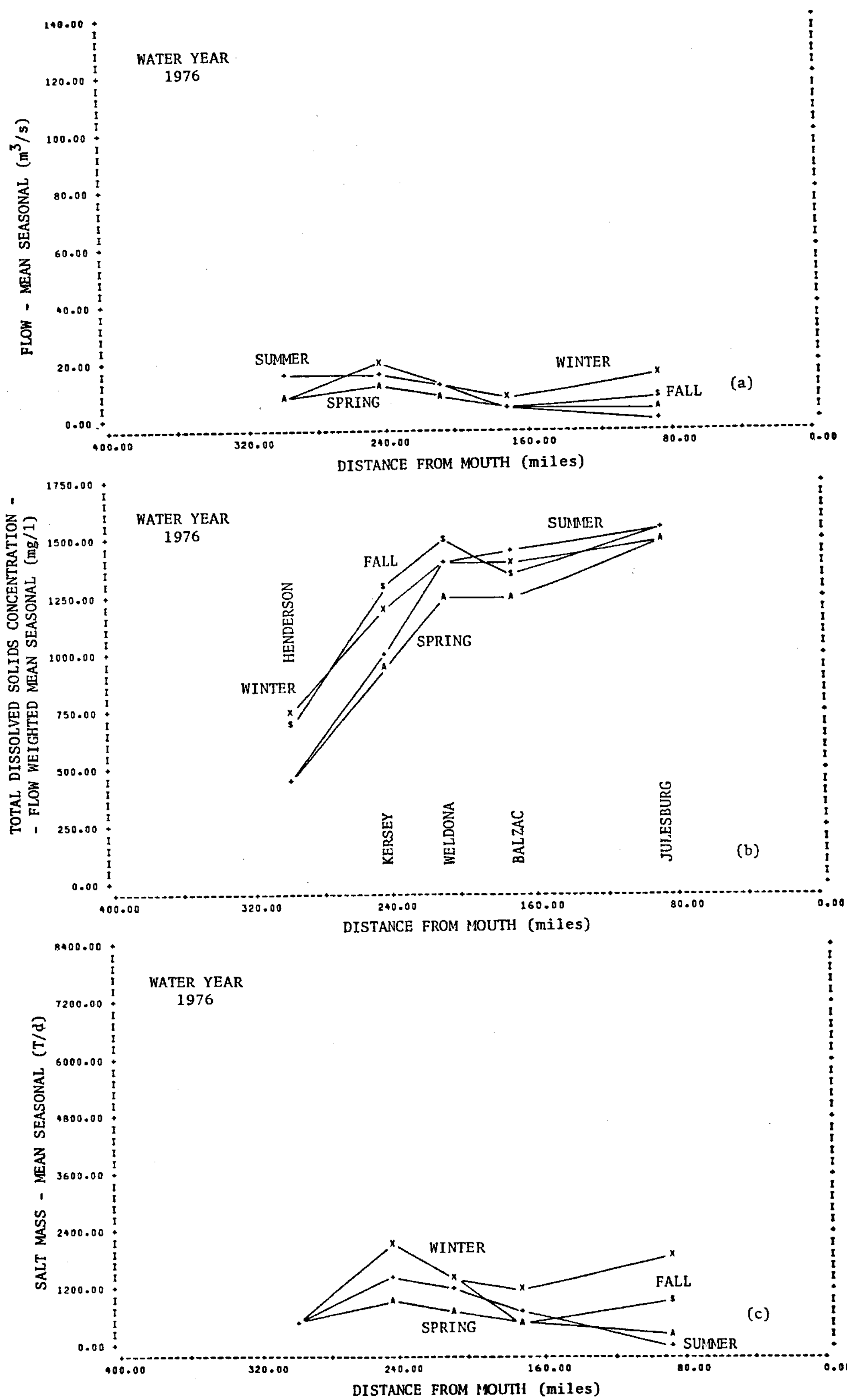

Figure D-12. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1976.

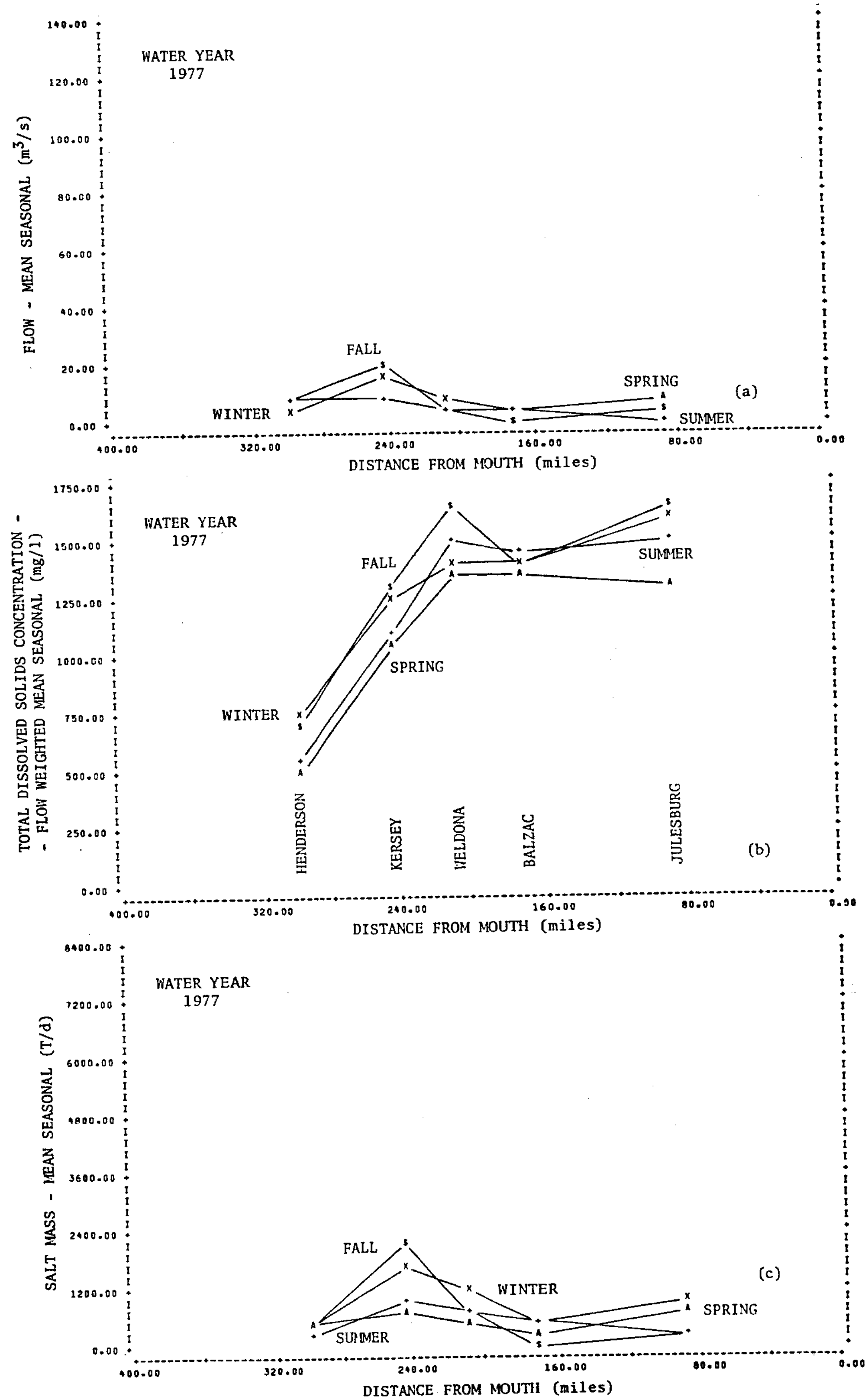

Figure D-13. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1977.

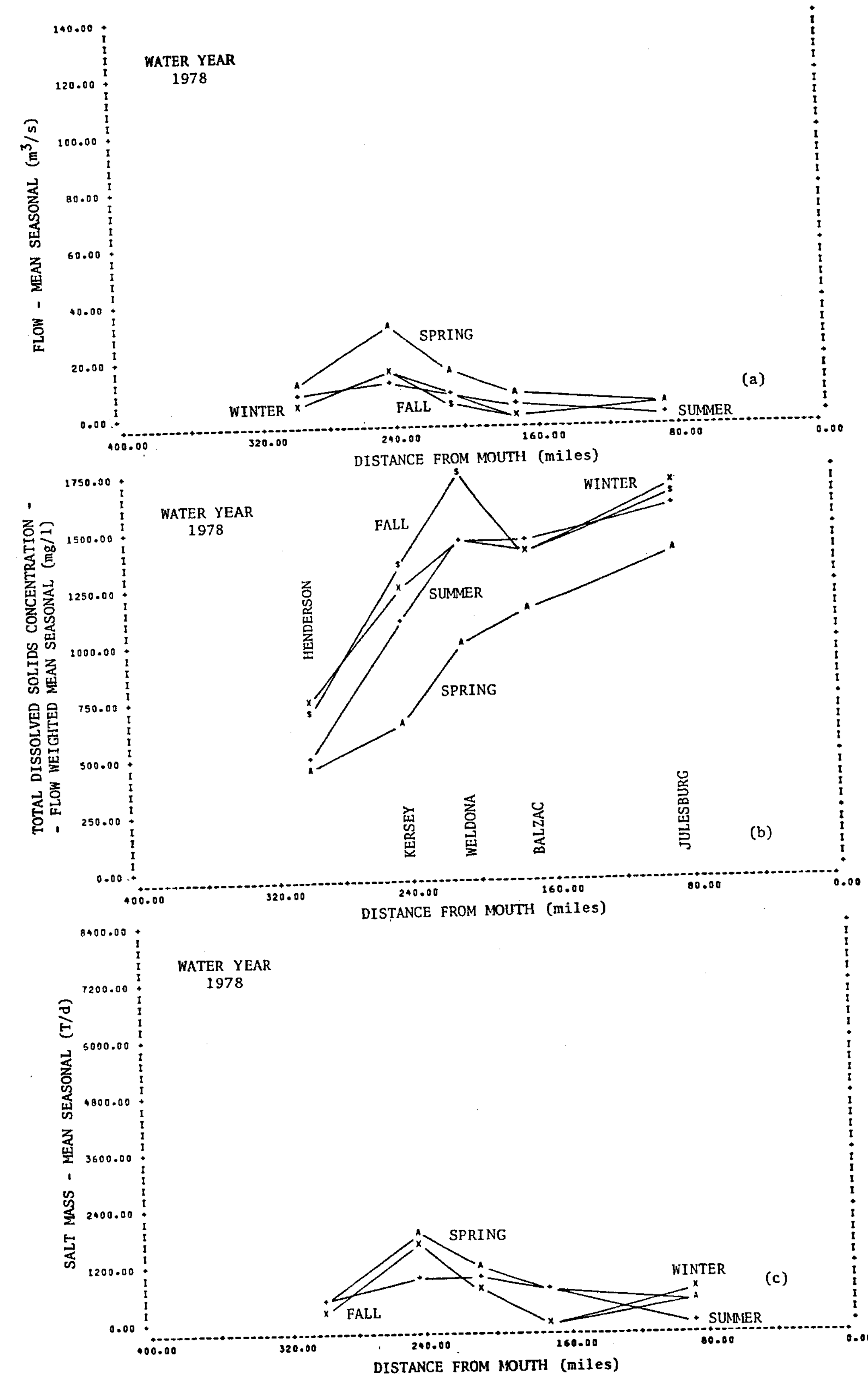

Figure D-14. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1978.

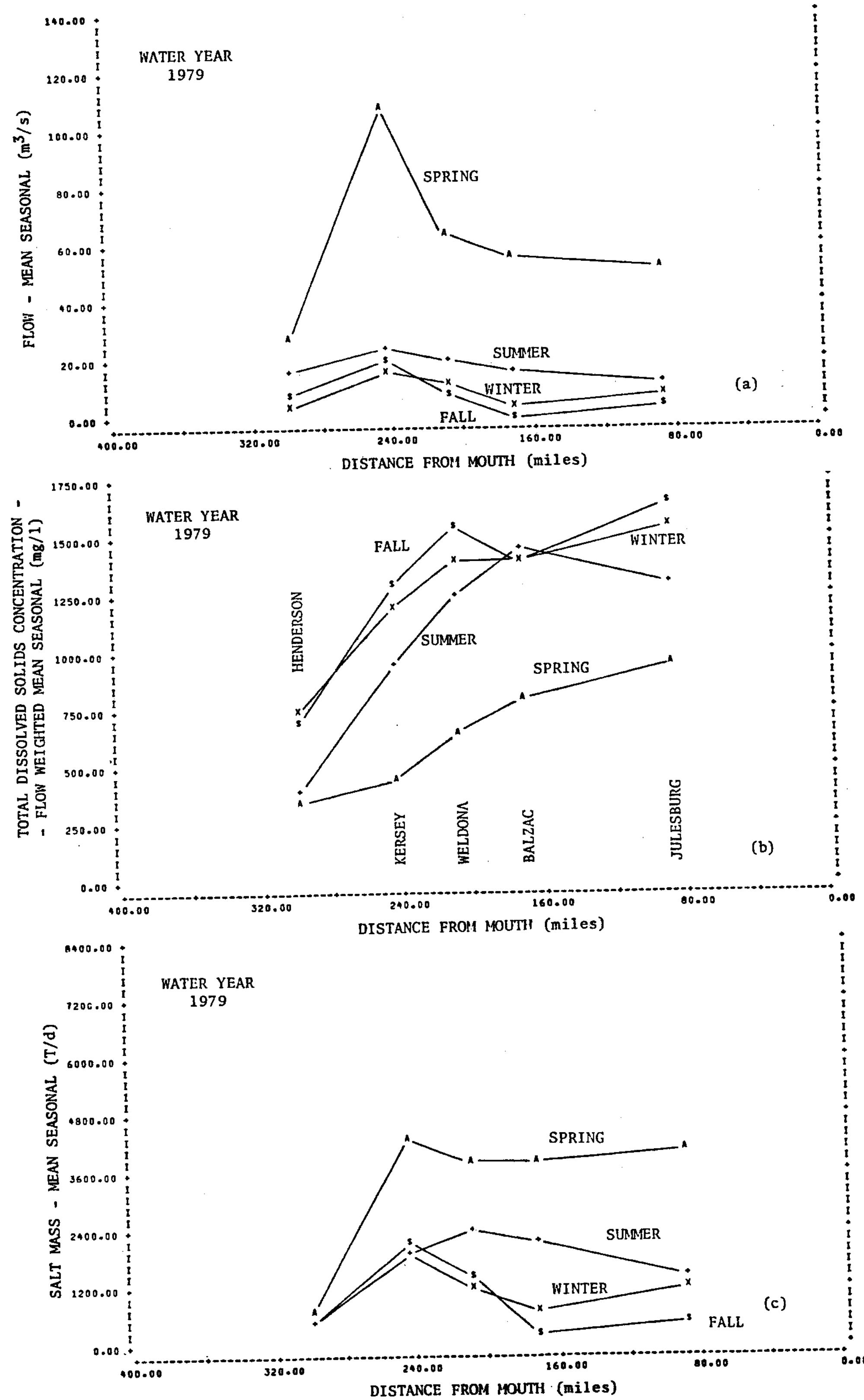

Figure D-15. Distance profiles of flow, salt concentration and salt mass flow averaged by season, South Platte River, water year 1979.

Table D-3. Mean daily flow, flow weighted average of total dissolved solids, and mean daily salt mass flow, averaged over each month, 1965-79, for eight stations in the South Platte River Basin.

RIVER POINT: 1 - SOUTH PLATTE RIVER AT HENDERSON

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	2.244	4.103	2.536	3.363	6.576	5.207	7.228	13.033	59.513	41.476	35.442	14.932
66	15.041	6.820	4.803	4.477	4.849	3.766	5.206	6.903	7.312	7.301	7.320	4.730
67	5.193	5.604	5.309	5.193	5.298	5.188	8.002	8.843	12.765	12.940	10.296	6.954
68	4.954	2.912	3.200	3.645	3.848	4.508	6.210	10.535	14.197	12.790	13.455	7.827
69	3.538	3.163	3.647	2.489	2.737	2.481	3.319	69.249	66.314	19.464	13.759	9.159
70	15.280	22.631	17.624	12.755	8.214	9.426	35.284	68.956	81.947	28.303	17.498	13.518
71	10.580	12.447	13.918	14.306	13.289	9.309	15.917	23.974	20.031	18.565	12.355	13.014
72	9.314	9.493	7.515	7.616	7.285	4.499	8.741	12.232	21.156	13.031	12.276	9.979
73	6.931	6.486	5.684	7.912	8.507	11.113	20.782	160.210	68.414	32.533	13.835	14.546
74	14.764	11.354	8.990	14.804	13.206	21.032	25.947	16.730	22.561	17.049	9.539	8.149
75	10.586	8.101	5.248	4.785	6.822	5.964	11.418	13.355	22.235	32.764	16.635	7.111
76	7.207	6.674	5.004	6.548	6.890	6.752	6.997	9.972	12.964	14.537	15.589	12.139
77	9.156	5.331	5.061	4.392	4.426	8.397	7.104	9.179	12.238	10.164	7.910	4.455
78	4.102	4.904	6.252	4.528	6.480	4.750	5.565	11.479	15.274	14.692	8.807	6.076
79	6.618	6.105	5.857	5.126	5.728	6.413	8.488	17.272	52.755	20.476	18.905	8.051

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	803.2	742.3	791.1	800.2	736.1	758.4	477.1	444.7	249.1	279.7	300.5	431.1
66	622.5	684.4	712.8	780.8	768.5	796.2	594.8	551.7	536.2	547.6	538.9	658.1
67	716.9	713.1	718.4	764.3	761.9	763.5	498.8	489.3	447.6	390.0	501.6	577.2
68	723.5	777.3	768.4	802.8	797.3	779.3	572.0	477.2	434.6	461.7	447.6	533.9
69	750.7	769.3	751.5	851.4	839.6	851.5	687.9	237.3	257.7	393.9	450.9	522.9
70	616.5	591.1	610.6	669.2	713.4	695.0	313.1	258.8	243.3	336.1	407.7	440.0
71	655.0	638.3	631.0	658.3	664.1	700.8	398.3	364.6	386.9	400.7	458.8	450.3
72	656.2	654.1	685.7	722.2	726.4	778.7	483.9	452.2	373.9	458.9	452.2	518.3
73	592.9	695.1	711.4	714.3	709.7	678.2	378.9	193.0	255.7	321.6	425.4	424.7
74	626.3	647.5	668.7	649.0	662.4	620.7	357.8	409.6	364.3	412.9	513.8	542.8
75	648.3	675.8	718.9	773.1	729.2	743.0	459.6	419.6	367.0	315.9	391.2	572.6
76	688.4	691.8	723.8	737.6	732.5	733.9	531.0	478.8	440.9	438.8	423.3	458.8
77	664.8	717.4	722.5	783.3	781.1	705.6	512.2	500.9	447.7	462.6	552.4	687.7
78	741.9	724.6	700.3	776.9	735.5	765.1	566.4	441.7	420.8	435.9	531.6	612.5
79	679.9	705.2	708.9	765.7	753.0	740.1	510.6	393.9	274.7	383.6	387.3	561.0

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	153.75	263.14	173.32	232.54	418.20	341.17	297.94	500.75	1280.62	1002.48	921.37	556.12
66	808.93	403.24	295.78	302.00	321.98	259.09	267.54	329.04	338.77	345.41	363.72	271.77
67	321.55	345.26	329.54	342.90	348.78	342.25	344.85	373.84	493.66	638.14	446.27	346.79
68	303.67	195.57	212.44	252.80	265.07	303.54	306.88	434.33	533.08	510.25	520.79	374.60
69	229.46	210.23	236.83	183.10	198.52	182.53	197.25	1419.81	1476.45	662.44	536.00	414.28
70	813.31	1155.72	929.76	736.30	506.29	565.58	954.49	1541.76	1723.49	839.34	619.38	513.94
71	593.68	686.44	758.86	813.65	762.45	563.66	547.81	755.27	669.57	642.74	513.97	506.32
72	536.10	544.69	445.23	475.22	457.16	302.68	365.45	477.59	683.45	516.72	435.97	402.12
73	414.93	389.50	349.39	488.31	521.62	651.16	690.31	2671.46	1511.64	907.83	595.58	542.08
74	798.30	635.23	519.42	830.07	755.79	1124.02	802.20	592.07	710.18	608.18	423.43	342.14
75	592.96	472.99	325.97	319.60	429.81	382.98	453.43	484.16	705.06	903.52	562.27	351.41
76	423.64	398.93	312.91	417.28	435.40	428.16	321.02	412.53	493.83	551.14	570.15	433.11
77	525.52	330.45	315.98	297.21	298.65	511.93	314.37	397.25	473.40	405.20	377.31	264.72
78	262.95	307.00	379.24	310.60	411.78	313.98	272.34	435.12	555.39	554.21	404.45	321.53
79	388.72	372.03	358.75	339.12	372.69	410.10	374.48	587.84	1251.51	678.55	632.73	383.27

Table D-3. (continued).

RIVER POINT: 2 - ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN MONTHLY FLOW (CMS) :												
65	2.091	2.400	2.277	1.958	2.264	2.395	2.262	2.951	31.411	24.432	18.485	6.968
66	6.809	4.234	4.231	3.816	3.976	3.724	1.839	1.715	3.757	3.600	3.590	5.097
67	2.907	2.392	2.169	2.402	2.108	1.439	3.018	2.467	22.402	25.214	6.931	5.273
68	3.951	3.986	3.205	3.974	4.949	3.826	2.595	3.128	5.582	4.950	5.395	5.350
69	5.148	3.121	2.209	2.707	2.308	2.537	1.924	28.344	49.972	8.253	3.765	4.763
70	8.669	9.058	7.230	6.180	4.924	4.361	15.374	9.467	31.948	10.032	6.380	5.814
71	6.270	7.396	5.705	4.481	3.930	4.094	13.517	25.044	16.395	7.317	5.937	7.506
72	5.377	5.163	4.554	4.449	4.970	2.933	2.905	3.340	9.766	5.284	4.852	4.454
73	3.560	4.782	5.542	5.580	4.297	3.490	4.876	37.634	17.963	7.563	5.452	6.449
74	5.070	4.750	4.265	5.243	4.924	4.611	3.845	4.549	10.692	6.500	5.817	5.549
75	5.299	4.802	4.238	4.639	3.988	3.222	3.546	4.979	19.576	7.414	8.433	6.345
76	4.750	4.840	4.803	4.205	3.355	2.494	1.913	3.115	4.067	4.334	6.070	5.861
77	3.834	3.716	3.400	3.198	3.254	2.744	3.014	1.730	2.770	4.569	4.491	2.631
78	2.932	2.719	3.166	3.298	2.960	2.523	2.461	13.347	20.315	7.119	6.016	4.193
79	3.959	4.229	3.931	3.786	3.742	3.625	5.031	20.713	36.395	6.987	10.130	6.073
FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :												
65	1278.5	1241.2	1255.1	1177.3	1144.8	1135.0	1274.2	1085.0	323.1	730.6	776.7	1071.5
66	992.5	1100.4	1100.4	1041.8	1031.5	1039.0	1409.3	1456.9	985.7	1254.5	1255.3	1137.7
67	1190.7	1242.6	1269.7	1134.2	1161.1	1245.1	1026.7	1186.9	390.6	754.2	1049.5	1137.4
68	1114.8	1113.1	1165.2	1027.3	995.3	1038.5	1197.5	1084.1	817.0	1164.4	1131.5	1145.1
69	1054.8	1171.2	1263.2	1109.6	1140.1	1122.4	1379.0	326.1	272.1	986.8	1244.7	1173.9
70	935.5	936.4	982.1	955.8	996.2	1016.8	500.7	632.9	337.4	968.2	1093.2	1124.4
71	1011.0	977.6	1032.9	1010.4	1036.0	1028.6	437.4	396.9	480.5	1039.9	1113.2	1043.4
72	1045.5	1053.7	1083.4	1011.7	993.2	1098.5	1123.8	1058.2	587.8	1146.6	1157.1	1135.8
73	1141.5	1071.2	1032.5	972.3	1021.2	1060.1	865.5	313.4	446.6	1031.4	1135.8	1093.4
74	1058.6	1073.8	1097.4	983.5	996.1	1008.3	584.6	903.9	578.3	1094.8	1121.0	1133.5
75	1048.4	1071.2	1100.0	1005.3	1033.9	1075.1	1025.5	825.1	435.2	1054.8	1013.9	1094.4
76	1070.9	1069.8	1070.2	1021.0	1066.2	1124.0	1379.9	1080.6	960.1	1200.5	1032.0	1117.7
77	1120.4	1131.2	1153.0	1076.4	1072.7	1105.1	1109.3	1455.2	1157.1	1141.6	1192.3	1359.9
78	1187.6	1208.4	1169.2	1069.4	1089.9	1123.8	1223.4	522.5	436.0	1063.7	1106.3	1213.6
79	1107.6	1100.9	1113.5	1043.1	1045.9	1092.3	857.4	430.3	322.9	1070.9	960.5	1105.6
MEAN MONTHLY SALINITY MASS (T/D) :												
65	230.96	257.41	246.95	199.21	223.97	234.86	248.98	276.68	876.99	1542.24	1240.63	645.09
66	583.90	402.59	402.26	343.52	354.31	334.31	223.88	215.93	319.93	390.19	393.34	497.83
67	299.03	256.80	237.70	235.43	211.42	154.77	267.69	253.01	756.01	1643.04	628.53	512.13
68	380.54	363.36	322.69	352.67	425.60	343.25	268.46	292.96	394.04	497.97	527.42	529.30
69	469.19	315.78	241.06	259.57	227.34	246.00	229.20	803.40	1174.79	704.50	404.32	483.05
70	702.93	732.82	613.51	510.41	423.83	393.10	665.05	517.66	931.37	839.20	603.66	558.63
71	547.28	624.74	509.08	391.22	351.79	363.85	510.83	858.75	680.84	570.00	571.95	575.53
72	485.74	470.07	426.25	388.94	426.46	268.84	282.09	305.58	495.25	523.52	485.22	460.20
73	351.07	442.54	494.37	468.78	379.16	319.68	364.65	1018.31	693.08	709.66	535.37	609.21
74	463.69	440.66	404.36	445.53	423.78	401.70	327.14	365.26	534.28	609.25	563.38	543.45
75	479.97	444.40	402.80	402.89	356.19	299.27	314.21	354.98	736.16	675.72	743.12	599.96
76	439.48	447.38	444.12	370.92	309.01	242.17	228.11	290.83	337.39	449.63	372.59	565.96
77	375.97	363.19	339.68	297.42	301.63	262.01	288.85	217.53	276.97	450.67	462.63	303.09
78	302.93	263.82	319.82	304.68	278.76	244.98	260.11	602.60	765.20	654.14	575.02	439.63
79	379.92	402.21	378.15	341.23	338.14	329.55	372.70	770.09	1015.06	646.43	841.03	551.37

Table D-3. (continued).

RIVER POINT: 3 - BIG THOMPSON RIVER AT MOUTH, NEAR LA SALLE

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1.675	2.170	1.948	1.736	1.372	1.240	1.296	.652	5.268	3.050	1.298	1.937
66	2.855	3.539	3.403	2.392	1.942	1.630	.711	.230	.913	1.199	.995	1.618
67	1.749	2.050	1.857	1.608	1.229	1.180	.862	.694	2.293	2.832	2.702	1.717
68	1.957	2.415	1.930	1.738	1.575	1.482	.930	1.018	2.414	1.212	.313	1.935
69	1.588	2.073	1.626	1.661	1.323	1.226	.571	7.111	7.479	.907	2.633	1.088
70	3.204	3.162	2.966	2.520	2.387	1.967	2.928	2.359	16.503	2.257	3.137	2.077
71	2.410	2.635	2.314	2.245	1.995	1.766	5.974	17.885	8.924	3.069	3.676	2.710
72	2.877	2.959	2.411	2.338	1.894	1.670	1.553	.569	2.712	1.052	2.423	1.656
73	1.726	2.235	1.715	1.992	2.113	2.077	2.204	20.800	8.500	2.359	1.739	3.260
74	2.918	4.265	3.724	2.185	2.298	2.036	2.069	2.918	3.949	2.120	4.733	2.487
75	2.193	2.434	2.103	1.850	1.744	1.653	2.472	2.294	9.120	2.853	4.315	3.579
76	2.447	2.510	2.137	1.758	1.874	1.720	1.368	1.400	1.179	2.279	7.151	4.665
77	2.495	2.268	2.021	1.605	1.770	1.384	.996	.238	.611	3.722	4.102	1.249
78	1.112	1.749	1.865	1.542	1.476	1.277	1.075	5.403	5.093	3.071	3.973	2.055
79	2.017	2.368	2.028	1.906	2.251	2.040	1.935	6.081	25.304	3.409	4.211	2.045

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1926.6	1890.1	1906.9	1934.0	1944.2	1948.7	1445.0	1808.0	632.7	1197.2	1792.9	1583.3
66	1845.6	1313.4	1819.7	1920.0	1929.3	1936.2	1959.2	3088.7	1658.6	1909.7	2021.3	1572.6
67	1922.3	1899.3	1915.0	1937.4	1948.9	1950.7	1626.7	1521.8	1134.7	1319.3	1376.4	1647.3
68	1904.5	1873.1	1908.6	1934.1	1938.4	1940.9	1750.9	1486.7	1082.2	1886.6	2019.4	1541.9
69	1932.1	1897.1	1935.9	1936.0	1945.9	1949.2	2031.9	520.9	589.1	2007.3	1379.4	1934.1
70	1827.6	1830.8	1840.2	1918.2	1920.6	1928.9	1038.5	1104.3	443.3	1473.7	1259.5	1342.2
71	1871.0	1856.2	1880.0	1923.0	1928.1	1933.4	619.3	450.1	601.2	1342.9	1247.9	1408.8
72	1844.4	1841.3	1873.2	1920.9	1930.4	1935.9	1337.0	2025.1	936.6	1957.5	1425.7	1569.6
73	1915.6	1885.1	1924.9	1927.7	1925.5	1926.3	1183.5	401.4	587.8	1467.8	1638.0	1321.4
74	1841.5	1784.0	1804.0	1923.5	1922.2	1927.3	1221.2	974.7	824.1	1535.6	1127.3	1423.6
75	1893.7	1871.7	1895.2	1931.4	1934.0	1936.0	1105.7	1077.9	573.8	1376.1	1175.4	1234.7
76	1869.8	1866.6	1892.1	1933.3	1930.9	1934.4	1476.1	1360.9	1571.1	1458.5	934.7	1157.8
77	1857.6	1893.0	1901.2	1932.5	1933.3	1943.5	1690.3	3254.5	1863.8	1141.3	1196.8	1856.9
78	1998.9	1922.1	1914.1	1939.2	1941.1	1947.4	1656.5	705.4	765.7	1332.1	1219.4	1555.0
79	1883.5	1876.3	1900.2	1932.3	1921.7	1927.1	1254.0	723.0	364.8	1295.6	1194.5	1559.1

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	278.86	354.37	321.01	290.16	230.53	208.70	161.86	101.51	287.97	315.43	193.86	264.97
66	455.33	554.42	534.96	396.86	323.67	272.61	120.41	61.40	130.84	187.53	173.76	236.59
67	290.52	336.43	307.26	269.12	206.90	198.91	121.12	91.32	224.78	322.77	321.32	244.38
68	321.65	390.91	318.28	290.49	263.71	246.46	140.65	130.82	225.76	157.59	159.39	260.43
69	265.03	339.75	271.96	277.78	222.40	206.45	100.19	320.04	380.65	157.23	313.87	191.86
70	505.99	500.17	471.57	417.68	396.04	327.75	262.72	225.13	632.14	287.40	352.26	276.69
71	389.54	430.68	375.83	373.05	332.40	294.96	319.13	695.55	463.54	356.08	395.31	323.31
72	453.53	470.75	390.15	383.10	315.93	279.29	179.42	99.62	219.44	177.97	282.52	238.82
73	285.58	364.04	285.15	331.82	351.47	345.71	225.36	721.42	431.64	300.50	249.99	379.31
74	464.36	657.32	580.46	363.12	381.59	339.04	218.30	245.79	281.21	281.29	480.33	307.32
75	356.95	393.66	344.32	308.68	291.33	276.55	236.17	213.61	452.17	338.17	438.20	381.93
76	395.34	404.77	349.44	293.72	312.62	287.48	174.43	164.61	160.03	295.08	577.55	466.44
77	402.69	369.01	332.06	301.37	295.63	232.38	145.50	66.99	130.55	372.91	424.21	209.35
78	191.99	290.46	308.47	255.35	247.47	214.86	153.87	328.30	335.27	353.45	419.11	272.27
79	328.22	383.92	332.93	301.50	375.45	339.61	209.65	379.96	797.45	331.90	434.33	[illegible]

Table D-3. (continued).

RIVER POINT : 4 - CACHE LA POUDRE RIVER NEAR GREELEY

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1.916	2.336	2.137	1.830	1.983	1.847	1.367	1.152	33.562	2.290	.697	1.630
66	3.143	2.795	3.292	3.947	3.358	2.523	1.367	.287	.961	.988	.636	1.509
67	1.369	1.842	2.146	1.779	1.613	1.745	1.305	.525	17.116	6.216	.877	1.284
68	2.449	2.884	2.704	2.216	2.453	1.911	1.594	.779	4.894	.864	.339	.958
69	2.498	2.768	2.470	2.217	2.049	2.041	1.459	.867	10.989	1.002	.533	1.054
70	4.308	5.005	3.499	3.436	4.177	3.673	3.792	1.673	24.360	2.961	1.621	2.336
71	3.750	5.796	4.696	3.503	3.381	3.233	5.845	26.414	16.951	4.670	1.337	3.911
72	4.338	6.181	4.628	4.158	4.448	3.089	2.983	.552	9.804	.392	1.763	2.374
73	2.477	2.944	2.253	3.560	3.772	3.073	2.963	27.760	13.876	4.420	2.621	3.398
74	5.322	6.352	4.782	4.339	4.622	3.388	3.717	2.576	15.692	2.331	2.224	2.582
75	4.292	4.224	4.079	3.887	3.323	2.930	2.840	2.391	15.063	3.995	1.204	1.752
76	3.207	3.437	2.781	2.629	2.774	2.700	2.248	1.673	1.546	.793	3.095	1.653
77	2.834	2.880	4.040	2.359	2.381	2.118	1.277	.776	.268	2.505	.747	.604
78	2.024	2.460	2.304	2.475	2.507	2.518	2.184	3.757	19.736	1.060	.883	1.516
79	2.958	2.902	2.261	2.074	2.475	3.126	3.157	20.378	41.299	2.731	5.855	2.903

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1435.3	1416.8	1431.3	1554.3	1517.1	1540.2	1184.8	1090.8	330.5	1346.0	1396.9	1361.4
66	1358.8	1388.6	1360.1	1252.5	1321.9	1407.2	1193.5	2121.3	1258.0	1373.3	1396.5	1347.4
67	1465.0	1453.2	1431.0	1565.6	1607.9	1574.5	1176.2	1298.9	424.2	1310.4	1380.8	1370.7
68	1408.3	1382.8	1393.0	1477.0	1437.3	1512.1	1113.0	1365.9	680.2	1381.2	1379.4	1379.0
69	1398.7	1389.5	1407.3	1476.4	1508.5	1508.9	1160.1	1300.2	487.4	1372.9	1354.7	1376.5
70	1315.1	1297.1	1350.7	1307.1	1247.0	1289.7	936.5	1115.7	394.8	1346.1	1360.7	1353.5
71	1338.0	1275.4	1304.7	1295.9	1317.3	1333.5	604.5	410.3	456.4	1328.6	1357.7	1338.4
72	1318.3	1265.6	1309.3	1248.3	1226.2	1333.1	898.9	1636.0	538.1	1372.7	1354.4	1350.0
73	1401.4	1379.3	1421.4	1294.7	1281.4	1349.9	910.9	389.3	441.1	1333.7	1345.6	1340.4
74	1288.2	1259.9	1301.5	1227.4	1213.6	1306.7	825.6	801.9	442.5	1353.1	1353.4	1350.4
75	1315.0	1322.8	1327.0	1270.6	1324.7	1366.5	929.1	895.0	479.1	1324.5	1370.2	1356.0
76	1363.6	1354.7	1388.6	1409.7	1390.6	1400.1	1008.1	1043.4	1140.9	1327.5	1318.1	1358.0
77	1385.5	1383.1	1317.3	1452.8	1449.0	1454.7	1212.9	1339.9	2169.1	1317.9	1382.7	1391.9
78	1439.1	1408.3	1419.0	1433.8	1429.1	1427.3	1003.8	778.4	409.6	1372.1	1380.9	1364.3
79	1356.8	1381.1	1422.2	1503.8	1431.3	1341.8	892.3	421.5	337.9	1343.6	1321.9	1346.3

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	237.65	285.97	264.33	245.70	259.96	247.38	139.91	108.56	958.34	266.32	83.52	191.74
66	371.74	334.18	386.86	430.56	383.45	318.86	140.93	52.59	104.49	117.29	76.16	175.71
67	173.41	231.22	265.29	240.70	224.08	237.34	132.66	103.84	627.34	703.76	104.62	152.03
68	297.98	344.52	325.42	282.80	304.67	249.65	153.31	91.95	287.01	103.12	111.92	114.15
69	300.70	332.36	300.33	282.30	267.05	266.03	146.26	97.34	462.74	118.86	54.29	125.39
70	489.49	560.88	408.29	388.10	450.00	409.27	274.04	161.22	809.64	332.74	214.13	273.20
71	433.46	638.72	529.37	403.36	384.80	372.46	305.26	936.38	683.12	536.03	221.37	452.21
72	494.10	675.82	523.49	448.47	471.22	355.81	230.87	77.99	455.81	116.51	205.31	300.24
73	299.95	350.85	276.64	398.20	417.62	358.12	233.19	933.62	528.85	305.33	304.58	353.54
74	592.29	691.52	537.73	460.12	484.63	382.49	265.15	178.49	599.93	272.54	260.09	299.88
75	487.67	482.75	467.63	426.67	380.35	345.99	227.99	184.92	623.54	443.83	142.53	205.25
76	377.85	402.27	333.60	320.19	333.31	326.63	195.84	150.82	152.41	94.77	352.71	218.52
77	339.31	344.14	459.83	296.04	298.03	273.56	133.83	89.84	50.17	329.78	95.34	72.65
78	251.69	299.30	282.45	306.66	309.56	310.55	189.43	252.66	698.49	125.62	105.33	173.69
79	347.30	346.23	277.79	269.41	306.03	362.38	243.43	742.20	1205.57	317.05	668.76	337.73

Table D-3. (continued).

RIVER POINT : 6 - SOUTH PLATTE RIVER NEAR WELDONA

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	6.207	4.049	2.516	1.814	4.491	5.673	7.341	7.978	91.993	30.237	33.327	19.027
66	38.666	24.173	13.202	16.386	19.253	6.723	2.785	2.939	4.999	6.060	6.632	7.128
67	5.842	3.155	3.087	5.325	6.268	4.527	6.770	3.845	31.380	32.806	7.028	5.201
68	3.579	3.033	8.730	12.362	7.219	10.800	6.621	4.948	5.847	6.682	6.623	5.905
69	4.998	3.175	3.221	3.361	3.987	9.546	6.585	65.825	115.432	9.462	6.957	7.003
70	18.789	27.653	29.949	29.592	22.524	13.866	45.902	62.001	140.632	23.865	10.835	19.887
71	18.531	21.248	18.338	26.720	20.475	21.926	39.148	92.852	34.998	11.257	10.901	32.118
72	24.671	11.473	10.231	18.353	12.206	10.000	5.763	4.477	13.658	6.504	10.115	7.545
73	3.922	7.287	11.683	22.008	22.579	22.408	37.138	261.996	104.962	24.255	13.191	32.390
74	39.552	32.769	14.128	22.439	16.478	21.677	30.290	14.359	17.641	10.335	12.217	21.183
75	13.387	9.528	10.097	14.845	12.250	8.326	7.300	11.311	46.564	18.683	15.023	14.974
76	11.810	7.456	14.083	13.367	8.303	11.611	6.637	6.626	5.198	5.694	10.180	16.459
77	3.794	2.839	9.954	14.324	7.149	8.182	6.066	5.343	2.869	7.131	7.152	7.470
78	4.681	4.956	3.689	9.546	6.544	3.741	5.679	12.078	26.232	9.437	8.952	7.310
79	13.174	6.722	9.863	15.091	14.059	4.218	4.623	47.348	141.519	11.090	36.318	16.364

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1671.7	1784.7	1931.4	1643.5	1512.1	1474.2	1262.2	1230.3	628.8	1138.0	1206.8	1311.3
66	1252.4	1350.7	1485.6	1343.3	1323.3	1429.1	1581.2	1573.1	1344.9	1509.0	1459.3	1469.5
67	1679.2	1869.5	1872.4	1489.7	1468.9	1508.1	1230.4	1465.1	798.0	1016.4	1497.4	1519.6
68	1823.1	1873.6	1578.9	1378.5	1448.6	1398.6	1278.7	1376.5	1299.3	1496.7	1435.3	1484.4
69	1700.1	1867.8	1858.4	1528.4	1530.2	1411.0	1298.6	674.4	614.7	1385.6	1426.5	1434.0
70	1395.0	1322.2	1303.0	1271.7	1302.0	1360.5	815.9	740.1	606.0	1267.4	1402.4	1257.5
71	1406.8	1377.8	1411.1	1282.4	1315.8	1307.4	738.2	687.7	847.5	1400.3	1414.7	1225.7
72	1334.2	1490.4	1548.4	1324.6	1366.6	1391.5	1324.8	1387.0	997.0	1498.2	1411.4	1458.1
73	1579.8	1629.3	1512.2	1304.0	1303.3	1304.3	850.9	529.9	641.0	1269.6	1370.7	1237.7
74	1246.5	1293.9	1459.6	1235.4	1340.8	1305.8	903.0	1047.2	964.0	1410.0	1398.9	1306.0
75	1477.8	1559.3	1541.8	1354.2	1371.5	1419.1	1221.6	1077.2	785.1	1305.9	1337.7	1362.6
76	1430.5	1623.1	1467.3	1362.2	1426.4	1385.3	1270.3	1246.2	1316.5	1514.1	1412.7	1341.0
77	1771.6	1888.8	1552.5	1359.4	1444.9	1427.8	1285.2	1319.8	1584.8	1466.9	1482.4	1507.5
78	1724.4	1732.0	1807.1	1402.9	1460.3	1538.3	1285.8	1090.3	888.5	1434.7	1445.3	1473.4
79	1491.0	1650.5	1546.7	1352.4	1354.4	1522.6	1385.6	795.9	607.7	1406.7	1195.2	1347.5

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	896.48	624.39	419.79	257.61	586.78	722.62	800.50	848.02	4997.58	2973.08	3474.30	2155.65
66	4184.09	2821.02	1694.57	1901.89	2201.17	830.14	380.55	399.41	580.88	759.52	853.36	904.42
67	847.51	509.53	499.47	685.43	795.51	585.89	719.67	486.68	2163.44	3447.69	903.17	682.83
68	563.73	490.94	1190.89	1472.31	903.47	1280.84	731.56	588.49	655.45	844.05	849.83	888.55
69	734.22	512.43	517.16	523.03	527.09	1163.68	738.79	3835.27	6130.68	1132.66	893.50	837.35
70	2248.28	3159.16	3371.67	3251.52	2533.78	1629.97	3235.90	3964.54	7362.86	2613.34	1318.88	2229.45
71	2252.41	2529.47	2235.81	2960.67	2327.64	2476.80	2496.83	5516.76	2562.66	1363.82	1332.60	3401.42
72	2844.06	1477.44	1368.66	2100.48	1441.19	1202.22	659.58	536.50	1176.50	841.88	1233.65	956.95
73	1217.80	1025.78	1526.44	2479.51	2542.44	2525.26	2730.21	11994.05	5812.67	2662.89	1561.05	3453.82
74	4259.59	3634.97	1781.77	2511.36	1908.94	2445.55	2356.23	1299.14	1469.21	1253.16	1468.89	2390.35
75	1709.19	1283.63	1345.09	1736.87	1451.56	1020.84	770.51	1052.74	3159.73	2107.98	1732.25	1752.95
76	1510.71	1045.58	1785.32	1573.16	1023.28	1389.66	728.38	713.43	591.24	744.95	1242.52	1905.59
77	580.68	463.35	1336.53	1682.35	892.49	1009.33	673.62	609.23	392.78	903.84	917.36	481.91
78	697.47	741.70	576.06	1157.05	825.70	497.29	630.96	1127.33	2017.49	1169.80	1107.79	933.69
79	1685.69	958.67	1317.95	1762.21	1645.21	554.92	553.49	3256.07	7430.40	1347.89	3753.56	1905.26

Table D-3. (continued).

RIVER POINT : 7 - SCUTH PLATTE RIVER AT BALZAC

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	4.822	2.203	.342	.420	.418	.436	4.015	5.293	114.001	28.330	29.895	13.414
66	26.068	19.689	17.260	19.401	21.177	4.072	1.499	2.483	2.848	3.988	4.295	8.398
67	1.148	.229	.262	.374	.257	1.187	5.970	5.242	28.034	31.285	3.525	3.051
68	.551	.282	.509	2.696	.335	5.991	4.091	3.870	3.013	4.745	3.779	4.610
69	1.053	.269	.454	.666	.320	.549	3.064	57.975	91.254	11.499	4.621	4.719
70	1.676	20.272	23.218	33.633	23.134	11.658	48.686	49.898	170.294	21.597	9.852	16.834
71	4.206	12.242	13.717	20.779	25.046	20.046	32.803	90.675	25.531	9.083	7.970	18.833
72	7.027	3.470	7.308	15.398	13.140	9.478	5.294	3.885	5.797	4.478	7.723	2.583
73	1.910	1.046	7.281	17.110	20.207	19.478	37.327	226.098	85.159	19.252	8.757	26.440
74	29.354	17.180	12.891	28.018	22.277	22.347	28.258	11.935	10.085	7.040	7.599	13.825
75	3.588	1.381	4.583	8.985	9.720	3.565	9.342	10.398	36.702	13.950	11.583	11.167
76	2.612	1.232	6.931	11.451	4.652	10.084	5.055	5.652	4.886	4.093	6.824	5.595
77	.441	.487	1.937	2.899	1.274	5.969	2.631	4.211	1.630	5.310	5.436	1.572
78	1.327	.370	.460	1.342	.848	.481	5.869	5.097	10.236	5.686	6.032	5.174
79	3.025	.667	1.601	5.078	10.601	1.587	4.433	31.704	129.531	10.745	32.491	9.590

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1372.4	1372.8	1447.3	1406.2	1406.2	1406.4	1293.4	1270.5	624.1	1457.1	1454.3	1447.2
66	1327.2	1332.0	1338.2	1425.2	1425.9	1420.4	1497.1	1432.7	1321.4	1439.4	1440.0	1445.6
67	1401.3	1458.8	1454.8	1405.7	1403.8	1415.9	1209.4	1109.7	908.6	1453.7	1432.6	1439.5
68	1403.2	1451.5	1412.5	1416.3	1405.1	1421.6	1285.1	1325.3	1338.7	1440.2	1440.3	1440.3
69	1393.5	1453.7	1435.3	1409.1	1404.9	1407.7	1294.6	793.7	767.7	1450.6	1440.4	1440.9
70	1397.5	1333.8	1330.5	1427.9	1426.3	1423.5	890.0	840.0	699.6	1451.0	1445.5	1443.1
71	1367.2	1346.1	1343.8	1425.9	1426.5	1425.4	865.8	799.2	956.5	1444.6	1443.4	1449.3
72	1360.3	1380.4	1358.3	1424.7	1423.9	1422.0	1263.8	1317.4	1152.0	1439.9	1444.3	1438.5
73	1394.4	1411.8	1357.9	1425.2	1425.4	1425.3	922.4	687.6	788.8	1450.1	1444.9	1451.3
74	1324.2	1338.5	1343.4	1427.3	1425.9	1426.1	965.3	1090.2	1078.8	1443.2	1443.6	1447.3
75	1379.5	1397.1	1369.7	1421.7	1422.7	1420.8	1154.3	1104.0	904.0	1447.3	1447.0	1445.3
76	1378.2	1402.9	1360.3	1422.9	1419.8	1423.1	1235.3	1238.3	1261.3	1442.0	1443.4	1443.8
77	1435.2	1435.9	1392.8	1416.8	1412.0	1421.2	1376.2	1295.4	1524.8	1444.0	1441.3	1433.4
78	1339.9	1443.6	1436.4	1412.3	1410.2	1406.9	1205.4	1198.6	1058.1	1441.6	1441.8	1440.8
79	1379.7	1428.2	1399.2	1419.3	1423.2	1413.3	1254.2	940.6	748.2	1445.7	1453.7	1443.0

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	571.90	261.30	42.72	51.05	50.75	52.95	448.71	580.98	6738.31	3566.43	3756.34	1677.27
66	2989.24	2265.92	1995.63	2388.91	2608.96	499.73	193.89	307.32	325.13	496.00	534.49	1049.93
67	138.98	28.91	32.94	45.37	31.14	145.23	623.85	502.58	2205.54	3929.46	450.33	379.15
68	103.15	35.34	110.92	329.85	40.64	735.89	454.17	443.19	343.48	540.69	470.27	573.55
69	126.91	33.74	56.24	81.07	38.94	66.77	342.57	3975.63	6052.95	1441.23	582.52	587.43
70	202.39	2336.10	2669.04	4149.39	2850.88	1433.95	3743.73	3621.20	10296.93	2707.54	1230.47	2107.55
71	496.79	1423.85	1592.69	2559.95	3086.87	2468.72	2453.79	6261.40	2109.86	1133.73	993.90	2358.26
72	825.90	413.82	857.62	1895.35	1616.57	1164.45	578.10	442.21	576.99	557.07	963.79	321.09
73	230.11	127.57	854.22	2106.88	2488.62	2398.57	2974.78	13431.31	5803.48	2412.02	1093.29	3315.26
74	3358.40	1986.77	1436.25	3455.28	2744.49	2753.39	2356.93	1124.18	940.00	877.83	950.23	1725.31
75	427.34	227.07	542.32	1103.62	1194.78	437.67	931.66	991.78	2866.62	1743.14	1449.73	1394.98
76	311.09	149.31	814.63	1407.79	570.67	1239.84	539.50	604.64	532.43	509.96	851.09	835.16
77	54.65	60.47	233.04	353.67	155.46	732.99	312.80	471.29	214.75	662.48	676.92	194.64
78	159.31	46.10	57.14	163.74	103.39	58.52	613.32	527.85	935.72	705.74	751.45	644.16
79	360.63	82.35	193.58	622.70	1303.52	193.75	490.34	2576.65	8373.39	1342.14	4090.37	1197.96

Table D-3. (continued).

RIVER POINT : 8 - SOUTH PLATTE RIVER AT JULESBURG

MEAN MONTHLY FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	.583	1.394	2.137	2.546	4.452	3.310	1.665	1.300	125.125	28.476	24.281	11.387
66	32.361	27.764	26.634	21.740	29.187	17.643	8.057	1.919	3.205	2.182	1.368	4.311
67	3.341	5.355	6.480	6.698	6.491	3.751	1.169	2.347	43.204	39.709	1.375	1.129
68	2.358	4.945	7.453	10.876	9.177	5.536	6.429	3.068	2.395	.271	30.443	5.445
69	3.944	5.694	6.834	8.286	7.522	7.004	3.235	58.698	99.094	20.551	1.330	1.110
70	4.733	22.196	28.266	44.337	34.129	17.495	58.201	47.732	104.758	16.449	1.560	5.626
71	12.066	16.433	17.508	21.445	29.641	25.555	24.658	91.537	25.751	2.190	.709	8.640
72	9.834	11.912	12.018	11.221	18.468	12.611	3.811	2.932	5.511	.913	1.172	4.036
73	2.800	4.555	9.108	18.883	27.117	25.091	45.052	243.225	103.665	5.236	3.409	23.005
74	39.662	27.427	18.440	35.267	30.943	28.821	32.913	4.271	4.633	.787	.785	5.573
75	3.792	3.760	8.877	13.309	15.951	6.946	14.807	6.685	38.853	2.198	2.200	3.731
76	3.867	5.596	12.226	16.337	12.897	14.231	4.204	2.629	1.443	.651	.517	1.350
77	2.110	1.798	3.424	4.549	6.523	11.519	9.518	4.770	3.732	1.120	1.517	1.340
78	2.710	2.421	2.970	3.638	5.158	5.425	2.053	1.662	6.465	.889	.450	.392
79	2.481	2.362	2.909	4.389	15.029	6.842	8.382	20.367	124.123	5.074	19.618	9.204

FLOW WEIGHTED MEAN MONTHLY SALINITY (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1850.0	1751.8	1690.6	1772.3	1685.1	1730.8	1599.0	1610.3	806.7	1232.3	1241.9	1314.1
66	1390.9	1396.7	1402.7	1470.7	1436.5	1486.9	1316.5	1583.7	1465.6	1458.6	1514.8	1412.1
67	1620.6	1578.7	1559.7	1631.2	1636.6	1713.9	1706.9	1531.4	1037.9	1223.0	1512.6	1538.6
68	1653.4	1583.9	1544.3	1553.9	1589.2	1576.9	1318.6	1485.2	1469.6	1347.9	1187.3	1392.8
69	1623.8	1570.3	1554.7	1601.5	1515.9	1625.1	1485.5	953.9	897.4	1232.5	1515.9	1534.0
70	1594.8	1416.8	1396.5	1377.9	1415.9	1497.9	1005.3	1007.5	903.4	1254.0	1501.8	1364.1
71	1498.7	1453.9	1448.4	1464.2	1435.2	1454.0	1119.2	945.2	1115.7	1463.2	1575.2	1319.5
72	1510.2	1491.0	1487.5	1560.7	1484.0	1542.4	1420.1	1494.0	1333.4	1554.8	1479.7	1405.1
73	1662.6	1598.1	1508.6	1484.3	1446.1	1454.6	1039.9	819.2	921.0	1328.2	1419.7	1260.8
74	1361.3	1399.5	1438.4	1405.6	1430.0	1437.2	1084.2	1354.1	1295.3	1570.5	1570.1	1386.7
75	1622.5	1616.3	1523.5	1537.1	1510.4	1615.4	1197.5	1278.0	1057.3	1458.2	1453.5	1417.0
76	1620.0	1573.6	1482.9	1500.2	1538.2	1523.8	1431.8	1501.5	1635.8	1587.0	1509.1	1429.7
77	1698.1	1721.0	1636.0	1679.8	1635.4	1544.1	1283.8	1333.3	1397.7	1529.7	1500.7	1512.0
78	1659.4	1680.9	1653.8	1719.2	1668.1	1654.2	1566.7	1597.5	1317.7	1557.9	1411.9	1539.5
79	1657.0	1685.1	1657.9	1673.1	1500.5	1623.2	1309.0	1134.0	899.3	1307.1	1254.4	1349.5

MEAN MONTHLY SALINITY MASS (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	103.21	211.01	312.21	389.84	648.14	495.03	230.03	180.85	8721.12	3031.87	2605.37	1292.94
66	3920.30	3350.41	3227.80	2762.55	3622.57	2266.57	916.44	262.60	405.78	275.02	179.09	525.93
67	551.76	730.37	873.25	944.05	917.82	555.41	172.33	310.49	3874.16	4195.99	179.67	149.38
68	422.53	676.74	994.41	1460.29	1259.27	1299.26	732.41	393.72	380.30	116.54	3122.93	655.26
69	539.27	772.48	918.02	1145.49	1050.23	983.45	415.16	4837.04	7583.36	2200.17	174.31	147.12
70	559.03	2717.04	3410.40	5278.40	4175.13	2264.26	5055.34	4154.95	8176.79	1732.13	202.45	663.05
71	1551.94	2064.25	2190.93	2712.93	3675.38	3210.44	2384.54	7475.56	2482.26	276.93	96.76	985.05
72	1283.17	1534.54	1544.63	1513.07	2367.87	1680.61	467.64	378.49	634.95	122.58	149.83	489.99
73	402.18	628.96	1187.14	2421.65	3388.07	3153.31	4047.77	17215.88	8248.73	1105.80	418.15	2505.03
74	4665.02	3316.40	2291.72	4286.13	3823.24	3578.74	3083.15	499.72	521.29	106.44	106.44	679.65
75	531.53	525.00	1168.48	1757.52	2081.51	969.43	1532.03	738.09	3535.69	277.09	276.25	459.24
76	541.19	760.88	1566.41	2117.62	1714.03	1873.59	520.07	341.04	203.97	89.30	71.83	173.73
77	309.58	267.38	483.92	660.20	921.72	1536.73	1055.75	549.50	456.75	148.01	195.72	175.10
78	388.57	351.61	424.32	540.43	743.34	775.35	279.31	229.46	736.00	119.63	57.12	54.15
79	357.32	343.84	416.75	634.46	1948.41	959.53	947.98	1595.54	9644.09	1024.91	2196.37	1073.13

APPENDIX E

DIVERSION AND POINT SOURCE FLOW DATA, WATER YEARS 1965-77, SOUTH PLATTE RIVER BETWEEN HENDERSON AND JULESBURG

Tables E-1, E-2, E-3, and E-4 contain diversion and point source monthly flow data for water years 1965-77 used in the materials balance analysis discussed in Sections 3-3 and 4-3. Each table contain data for each of the four river reaches considered, i.e. Henderson-Kersey, Kersey-Weldona, Weldona-Balzac, Balzac-Julesburg, respectively. Flow data were taken from WPRS (1979).

Tables E-1, E-3 and E-4 contain also salinity concentration data used to characterize the indicated point source discharges considered. The three subreaches mentioned in Table E-1 are as follow:

- subreach 1: Henderson-St. Vrain Creek confluence
- subreach 2: St. Vrain Creek confluence-Big Thompson confluence
- subreach 3: Big Thompson confluence-Kersey

Table E-1. Diversion and point source flow monthly data used in materials balance analysis, water years 1965-77, Henderson-Kersey reach, South Platte River.

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 1 HENDERSON - KERSEY.

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RIVER SUBREACH : 1 HENDERSON - ST. VRAIN CK. TOTAL OUTFLOW IN 1000 AF UNITS FROM SUBREACH :												
65	9.9	4.5	0.0	0.0	0.0	0.0	5.0	17.6	8.8	21.8	25.1	12.7
66	1.9	0.0	0.0	.6	1.4	3.9	10.8	19.2	19.0	19.4	20.3	13.5
67	8.5	4.0	0.0	0.0	0.0	.9	12.9	15.9	15.9	24.1	30.5	19.7
68	10.4	4.0	2.0	0.0	2.3	1.1	3.5	20.7	30.2	33.2	31.6	21.7
69	6.7	9.9	2.3	0.0	0.0	3.0	7.4	18.9	18.4	42.2	37.5	21.2
70	9.1	2.2	0.0	0.0	0.0	0.0	3.7	21.6	20.4	42.5	39.3	15.4
71	8.9	2.6	0.0	0.0	0.0	0.0	.4	12.2	35.1	42.9	33.4	10.2
72	9.4	7.8	0.0	0.0	0.0	2.7	7.8	20.9	24.6	33.8	35.8	11.9
73	9.9	0.0	0.0	0.0	0.0	3.4	0.0	1.9	21.5	38.7	35.5	11.1
74	4.7	7.4	5.8	0.0	0.0	0.0	.2	21.6	28.7	36.2	30.7	14.2
75	10.2	1.7	0.0	0.0	0.0	0.0	6.6	18.7	17.9	40.0	33.3	17.2
76	14.4	7.2	0.0	0.0	0.0	.5	10.3	18.1	27.7	34.7	36.0	14.5
77	10.3	6.2	.1	.2	3.0	3.9	9.2	20.3	27.2	20.0	23.1	15.5
RIVER SUBREACH : 2 ST. VRAIN CK. - BIG THOMPSON R. TOTAL OUTFLOW IN 1000 AF UNITS FROM SUBREACH :												
65	5.6	1.4	0.0	0.0	0.0	0.0	2.7	5.9	4.3	9.0	9.2	5.5
66	1.0	0.0	0.0	0.0	0.0	0.0	1.2	5.6	5.5	6.3	5.9	5.3
67	4.4	2.7	1.2	0.0	0.0	0.0	2.9	5.3	1.8	8.8	9.3	6.5
68	3.3	0.0	0.0	0.0	0.0	0.0	.4	6.2	7.4	9.5	7.5	6.5
69	1.7	0.0	0.0	0.0	0.0	0.0	1.3	3.3	3.9	8.4	9.5	5.8
70	.4	0.0	0.0	0.0	0.0	0.0	0.0	4.7	5.0	8.3	8.4	3.3
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	5.8	9.5	9.1	2.5
72	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.1	5.8	9.3	7.4	1.4
73	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	9.6	7.2	2.8
74	0.0	0.0	0.0	0.0	0.0	0.0	1.9	6.6	8.0	9.1	7.4	1.6
75	1.5	0.0	0.0	0.0	0.0	0.0	.5	5.5	3.4	9.3	8.2	4.7
76	.9	0.0	0.0	0.0	0.0	0.0	1.7	4.4	6.7	8.9	8.3	4.2
77	1.2	0.0	0.0	0.0	0.0	.5	3.5	5.0	7.9	6.8	8.2	6.5
RIVER SUBREACH : 3 BIG THOMPSON R. - KERSEY TOTAL OUTFLOW IN 1000 AF UNITS FROM SUBREACH :												
65	5.0	9.3	0.0	0.0	0.0	0.0	5.1	6.9	2.2	12.6	13.7	5.6
66	.6	0.0	0.0	0.0	0.0	0.0	4.6	5.1	3.9	7.3	7.7	6.8
67	3.7	0.0	0.0	0.0	0.0	0.0	5.0	4.5	1.4	12.5	11.4	7.5
68	2.4	0.0	0.0	0.0	0.0	0.0	.5	7.2	10.1	12.7	10.1	8.7
69	2.6	0.0	0.0	0.0	0.0	0.0	3.6	3.9	3.9	12.7	12.2	7.8
70	.4	0.0	0.0	0.0	0.0	0.0	0.0	6.3	6.8	15.0	13.4	6.4
71	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.8	10.6	15.7	13.9	4.6
72	.3	0.0	0.0	0.0	0.0	0.0	5.7	8.7	9.5	11.6	9.5	1.8
73	2.5	0.0	0.0	0.0	0.0	0.0	0.0	1.4	11.0	11.8	12.5	3.4
74	.1	0.0	0.0	0.0	0.0	0.0	.2	8.9	9.0	14.0	11.7	1.9
75	1.4	0.0	0.0	0.0	0.0	0.0	1.0	6.0	3.4	15.1	12.3	4.9
76	.3	0.0	0.0	0.0	0.0	0.0	1.5	5.6	8.4	11.7	12.3	4.9
77	.7	0.0	0.0	0.0	0.0	0.0	5.3	5.7	8.3	9.6	10.0	5.3

Table E-1. (continued).

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 1 HENDERSON - KERSEY.

TOTAL OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	20.5	15.3	0.0	0.0	0.0	0.0	12.8	30.4	15.3	43.4	43.0	23.8
66	3.5	0.0	0.0	.6	1.4	3.9	16.6	29.9	28.5	33.0	33.9	25.6
67	16.6	6.7	1.2	0.0	0.0	.9	20.8	25.7	19.1	43.1	51.2	33.9
68	15.1	4.0	2.0	0.0	2.3	1.1	4.4	34.1	47.7	55.4	49.5	36.9
69	11.0	9.9	2.3	0.0	0.0	3.0	12.3	26.1	26.2	63.3	59.3	32.8
70	9.9	2.2	0.0	0.0	0.0	0.0	3.7	32.6	32.2	65.8	61.1	26.1
71	8.9	2.6	0.0	0.0	0.0	0.0	1.5	17.7	51.5	68.2	55.4	17.3
72	9.7	7.8	0.0	0.0	0.0	2.7	17.1	36.7	39.9	54.7	42.7	15.1
73	16.6	0.0	0.0	0.0	0.0	3.4	0.0	3.3	37.7	59.4	55.2	17.3
74	4.8	7.4	5.8	0.0	0.0	0.0	2.3	37.1	45.7	59.3	49.8	17.7
75	13.1	1.7	0.0	0.0	0.0	0.0	8.1	30.2	24.7	64.4	53.8	25.8
76	15.6	7.2	0.0	0.0	0.0	.5	13.5	28.1	42.8	55.3	55.6	23.6
77	12.2	6.2	.1	.2	3.0	4.4	18.0	31.0	43.4	36.4	41.3	27.3

RIVER SUBREACH : 1 HENDERSON - ST. VRAIN CK.
SOUTH PLATTE SUPPLY CANAL.
POINT INFLOW IN 1000 AF UNITS TO SUBREACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	.2	.1
66	.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.9	2.8	2.4	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	3.5	.9
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	3.0	1.8	.5
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.9	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.7	.6	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.9	3.3	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.4	3.4	2.5	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.6	0.0
74	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	.3	3.1	4.1	.8
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	3.5	1.1
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.6	2.0	1.3
77	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	4.2	3.4	0.0

RIVER SUBREACH : 1 HENDERSON - ST. VRAIN CK.
SOUTH PLATTE SUPPLY CANAL.
SALINITY IN POINT INFLOW TO SUBREACH (MG/L) :

RIVER SUBREACH : **

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
66	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
67	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
68	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
69	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
70	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
71	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
72	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
73	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
74	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
75	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
76	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
77	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0

Table E-2. Diversion and point source flow monthly data used in materials balance analysis, water years 1965-77, Kersey-Weldona reach, South Platte River.

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 2 KERSEY - WELDONA.

TOTAL OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	7.7	29.1	28.6	32.6	33.4	31.0	14.4	19.2	77.1	51.6	39.3	26.4
66	5.2	11.3	35.8	25.4	15.8	34.4	22.5	15.3	23.9	12.9	12.9	20.3
67	26.7	36.8	34.2	25.2	29.4	17.0	16.2	22.8	46.1	46.7	30.4	31.3
68	37.8	38.6	24.0	13.7	31.8	21.4	23.1	19.6	36.3	22.1	31.7	25.0
69	39.7	29.5	27.1	30.1	27.7	17.4	14.6	63.3	48.5	44.5	26.2	30.7
70	42.2	48.2	28.2	12.9	19.6	30.9	12.9	12.8	59.2	39.5	31.9	34.5
71	23.6	28.5	35.8	23.6	29.3	18.3	24.8	31.0	65.5	43.1	29.5	13.5
72	19.4	42.4	35.3	14.5	32.2	24.0	27.3	25.0	74.3	25.2	25.5	39.1
73	21.6	45.7	17.1	7.7	20.3	21.3	16.6	16.1	94.1	44.0	29.9	5.5
74	0.0	6.2	36.7	24.5	37.1	48.6	30.3	29.0	64.1	26.9	31.3	22.8
75	23.1	45.3	35.7	21.2	29.3	34.5	38.1	33.5	54.8	35.3	30.3	43.2
76	32.4	41.9	29.1	28.8	42.3	44.0	22.6	32.7	28.6	24.9	31.4	29.9
77	30.2	45.9	35.3	19.8	24.9	28.0	27.6	14.3	17.5	26.4	25.6	21.2

JACKSON LAKE INLET CANAL.
POINT OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	.5	18.3	7.1	4.2	4.0	5.3	.6	0.0	13.3	4.2	1.3	0.0
66	0.0	0.0	8.4	4.8	3.6	5.1	2.3	0.0	4.6	0.0	0.0	0.0
67	16.9	12.9	4.9	2.3	1.3	.1	0.0	.2	1.7	1.5	0.0	1.7
68	3.9	4.8	5.0	2.8	2.7	2.5	.8	0.0	.3	0.0	0.0	0.0
69	8.9	10.7	4.5	3.3	2.8	3.3	1.1	1.3	.4	0.0	0.0	4.5
70	6.7	4.6	3.0	2.5	3.6	3.8	1.7	.6	.6	0.0	0.0	0.0
71	1.9	3.6	3.4	1.5	1.3	1.0	1.9	.2	2.4	0.0	0.0	0.0
72	13.5	17.8	2.0	1.7	6.8	1.7	1.1	.2	3.6	0.0	0.0	9.2
73	2.3	5.4	1.4	1.2	3.0	4.8	1.9	.2	0.0	0.0	0.0	0.0
74	0.0	.6	4.3	5.2	4.0	3.4	3.1	.1	12.1	0.0	0.0	0.0
75	0.0	11.9	9.8	4.3	7.3	1.2	1.0	4.6	2.0	1.2	0.0	0.0
76	1.1	11.1	11.0	6.8	4.5	1.2	0.0	4.8	2.5	0.0	.8	0.0
77	3.0	9.5	7.5	4.5	3.3	2.0	3.6	0.0	0.0	1.2	0.0	0.0

JACKSON LAKE OUTLET CANAL.
POINT INFLOW IN 1000 AF UNITS TO REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	1.9	5.4	0.0	0.0	2.6	4.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	3.8	4.8	5.2	1.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	15.2	.7
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	8.0	5.8	1.4
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	10.5	1.1
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	5.3
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	6.1	12.8	5.4
72	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	10.4	7.5	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	1.9
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	4.6	9.7	9.3
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	16.9	19.7	24.0
76	13.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	3.1	8.3	7.0	2.6
77	.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	7.6	7.9	.6

Table E-3. Diversion and point source flow monthly data used in materials balance analysis, water years 1965-77, Weldona-Balzac reach, South Platte River.

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 3 WELDONA - BALZAC.

TOTAL OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	7.5	11.3	12.2	11.2	12.0	16.1	12.0	11.3	42.2	25.8	42.7	18.6
66	34.0	16.0	0.0	0.0	5.1	17.4	9.5	7.9	10.9	5.9	6.0	5.4
67	17.0	14.5	13.0	21.4	17.1	15.1	8.5	14.0	28.1	17.3	13.3	14.3
68	16.8	15.5	19.7	25.0	21.9	12.1	12.6	12.4	11.5	7.0	12.0	12.4
69	19.5	15.2	14.8	20.5	15.7	26.0	13.9	37.1	17.3	16.7	10.8	12.5
70	45.5	27.8	27.7	0.0	6.9	13.2	.8	22.5	25.4	25.3	16.7	15.8
71	42.3	33.8	23.6	14.5	2.5	10.5	4.5	13.4	32.3	15.4	10.7	24.3
72	45.6	25.4	15.4	10.9	4.2	7.3	11.2	11.3	27.2	9.7	9.5	13.0
73	24.2	23.6	23.7	17.6	14.7	16.0	3.7	12.4	36.4	20.9	13.7	17.0
74	25.5	39.6	12.3	0.0	0.0	7.7	12.2	16.8	25.7	13.5	13.7	25.5
75	33.5	26.5	20.9	24.7	12.6	20.9	7.4	13.4	32.0	21.7	14.2	16.1
76	35.0	23.2	28.8	19.5	20.2	12.5	14.7	13.1	8.4	11.1	11.7	21.7
77	20.0	15.5	29.5	30.1	23.3	13.2	17.8	14.6	10.6	10.8	9.0	8.3

BIJOU CK. + BIJOU 2 OUTLET.
POINT INFLOW IN 1000 AF UNITS TO REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.8	1.0	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	.1	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	1.2	1.8	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.7	1.1
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	.3	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	.4	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	1.8	1.1
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	2.1	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.6	1.8	1.4	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.6	0.0	0.0	0.0	0.0
77	0.0	0.0	.5	.5	.8	1.5	.6	1.9	.9	2.9	.4	.3

BIJOU CK. + BIJOU 2 OUTLET.
SALINITY IN POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
66	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
67	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
68	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
69	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
70	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
71	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
72	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
73	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
74	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
75	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
76	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
77	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0

Table E-4. Diversion and point source flow monthly data used in materials balance analysis, water years 1965-77, Balzac-Julesburg reach, South Platte River.

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 4 BALZAC - JULESBURG.

TOTAL OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	16.3	10.0	6.0	7.4	.7	5.6	14.5	21.2	6.2	8.6	30.5	20.6
66	0.0	0.0	0.0	0.0	0.0	3.6	6.1	21.6	19.2	24.5	22.0	19.6
67	7.2	4.8	0.0	0.0	.4	8.7	21.9	15.9	0.0	27.2	34.4	18.6
68	12.9	6.3	.4	.2	0.0	6.6	17.3	18.8	21.5	25.6	18.4	21.0
69	10.3	3.8	0.0	0.0	0.0	1.1	13.1	11.5	14.2	34.7	29.2	13.7
70	12.2	.7	.2	1.2	0.0	4.3	0.0	23.3	24.8	53.8	40.9	32.0
71	8.9	1.2	.6	.3	0.0	.4	.8	5.5	28.3	33.1	32.5	25.5
72	2.1	.5	.2	0.0	0.0	3.5	18.9	21.4	16.9	25.2	30.3	16.4
73	9.3	8.4	0.0	.2	1.1	.6	1.1	5.4	23.5	46.9	44.6	15.9
74	.9	.1	0.0	0.0	0.0	2.3	8.4	45.0	33.4	33.3	31.8	29.1
75	14.2	7.7	.1	.3	.6	5.5	9.9	30.1	17.4	31.1	43.7	31.5
76	13.5	4.1	.4	0.0	.7	4.1	19.0	28.1	24.4	27.1	24.3	19.8
77	9.8	6.5	5.2	2.6	1.4	.2	9.2	23.8	19.2	24.5	23.9	14.5

PREWITT RESERVOIR INLET.
POINT OUTFLOW IN 1000 AF UNITS FROM REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	.9	1.1	1.0	1.1	1.4	1.5	.9	22.9	9.0	14.9	.3
66	0.0	10.9	0.0	0.0	5.1	8.8	6.1	1.1	5.1	.3	0.0	.3
67	4.7	1.2	1.0	3.8	1.0	.8	.6	1.7	25.8	4.8	.2	5.1
68	.8	1.1	3.7	11.2	3.5	8.7	.5	2.4	1.8	.3	2.4	1.0
69	2.0	.9	1.3	4.2	1.4	15.9	8.9	10.9	3.4	.6	0.0	5.2
70	22.2	1.8	0.0	0.0	6.9	6.0	.8	2.9	2.6	2.1	0.0	2.8
71	16.5	3.1	0.0	0.0	.8	10.5	3.8	3.0	2.6	.5	.1	10.5
72	13.7	.7	0.0	0.0	4.2	7.3	1.8	2.1	4.7	.4	.1	.3
73	.5	2.2	10.1	5.4	5.4	16.0	3.7	3.6	3.5	5.3	2.0	0.0
74	0.0	15.7	0.0	0.0	0.0	7.7	4.1	2.6	4.0	.3	0.0	13.5
75	6.5	2.0	5.0	8.4	.4	4.3	2.5	2.8	1.7	1.9	0.0	5.1
76	3.7	2.1	9.4	0.0	2.8	4.2	1.5	3.5	.7	.3	0.0	5.5
77	2.3	1.0	9.4	9.9	6.8	4.3	1.7	1.0	.2	1.2	0.0	0.0

PREWITT RESERVOIR OUTLET.
POINT INFLOW IN 1000 AF UNITS TO REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	1.8	1.1
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	2.6	5.9	4.5	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	11.6	.2
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	7.5	2.2	.3
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	9.1	.1
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.8	5.9	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	5.9	.1
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.8	5.5	6.7	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	6.6	.5
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	1.2	7.8	4.1	.1
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	5.5	.9
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	.6	6.8	2.3	.2
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	4.3	.9

Table E-4. (continued)

THE FOLLOWING M O N T H L Y D A T A HAVE BEEN USED FOR RIVER REACH : 4 BALZAC - JULESBURG.

LODGEPOLE CREEK.
POINT INFLOW IN 1000 AF UNITS TO REACH :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	.1	.5	.5	.6	.6	.5	1.4	.7	.5	.4
66	.5	.6	.6	.5	.5	.7	.6	.5	.4	.3	1.1	1.3
67	.6	.5	.5	.5	.5	.5	.5	.6	1.5	.8	.5	.5
68	.6	.6	.6	.7	.8	.8	.9	.8	.6	.4	.5	.5
69	.6	.6	.5	.5	.6	.8	.7	.6	.6	.4	.3	.3
70	.5	.6	.6	.6	.6	.7	.7	.6	.4	.3	.3	.3
71	.4	.4	.4	.4	.5	.5	.5	.6	.5	.3	.2	.3
72	.4	.4	.4	.4	.4	.5	.4	.4	.3	.2	.3	.4
73	.4	.5	.4	.5	.5	.7	.8	.6	.4	.3	.3	.4
74	.5	.5	.5	.4	.4	.5	.5	.4	.3	.2	.2	.2
75	.3	.4	.3	.3	.3	.4	.5	.5	.3	.1	.3	.2
76	.2	.3	.3	.4	.4	.4	.4	.3	.2	.1	.1	.1
77	.2	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LODGEPOLE CREEK.
SALINITY IN POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
66	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
67	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
68	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
69	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
70	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
71	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
72	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
73	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
74	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
75	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
76	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
77	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0

APPENDIX F

MEAN VALUES OF FLOW AND SALT MASS AND FLOW WEIGHTED MEAN TOTAL DISSOLVED SOLIDS FOR ANNUAL, SEASONAL, AND MONTHLY TIME INTERVALS, WATER YEARS 1965-77, FOR POINT SOURCE INFLOWS, RETURN FLOWS AND DIVERSION FLOWS TO AND FROM FOUR REACHES IN THE SOUTH PLATTE RIVER

Tables F-1, F-2, and F-3 contain the results of the materials balance analysis, averaged by year, season and month respectively, for the four reaches considered in the lower South Platte River, i.e. Henderson-Kersey, Kersey-Weldona, Weldona-Balzac, Balzac-Julesburg. Each table contain mean values of flow and salt mass flow and flow weighted mean total dissolved solids for point source inflows, diversion flows and return flows to and from the reach. The seasonal and annual tables have been computed using the monthly results. It should be mentioned that negative values of monthly return flows have been omitted in the seasonal and annual averages.

Table F-4 contains revised seasonal and annual averages of flow, salt concentration and salt mass flow for return flows to reach Kersey-Weldona. The revision has been made excluding those monthly flows for which a salt concentration exceeding 3000 mg/ℓ was obtained in the basic computations. The revised averages were used to construct plot (b) in Figure 4-17 and the plots of Figure 4-19.

Figure F-1 is a sketch included to define the terms used in the computer output of the materials balance analysis.

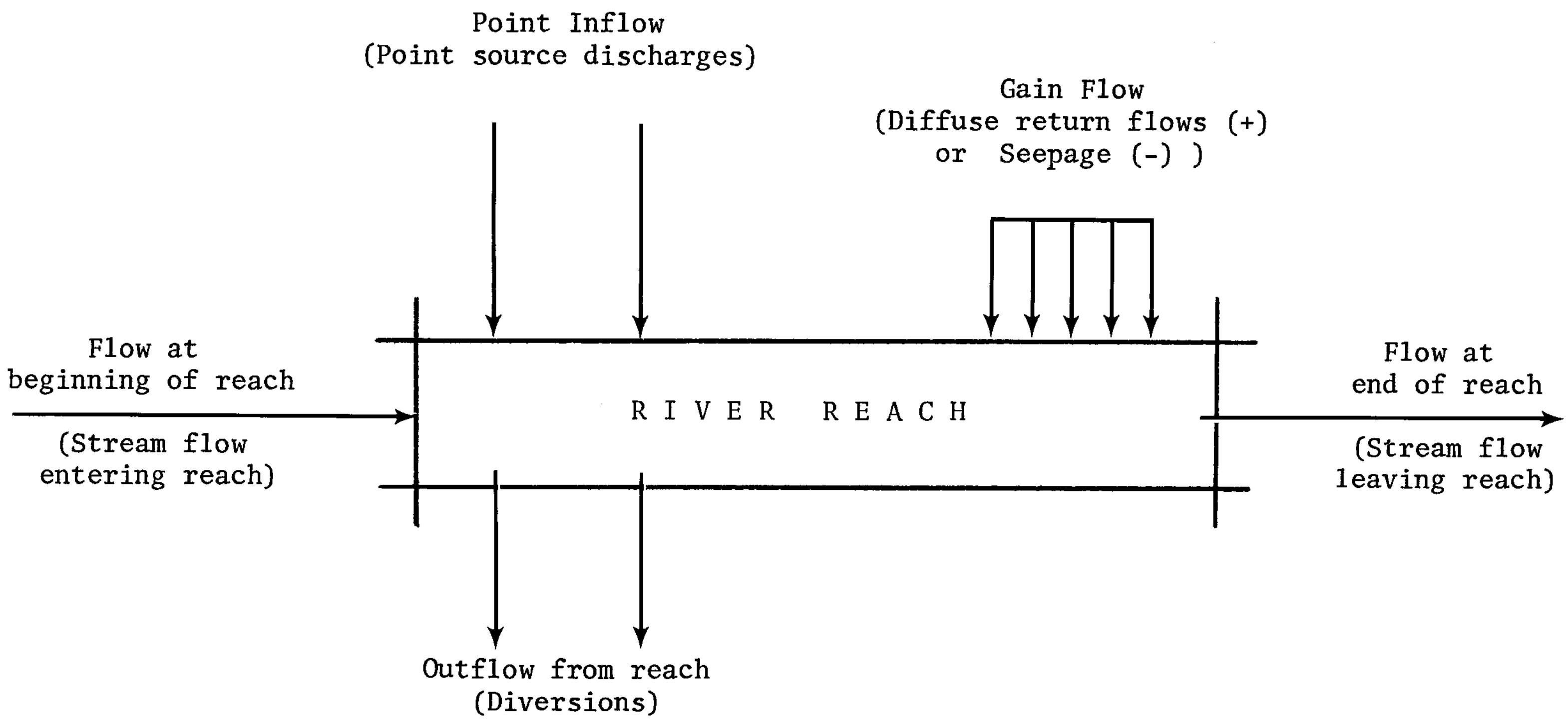

Figure F-1. Sketch to define terms used in computer output of material balance analysis.

Table F-1. Flow, salt concentration and salt mass flow averaged by year, water years 1965-77, for point source inflows, diversion flows and return flows, South Platte River between Henderson and Julesburg.

A N N U A L R E S U L T S

TOTAL POINT INFLOW TO REACH (CMS) :

WATER YEAR	RIVER REACH 1	2	3	4
65	14.69	.54	0.00	.34
66	8.06	.68	0.00	1.01
67	11.69	.73	.07	.84
68	8.12	.67	.02	.79
69	14.63	.66	.13	.81
70	18.78	.48	.07	.54
71	20.83	.97	.09	.65
72	10.84	.75	.08	.70
73	19.48	.50	.13	.56
74	13.59	.97	.09	.70
75	13.84	2.41	.15	.54
76	9.45	1.38	.02	.70
77	7.52	.83	.40	.47

SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) :

WATER YEAR	RIVER REACH 1	2	3	4
65	823.9	1246.5	0.0	1041.0
66	1292.6	1321.8	0.0	1278.4
67	960.0	1496.1	1000.0	1077.8
68	1227.3	1438.8	1000.0	1252.2
69	750.0	1470.9	1000.0	1146.3
70	866.7	1195.0	1000.0	1185.8
71	807.9	1122.0	1000.0	1189.4
72	1146.5	1282.8	1000.0	1271.1
73	776.5	1259.4	1000.0	1177.2
74	1073.8	1028.1	1000.0	1197.7
75	995.7	1274.6	1000.0	1264.7
76	1210.6	1303.6	1000.0	1304.8
77	1287.2	1428.1	1000.0	1392.5

SALINITY MASS IN TOTAL POINT INFLOW TO REACH (T/D) :

WATER YEAR	RIVER REACH 1	2	3	4
65	1045.5	58.6	0.0	31.0
66	900.2	78.2	0.0	111.0
67	969.6	94.5	6.1	78.3
68	860.8	83.1	1.4	85.5
69	947.7	84.0	11.2	79.8
70	1406.2	49.7	6.1	55.3
71	1453.8	94.0	8.1	66.3
72	1074.1	83.2	6.6	76.9
73	1306.9	54.1	11.5	56.5
74	1260.6	86.5	8.1	72.9
75	1190.2	264.9	12.8	59.4
76	988.9	155.1	2.0	78.5
77	836.3	102.3	34.8	56.9

NOTE: River reach 1: Henderson-Kersey
River reach 2: Kersey-Weldona
River reach 3: Weldona-Balzac
River reach 4: Balzac-Julesburg

Table F-1. (continued).

A N N U A L   R E S U L T S

TOTAL OUTFLOW FROM REACH (CMS) :

WATER YEAR	RIVER REACH 1	2	3	4
65	8.19	15.27	8.72	5.77
66	6.92	9.22	4.71	4.56
67	8.57	14.19	7.59	5.44
68	9.92	12.72	7.00	5.83
69	9.63	15.62	8.61	5.34
70	9.80	14.54	8.90	7.56
71	8.77	14.53	8.93	5.60
72	8.86	15.07	7.69	5.30
73	7.55	13.29	8.99	6.14
74	8.99	13.98	7.53	7.17
75	8.71	16.60	9.54	8.30
76	9.51	15.20	8.60	6.36
77	8.74	13.17	7.94	5.72

SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) :

WATER YEAR	RIVER REACH 1	2	3	4
65	684.5	1115.8	1259.5	1424.0
66	902.6	1348.2	1385.7	1450.7
67	758.3	1268.4	1372.3	1438.9
68	801.5	1351.4	1451.3	1418.5
69	706.6	1159.9	1293.4	1321.9
70	567.6	1057.6	1227.5	1276.6
71	645.1	1055.0	1259.1	1344.7
72	729.9	1202.6	1351.4	1410.7
73	592.6	1005.6	1251.2	1308.4
74	665.7	1086.4	1256.2	1341.0
75	618.3	1152.6	1318.9	1367.2
76	712.5	1270.9	1401.3	1453.6
77	813.5	1387.2	1459.9	1452.8

SALINITY MASS IN TOTAL OUTFLOW FROM REACH (T/D) :

WATER YEAR	RIVER REACH 1	2	3	4
65	484.6	1472.1	948.8	710.3
66	539.6	1073.9	563.4	571.7
67	561.7	1555.2	900.2	676.4
68	686.7	1484.7	877.5	714.3
69	587.9	1565.2	961.6	610.3
70	480.5	1328.9	944.2	834.4
71	488.5	1324.5	971.8	650.8
72	558.5	1565.5	898.3	646.0
73	386.3	1154.8	972.1	694.2
74	517.2	1312.2	817.2	830.7
75	465.6	1652.7	1087.1	980.0
76	585.6	1669.0	1041.4	798.3
77	614.4	1578.4	1001.1	717.8

Table F-1. (continued).

A N N U A L   R E S U L T S

WATER YEAR	RIVER REACH 1	2	3	4
TOTAL REACH GAIN FLOW (CMS) :				
65	3.94	4.71	7.78	5.65
66	6.12	7.04	3.20	7.34
67	8.68	6.17	4.67	7.99
68	7.08	6.34	2.96	9.99
69	13.38	6.38	4.92	8.43
70	11.69	6.09	8.37	8.39
71	9.99	6.48	4.37	5.67
72	5.99	7.42	3.47	6.18
73	20.49	7.77	4.01	9.32
74	6.84	7.30	3.90	7.98
75	6.67	5.95	4.64	7.33
76	7.49	6.91	4.64	6.10
77	6.79	5.98	3.83	6.72
SALINITY IN TOTAL REACH GAIN FLOW (MG/L) :				
65	1258.1	2261.1	1294.4	1449.1
66	1408.2	1623.6	1454.9	1518.9
67	1090.2	1833.0	1435.2	1457.6
68	1258.5	1787.5	1378.4	1434.5
69	1012.9	1780.0	1452.9	1582.5
70	1384.0	2403.9	1412.0	1476.4
71	1215.4	2068.4	1737.4	1710.7
72	1373.4	1719.5	1397.2	1553.7
73	808.5	1876.7	1843.7	1561.7
74	1432.1	1877.9	1646.3	1474.8
75	1333.5	1977.5	1462.0	1513.8
76	1223.2	1793.0	1368.4	1609.7
77	1276.3	1854.3	1456.1	1508.1
SALINITY MASS IN TOTAL REACH GAIN FLOW (T/D) :				
65	971.4	919.7	870.3	707.2
66	744.9	987.2	402.1	963.3
67	817.9	977.6	578.5	1005.9
68	769.7	979.6	352.3	1238.3
69	1170.7	981.1	617.2	1152.0
70	1398.3	1264.1	1021.0	1070.8
71	1049.4	1158.4	656.2	838.5
72	710.3	1102.6	418.8	829.8
73	1431.5	1259.9	635.5	1257.5
74	846.6	1184.0	555.3	1017.1
75	768.0	1016.8	586.0	958.3
76	791.6	1070.0	549.0	848.0
77	748.2	958.6	481.3	875.4

Table F-2. Flow, salt concentration and salt mass flow averaged by season, water years 1965-77, for point inflows, diversion flows and return flow, South Platte River between Henderson and Julesburg.

S E A S O N A L   R E S U L T S

RIVER REACH : 1 HENDERSON - KERSEY.

WATER YEAR	TOTAL POINT INFLOW TO REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL POINT INFLOW TO REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	6.31	5.54	26.42	20.41	1513.3	1490.8	459.0	900.7	825.1	713.5	1047.6	1588.7
66	11.46	9.13	4.44	7.20	1356.5	1334.0	1192.8	1200.5	1342.7	1052.4	467.7	746.6
67	6.16	5.04	16.89	18.59	1501.4	1516.8	585.9	969.0	798.9	660.1	834.7	1556.5
68	3.48	8.01	7.64	8.33	1401.7	1326.4	399.2	1162.9	1027.5	919.0	650.2	336.6
69	7.83	6.03	36.24	8.45	1397.0	1444.2	395.4	1169.7	944.5	753.0	1238.0	853.9
70	15.66	11.20	35.89	12.36	1225.4	1275.6	479.5	1161.2	1660.4	1234.2	1486.6	1240.5
71	13.65	9.59	45.91	14.19	1264.1	1316.2	460.1	1146.0	1490.8	1090.0	1825.2	1405.2
72	12.81	9.90	11.38	9.26	1321.6	1298.4	732.4	1175.6	1463.3	1111.0	779.2	940.4
73	9.07	9.98	45.97	12.98	1339.7	1302.3	434.9	1185.4	1048.9	1122.7	1727.5	1329.0
74	13.80	11.19	16.64	12.69	1349.4	1266.8	695.2	1098.8	1608.9	1223.2	999.3	1204.9
75	11.22	9.08	20.64	14.38	1327.1	1312.2	622.8	1070.9	1286.3	1029.4	1110.6	1330.0
76	10.30	7.83	6.48	13.13	1345.8	1376.4	1105.7	1059.2	1197.5	931.3	519.4	1202.1
77	9.21	6.99	4.23	9.60	1332.8	1409.3	1278.0	1102.7	1108.8	951.3	467.0	914.5

WATER YEAR	TOTAL OUTFLOW FROM REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL OUTFLOW FROM REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	5.56	0.00	9.18	17.88	1235.3	0.0	594.2	559.1	592.9	0.0	471.2	363.6
66	.54	.94	11.77	14.35	914.1	933.5	889.7	510.6	42.9	75.5	904.5	1129.3
67	3.80	.14	10.29	19.89	1064.5	912.1	666.5	745.4	343.7	11.3	593.0	1281.2
68	3.43	.54	13.52	22.00	1022.6	946.6	708.2	820.3	303.0	44.1	827.3	1559.6
69	3.60	.48	10.13	24.12	1027.3	1021.1	453.2	757.9	319.5	42.0	396.9	1579.2
70	1.88	0.00	15.17	23.74	806.9	0.0	364.8	634.6	130.9	0.0	473.0	1301.7
71	1.78	0.00	11.09	22.02	835.5	0.0	526.1	688.8	128.3	0.0	504.2	1310.6
72	2.72	.43	14.70	17.46	839.4	915.2	664.0	763.4	197.0	33.5	343.3	1151.4
73	2.59	.54	6.43	20.47	1027.7	786.9	344.0	610.2	228.7	36.7	191.2	1073.0
74	2.79	0.00	13.35	19.68	797.8	0.0	573.0	709.1	192.5	0.0	561.0	1205.5
75	2.30	0.00	9.88	22.50	894.4	0.0	548.1	620.7	177.5	0.0	458.1	1206.6
76	3.64	.08	13.24	21.03	859.7	852.5	686.4	696.8	275.0	5.8	785.2	1265.8
77	2.87	1.21	14.50	16.29	893.5	884.4	787.7	816.9	221.6	92.1	386.6	1150.1

WATER YEAR	TOTAL REACH GAIN FLOW (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL REACH GAIN FLOW (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL REACH GAIN FLOW (T/D) FALL	WINTER	SPRING	SUMMER
65	7.42	3.05	13.75	11.44	1404.1	1851.1	915.2	1416.4	900.7	487.6	1087.5	1430.6
66	8.61	3.72	5.51	6.59	1606.3	1494.9	1252.0	1157.6	1174.6	481.1	514.5	632.0
67	5.28	3.82	11.50	14.06	1628.0	1717.9	865.6	903.3	742.2	566.6	860.3	1097.7
68	6.25	4.27	7.15	10.59	1420.1	1530.4	1078.5	1175.8	766.8	564.2	666.1	1076.1
69	6.92	4.72	29.26	12.59	1399.3	1389.5	818.9	1109.5	836.3	556.2	2070.0	1206.2
70	9.79	3.28	21.98	15.01	2038.1	1999.6	1208.1	996.2	1724.8	566.3	2294.1	1291.6
71	5.67	4.61	17.91	11.76	2241.3	1852.9	926.9	910.6	1098.1	737.9	1433.7	525.1
72	4.99	3.67	6.68	8.56	1885.7	1659.2	1180.1	1103.9	813.4	528.9	581.2	816.3
73	5.44	4.23	61.23	11.16	1799.7	1732.8	607.8	1071.7	846.2	533.2	3213.6	1032.9
74	5.48	2.92	8.48	10.42	1541.9	2757.2	1245.8	951.0	519.7	695.0	712.8	955.3
75	5.23	2.81	7.77	10.78	1880.6	1925.6	1077.1	1089.9	850.4	466.8	733.2	1024.6
76	7.21	5.76	7.22	9.73	1515.5	1449.1	999.0	1040.4	944.1	720.7	623.3	874.9
77	6.48	3.82	7.89	8.90	1570.4	1662.5	1135.0	1003.8	879.2	548.3	773.3	736.9

Table F-2. (continued).

S E A S O N A L   R E S U L T S

RIVER REACH : 2 KERSEY - WELDONA.

WATER YEAR	TOTAL POINT INFLOW TO REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL POINT INFLOW TO REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	0.00	0.00	1.15	1.02	0.0	0.0	1246.5	1246.5	0.0	0.0	123.3	110.3
66	0.00	0.00	1.02	1.71	0.0	0.0	1321.8	1321.8	0.0	0.0	113.5	134.9
67	0.00	0.00	0.00	2.90	0.0	0.0	0.0	1456.1	0.0	0.0	0.0	375.1
68	0.00	0.00	.30	2.36	0.0	0.0	1438.8	1438.8	0.0	0.0	37.1	233.2
69	0.00	0.00	0.00	2.62	0.0	0.0	0.0	1470.9	0.0	0.0	0.0	333.3
70	0.00	0.00	0.00	1.91	0.0	0.0	0.0	1195.0	0.0	0.0	0.0	197.1
71	0.00	0.00	.08	3.77	0.0	0.0	1122.0	1122.0	0.0	0.0	7.6	365.5
72	.02	0.00	.19	2.78	1122.0	0.0	1283.7	1283.7	1.5	0.0	20.9	309.1
73	0.00	0.00	0.00	1.97	0.0	0.0	0.0	1259.4	0.0	0.0	0.0	214.5
74	0.00	0.00	.52	3.35	0.0	0.0	1028.1	1028.1	0.0	0.0	46.0	237.7
75	0.00	0.00	.30	9.25	0.0	0.0	1274.6	1274.6	0.0	0.0	32.8	1018.6
76	2.03	0.00	.66	2.78	1274.6	0.0	1320.8	1320.8	223.9	0.0	75.2	317.0
77	.01	[illegible]	.74	2.50	1320.8	0.0	1430.2	1430.2	7.1	0.0	91.1	308.7

WATER YEAR	TOTAL OUTFLOW FROM REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL OUTFLOW FROM REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	10.15	15.35	17.37	19.00	1606.2	1423.8	695.0	985.9	1406.7	1892.6	1042.6	1550.6
66	8.12	11.99	9.68	7.15	1344.2	1317.2	1376.9	1364.9	942.6	1364.8	1151.6	843.6
67	15.16	11.36	13.35	16.82	1587.7	1389.9	907.9	1183.4	2079.8	1363.9	1047.3	1720.0
68	15.58	10.61	12.39	12.23	1560.7	1339.1	1120.4	1326.8	2100.9	1227.9	1199.7	1401.7
69	14.94	11.93	19.83	15.74	1566.8	1410.1	620.3	1260.6	2022.9	1453.3	1062.7	1713.9
70	18.40	9.90	13.32	16.43	1249.8	1235.1	567.7	1130.6	1987.3	1056.3	653.3	1605.2
71	13.64	11.29	19.03	14.14	1308.3	1207.0	674.3	1198.6	1541.9	1177.9	1109.7	1464.0
72	15.07	11.22	19.86	14.09	1367.7	1283.9	975.7	1279.2	1780.6	1243.9	1674.3	1557.3
73	13.10	7.82	19.89	12.31	1444.4	1227.1	549.4	1130.3	1634.5	829.2	944.3	1201.7
74	6.66	17.48	19.36	12.55	1345.1	1192.6	821.8	1208.3	773.7	1801.3	1374.6	1310.6
75	16.15	13.48	19.83	16.88	1401.2	1306.2	851.3	1144.6	1955.7	1521.7	1458.6	1659.7
76	16.05	18.29	13.16	13.38	1408.9	1290.9	1123.5	1222.3	1953.2	2036.2	1277.7	1412.7
77	20.39	11.53	9.32	11.36	1522.4	1338.5	1248.5	1305.2	2682.2	1333.7	1005.3	1280.9

WATER YEAR	TOTAL REACH GAIN FLOW (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL REACH GAIN FLOW (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL REACH GAIN FLOW (T/D) FALL	WINTER	SPRING	SUMMER
65	3.28	5.78	4.42	5.57	2555.5	1771.4	1618.8	3258.1	724.3	884.2	617.3	1568.3
66	5.05	9.67	7.57	5.93	1938.7	1492.6	1538.1	1688.6	845.2	1239.2	1005.8	864.5
67	6.20	4.46	6.19	7.77	2196.3	1828.0	1579.0	1601.1	1176.4	704.7	845.0	1074.2
68	5.72	5.02	6.31	8.29	2270.7	1716.5	1645.1	1603.9	1121.2	745.1	897.0	1149.1
69	4.15	4.98	6.87	9.82	2579.0	1703.2	1376.0	1573.0	923.9	733.3	817.3	1334.0
70	1.78	7.20	6.87	9.05	4511.3	1798.8	4236.1	2007.7	692.4	1119.4	2514.2	1569.6
71	3.14	7.96	4.75	9.51	2716.7	1796.9	2695.8	1872.3	737.7	1235.4	1105.3	1538.5
72	6.70	5.20	10.22	7.56	1887.6	1819.5	1490.3	1809.6	1092.4	816.7	1315.5	1181.8
73	6.43	7.28	8.82	8.80	2051.3	1702.1	1445.5	2074.3	1139.9	1070.0	1101.4	1577.0
74	7.24	7.24	6.04	8.66	1611.1	2034.9	2069.6	1840.3	1007.4	1272.7	1080.4	1376.5
75	5.04	7.57	6.97	3.42	2250.6	1608.4	1937.2	2698.4	980.3	1051.4	1167.2	796.4
76	4.91	9.22	8.22	5.35	2203.9	1635.6	1425.4	2240.4	934.4	1302.3	1012.5	1035.2
77	6.53	6.12	6.22	5.06	2327.3	1624.2	1530.8	1908.8	1314.0	858.8	922.7	835.3

Table F-2. (continued).

S E A S O N A L   R E S U L T S

RIVER REACH : 3 WELDONA - BALZAC.

WATER YEAR	TOTAL POINT INFLOW TO REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL POINT INFLOW TO REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	0.00	0.00	.13	.16	0.0	0.0	1000.0	1000.0	0.0	0.0	10.3	13.4
68	0.00	0.00	.05	.02	0.0	0.0	1000.0	1000.0	0.0	0.0	4.1	1.3
69	0.00	0.00	.05	.47	0.0	0.0	1000.0	1000.0	0.0	0.0	4.1	40.2
70	0.00	0.00	0.00	.28	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	24.1
71	0.00	0.00	0.00	.37	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	32.2
72	0.00	0.00	0.00	.31	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	25.8
73	0.00	0.00	0.00	.53	0.0	0.0	0.0	1000.0	0.0	0.0	0.0	45.6
74	0.00	0.00	.05	.33	0.0	0.0	1000.0	1000.0	0.0	0.0	4.1	28.2
75	0.00	0.00	.09	.50	0.0	0.0	1000.0	1000.0	0.0	0.0	8.1	42.9
76	0.00	0.00	.09	0.00	0.0	0.0	1000.0	0.0	0.0	0.0	8.1	0.0
77	.08	.44	.53	.56	1000.0	1000.0	1000.0	1000.0	6.7	38.4	46.1	48.3

WATER YEAR	TOTAL OUTFLOW FROM REACH (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL OUTFLOW FROM REACH (T/D) FALL	WINTER	SPRING	SUMMER
65	4.81	6.23	10.28	13.52	1608.6	1470.2	872.8	1331.2	658.6	721.9	774.9	1554.5
66	7.76	3.57	4.44	3.03	1306.3	1413.4	1449.7	1464.7	875.7	435.9	556.1	382.9
67	6.91	8.50	7.94	7.05	1616.7	1448.1	1035.0	1419.3	964.6	1063.8	709.9	863.9
68	8.07	9.36	5.73	4.87	1583.4	1410.9	1317.0	1464.7	1103.9	1140.9	651.6	616.6
69	7.68	9.87	10.72	6.21	1611.7	1443.6	837.7	1444.2	1069.7	1230.7	775.5	774.5
70	15.67	3.19	7.64	8.97	1353.4	1382.4	719.6	1381.8	1832.7	380.8	475.0	1070.8
71	15.47	4.36	7.97	7.82	1376.2	1360.4	851.3	1383.0	1839.7	512.7	586.2	934.6
72	13.41	3.55	7.80	5.93	1392.1	1389.0	1187.2	1451.0	1612.5	426.4	739.8	743.1
73	11.10	7.66	8.24	8.94	1480.9	1364.5	701.9	1371.5	1419.6	903.3	499.5	1059.2
74	12.01	1.22	8.58	8.18	1317.0	1366.0	1016.5	1399.7	1366.8	144.2	753.7	989.0
75	12.55	9.23	8.28	8.07	1451.7	1401.4	955.1	1389.6	1574.6	1117.9	683.5	968.8
76	13.50	8.28	5.68	6.91	1446.5	1407.2	1257.4	1423.1	1687.3	1006.7	617.0	849.1
77	10.09	10.56	6.78	4.36	1558.2	1409.4	1378.9	1476.7	1358.0	1286.5	807.5	556.4

WATER YEAR	TOTAL REACH GAIN FLOW (CMS) FALL	WINTER	SPRING	SUMMER	SALINITY IN TOTAL REACH GAIN FLOW (MG/L) FALL	WINTER	SPRING	SUMMER	SALT MASS IN TOTAL REACH GAIN FLOW (T/D) FALL	WINTER	SPRING	SUMMER
65	3.01	2.68	15.52	9.89	1206.5	1394.6	851.5	1982.3	313.7	323.3	1141.8	1693.3
66	3.42	4.29	3.15	1.95	1332.1	1662.5	1391.5	1324.6	393.5	616.7	378.9	223.7
67	3.42	3.78	6.94	4.53	1394.8	1386.4	1145.0	1945.3	411.9	452.4	686.7	761.3
68	3.62	2.30	3.54	2.36	1395.7	1465.4	1323.0	1351.3	436.3	291.3	405.1	275.7
69	4.47	4.49	6.22	4.92	1432.7	1413.8	1474.2	1498.5	553.6	548.7	791.7	632.3
70	5.23	4.01	22.46	6.59	1411.9	2081.8	1069.9	1774.0	638.2	721.2	2075.9	1008.9
71	6.15	3.09	5.07	2.90	1262.4	2277.5	2183.6	1628.4	670.9	608.1	957.3	408.0
72	3.87	2.65	4.85	2.51	1237.5	1737.8	1296.3	1484.9	413.5	397.3	543.2	322.1
73	5.21	4.23	1.95	3.28	1259.5	1956.4	2252.5	2550.9	567.4	714.6	379.5	723.0
74	3.07	5.18	4.58	2.82	1616.6	1867.0	1304.1	1931.7	429.4	835.3	515.8	446.3
75	4.90	4.79	5.30	3.58	1246.1	1496.7	1335.3	1897.6	527.6	619.0	611.5	585.8
76	5.96	5.96	4.63	2.05	1288.5	1471.1	1225.5	1627.8	663.7	757.3	490.1	228.5
77	5.41	3.59	4.32	1.99	1435.8	1501.6	1438.8	1467.6	670.8	466.0	536.7	252.1

Table F-2. (continued).

S E A S O N A L   R E S U L T S

RIVER REACH : 4 BALZAC - JULESBURG.

WATER YEAR	TOTAL POINT INFLOW TO REACH (CMS)				SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L)				SALT MASS IN TOTAL POINT INFLOW TO REACH (T/D)			
	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	.02	.25	.39	.71	1000.0	1000.0	1000.0	1078.5	1.3	21.9	33.9	66.5
66	.25	.27	1.44	2.03	1000.0	1000.0	1330.9	1313.8	22.8	23.3	166.0	230.8
67	.25	.24	.41	2.45	1000.0	1000.0	1000.0	1105.9	21.5	20.6	35.2	234.3
68	.28	.36	.74	1.77	1000.0	1000.0	1209.8	1360.4	24.1	31.5	77.1	207.9
69	.26	.30	.30	2.34	1000.0	1000.0	1000.0	1199.5	22.8	26.0	23.9	242.8
70	.26	.30	.27	1.32	1000.0	1000.0	1000.0	1301.6	22.8	26.0	23.0	148.3
71	.19	.22	.31	1.85	1000.0	1000.0	1000.0	1262.6	16.1	19.2	27.1	201.5
72	.19	.21	.30	2.09	1000.0	1000.0	1156.0	1337.6	16.1	17.9	29.3	242.1
73	.20	.27	.28	1.46	1000.0	1000.0	1000.0	1267.7	17.4	23.3	24.4	159.8
74	.23	.21	.41	1.96	1000.0	1000.0	1143.0	1252.9	20.1	17.9	40.3	211.7
75	.16	.16	.22	1.63	1000.0	1000.0	1000.0	1350.4	13.4	13.7	19.0	190.1
76	.12	.19	.42	2.03	1000.0	1000.0	1247.7	1363.1	10.7	16.4	45.7	279.4
77	.09	0.00	0.00	1.78	1000.0	0.0	0.0	1413.0	8.0	0.0	0.0	217.9

WATER YEAR	TOTAL OUTFLOW FROM REACH (CMS)				SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L)				SALT MASS IN TOTAL OUTFLOW FROM REACH (T/D)			
	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	5.01	2.17	6.57	9.26	1588.2	1578.6	1339.6	1358.8	687.8	296.4	760.8	1087.7
66	0.00	.57	7.36	10.26	0.0	1453.7	1448.1	1452.5	0.0	71.7	920.6	1297.2
67	1.86	1.44	5.93	12.45	1514.1	1562.9	1400.3	1431.8	243.6	194.9	717.5	1535.5
68	3.04	1.08	9.04	10.09	1523.9	1498.8	1373.8	1418.0	400.5	139.7	1072.5	1235.3
69	2.19	.17	6.09	12.82	1509.6	1516.4	1033.0	1423.0	285.4	22.9	543.3	1576.0
70	2.03	.87	7.55	19.66	1487.7	1448.1	860.8	1405.3	261.3	109.2	561.2	2387.2
71	1.55	.11	5.43	15.08	1423.0	1442.0	1009.0	1454.9	204.1	13.8	473.2	1896.1
72	.45	.56	8.97	11.16	1434.5	1482.2	1336.5	1465.2	55.8	71.1	1036.2	1412.5
73	2.75	.30	4.71	16.67	1517.3	1439.1	841.3	1402.2	360.1	37.3	342.1	2019.1
74	.16	.36	13.62	14.46	1345.4	1431.7	1189.5	1479.8	18.0	45.1	1339.5	1849.1
75	3.41	1.02	9.01	19.60	1502.4	1511.5	1124.0	1446.9	443.2	132.6	874.6	2450.2
76	2.79	.76	10.75	11.05	1494.9	1474.3	1387.8	1505.1	360.8	97.0	1288.6	1436.9
77	3.34	.67	8.19	10.60	1557.7	1537.0	1371.1	1477.1	449.0	88.5	970.2	1352.6

WATER YEAR	TOTAL REACH GAIN FLOW (CMS)				SALINITY IN TOTAL REACH GAIN FLOW (MG/L)				SALT MASS IN TOTAL REACH GAIN FLOW (T/D)			
	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER	FALL	WINTER	SPRING	SUMMER
65	3.94	4.90	7.71	6.05	1775.8	1723.8	1758.9	627.5	605.0	729.3	1172.2	327.8
66	7.82	8.27	8.00	5.30	1569.1	1540.3	1452.4	1511.5	1059.8	1101.0	1004.2	591.7
67	6.32	6.21	7.93	11.45	1598.6	1680.3	1465.0	1242.8	873.1	901.1	1018.0	1229.1
68	7.20	7.50	8.79	16.40	1593.2	1651.6	1423.1	1273.4	950.8	1070.7	1090.7	1805.4
69	6.78	6.96	8.67	11.26	1591.6	1652.9	1831.5	1344.7	932.8	994.2	1372.4	1307.7
70	5.14	9.69	8.73	10.16	1724.3	1397.6	1757.5	1264.1	766.4	1170.0	1325.2	1109.6
71	6.77	3.45	8.11	5.14	1631.8	1632.1	2084.4	1475.7	954.0	485.9	1459.8	655.8
72	5.55	4.80	7.77	6.13	1649.1	1728.4	1441.5	1520.1	790.7	717.4	967.4	804.8
73	4.60	4.73	18.91	9.05	1699.9	1622.4	1693.8	1187.2	676.3	662.4	2766.8	927.8
74	8.61	7.58	10.34	5.41	1532.8	1424.9	1396.3	1599.1	1139.8	933.4	1247.9	747.8
75	5.39	5.45	10.03	8.43	1660.8	1713.2	1370.3	1462.7	773.0	806.6	1187.6	1065.2
76	6.30	6.25	7.88	3.99	1617.5	1655.5	1525.7	1675.6	880.3	899.0	1032.5	577.3
77	4.73	4.78	11.36	6.01	1659.8	1716.5	1346.5	1528.5	675.9	709.3	1321.5	793.2

Table F-3. Flow, salt concentration and salt mass flow averaged by month, water years 1965-77, for point inflows, diversion flows and return flow, South Platte River between Henderson and Julesburg.

M O N T H L Y   R E S U L T S   RIVER REACH : 1 HENDERSON - KERSEY.

TOTAL POINT INFLOW TO REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	5.68	6.91	6.36	5.52	5.62	5.48	4.93	4.76	70.29	29.77	20.57	10.58
66	12.95	10.56	10.93	10.16	9.28	7.98	3.92	2.92	6.54	7.08	6.33	8.22
67	6.03	6.28	6.17	5.79	4.93	4.36	5.19	4.09	41.81	34.49	12.26	8.70
68	8.36	9.29	7.84	7.93	8.98	7.22	5.12	4.93	12.98	8.41	9.08	8.50
69	9.22	7.96	6.31	6.59	5.68	5.80	3.95	36.32	68.44	10.63	7.76	5.91
70	16.18	17.23	13.70	12.14	11.49	10.00	22.09	13.50	72.81	15.47	11.31	9.33
71	12.43	15.88	12.72	10.33	9.31	9.09	25.34	69.34	42.27	15.42	13.02	14.13
72	12.59	14.30	11.59	10.95	11.31	7.59	7.44	4.46	22.47	8.88	10.19	8.63
73	7.76	9.96	9.51	11.13	10.18	8.64	10.04	86.19	40.34	15.26	10.37	17.11
74	13.31	15.37	12.77	11.77	11.84	10.04	9.63	10.04	30.48	12.38	14.55	10.55
75	11.78	11.46	10.42	10.38	9.06	7.81	8.86	9.66	43.76	15.27	15.39	12.20
76	10.40	10.79	9.72	8.59	8.00	6.91	5.53	6.19	7.74	9.16	17.24	13.01
77	9.31	8.86	9.46	7.36	7.41	6.25	5.29	2.74	4.71	13.19	10.36	4.48

SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1522.6	1504.6	1514.1	1540.1	1471.7	1458.8	1294.3	1165.8	349.7	825.7	657.7	1205.3
66	1270.7	1415.5	1402.6	1334.6	1324.4	1343.2	1433.7	1318.3	990.3	1145.8	1178.3	1266.8
67	1465.7	1519.5	1519.4	1490.0	1502.1	1567.5	1164.0	1269.5	445.2	996.1	1002.5	1219.4
68	1385.6	1394.6	1426.8	1351.8	1281.5	1348.9	1271.6	1212.1	809.3	1107.7	1149.8	1232.0
69	1298.6	1436.1	1493.1	1441.5	1460.6	1432.8	1392.3	389.0	341.3	1063.6	1173.3	1324.7
70	1214.9	1205.4	1262.1	1255.2	1279.4	1256.3	629.6	775.1	377.3	1092.7	1166.2	1265.7
71	1276.3	1235.0	1287.4	1308.4	1329.5	1312.7	518.6	415.7	500.4	1173.4	1062.6	1194.7
72	1322.1	1308.2	1337.7	1295.9	1241.7	1378.1	1077.0	1253.6	603.6	1074.5	1134.9	1331.8
73	1396.4	1344.9	1285.4	1246.4	1305.2	1371.1	948.7	359.1	474.5	1154.2	1195.8	1214.2
74	1322.1	1347.8	1379.9	1248.0	1260.6	1295.5	974.1	898.4	537.8	1093.2	1020.3	1213.6
75	1301.0	1334.0	1349.3	1269.7	1313.8	1367.0	1017.0	902.4	479.2	1111.0	988.1	1129.3
76	1349.1	1345.9	1342.0	1326.6	1381.1	1433.4	1252.6	1134.0	977.4	1070.7	1011.7	1115.7
77	1390.9	1405.4	1383.1	1406.8	1399.3	1423.0	1243.8	1579.0	1134.9	1019.4	1044.5	1502.5

SALINITY MASS IN TOTAL POINT INFLOW TO REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	747.5	897.7	832.3	735.1	714.5	690.9	550.6	487.2	2123.5	2124.0	1524.5	1102.0
66	1411.2	1291.2	1324.1	1170.9	1061.4	925.8	485.2	332.9	559.2	700.6	644.0	900.1
67	763.0	824.5	810.3	745.3	642.4	591.0	521.5	448.2	1608.1	2670.6	1062.0	914.4
68	1000.4	1118.8	966.4	926.0	994.0	841.4	562.4	515.3	907.2	804.6	902.3	904.9
69	1034.9	987.9	813.4	820.1	716.8	718.5	475.7	1220.6	2018.2	982.6	786.7	700.3
70	1698.4	1793.9	1493.4	1316.2	1269.9	1120.1	1201.8	904.0	2373.3	1460.7	1170.2	1035.6
71	1370.7	1694.1	1414.3	1167.6	1069.0	1031.3	1135.2	2490.7	1827.5	1563.7	1195.3	1458.2
72	1438.4	1616.6	1339.9	1225.5	1213.6	903.9	692.4	483.2	1172.0	824.9	999.1	999.3
73	936.6	1157.4	1056.2	1198.8	1146.3	1023.5	823.2	2674.2	1553.6	1521.7	1021.9	1375.0
74	1520.3	1789.5	1522.6	1258.8	1290.0	1123.2	910.6	779.5	1415.0	1165.2	[illegible]	1171.2
75	1324.6	1320.8	1214.8	1138.2	1027.9	921.8	778.4	753.5	1811.9	1465.3	1330.9	1188.3
76	1212.7	1254.4	1127.2	984.8	954.9	856.3	598.4	606.3	653.9	847.0	1506.9	1253.9
77	1118.4	1076.3	1130.6	894.8	855.3	768.0	568.2	374.4	461.4	1161.7	989.0	592.1

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 1 HENDERSON - KERSEY.

TOTAL OUTFLOW FROM REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	9.44	7.28	0.00	0.00	0.00	0.00	6.09	14.00	7.28	19.99	22.11	11.33
66	1.61	0.00	0.00	.28	.71	1.80	7.90	13.77	13.56	15.20	15.61	12.18
67	7.64	3.19	.55	0.00	0.00	.41	9.90	11.84	9.09	19.85	23.33	15.13
68	7.41	1.90	.92	0.00	1.17	.51	2.09	15.70	22.70	25.51	22.50	17.56
69	5.07	4.71	1.06	0.00	0.00	1.38	5.85	12.02	12.47	29.15	27.31	15.61
70	4.56	1.05	0.00	0.00	0.00	0.00	1.76	15.01	15.32	30.30	28.14	12.42
71	4.10	1.24	0.00	0.00	0.00	0.00	.71	8.15	24.51	31.41	25.97	8.23
72	4.47	3.71	0.00	0.00	0.00	1.24	8.14	16.90	18.99	25.19	19.36	7.19
73	7.64	0.00	0.00	0.00	0.00	1.57	0.00	1.52	17.34	27.36	25.42	4.23
74	2.21	3.52	2.67	0.00	0.00	0.00	1.09	17.09	21.75	27.31	22.43	5.42
75	6.03	.81	0.00	0.00	0.00	0.00	3.85	13.91	11.75	29.66	24.78	12.75
76	7.18	3.43	0.00	0.00	0.00	.23	6.42	12.94	20.37	25.47	26.07	11.23
77	5.62	2.95	.05	.09	1.53	2.03	8.57	14.28	20.65	16.75	19.02	12.95

SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1249.3	1217.9	0.0	0.0	0.0	0.0	798.9	628.1	355.8	501.1	553.8	665.4
66	914.1	0.0	0.0	879.2	897.0	954.9	836.7	1030.1	773.4	549.2	899.1	877.1
67	1093.0	982.4	1129.3	0.0	0.0	912.1	671.8	750.8	548.7	566.7	830.1	844.8
68	1046.9	961.0	951.0	0.0	956.5	926.0	675.5	737.8	690.1	456.5	746.1	855.5
69	1097.7	991.7	934.7	0.0	0.0	1021.1	919.8	337.1	349.8	655.6	844.9	756.2
70	817.3	759.9	0.0	0.0	0.0	0.0	***********	377.6	351.9	572.5	690.0	661.2
71	842.4	812.3	0.0	0.0	0.0	0.0	544.5	481.0	541.1	636.4	768.4	635.5
72	850.4	825.8	0.0	0.0	0.0	915.2	771.4	770.1	520.2	827.5	717.8	555.2
73	1027.7	0.0	0.0	0.0	0.0	786.9	0.0	299.4	348.8	732.2	681.9	617.2
74	794.7	789.5	811.1	0.0	0.0	0.0	564.1	612.9	541.4	681.8	757.7	653.9
75	900.2	848.9	0.0	0.0	0.0	0.0	575.7	586.1	492.7	542.3	648.6	732.4
76	909.6	878.2	0.0	0.0	0.0	852.5	680.5	654.0	709.5	770.6	632.0	669.5
77	889.4	901.6	895.1	910.3	913.6	863.4	754.6	741.1	834.8	633.1	863.5	551.5

SALINITY MASS IN TOTAL OUTFLOW FROM REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1018.3	766.2	0.0	0.0	0.0	0.0	420.5	759.7	223.8	865.4	1067.3	651.2
66	127.3	0.0	0.0	21.0	55.3	148.2	571.1	1225.5	906.3	1245.1	1212.8	923.2
67	722.0	270.6	53.9	0.0	0.0	32.7	574.6	767.8	430.9	971.9	1651.0	1177.5
68	670.6	158.1	75.7	0.0	96.9	40.5	122.2	1001.1	1353.5	1899.2	1469.5	1313.2
69	476.1	399.6	85.5	0.0	0.0	121.9	465.2	350.1	376.9	1653.7	1993.7	1073.8
70	322.0	68.7	0.0	0.0	0.0	0.0	***********	489.8	465.9	1499.0	1677.5	709.6
71	298.3	86.8	0.0	0.0	0.0	0.0	33.6	338.8	1145.7	1727.0	1724.5	432.8
72	329.2	264.8	0.0	0.0	0.0	98.3	542.4	1124.6	853.5	1901.4	1217.7	405.3
73	678.6	0.0	0.0	0.0	0.0	106.5	0.0	38.0	540.6	1257.8	1519.6	437.1
74	151.8	240.2	187.2	0.0	0.0	0.0	53.3	904.1	1017.3	1508.8	1501.4	453.2
75	469.3	59.3	0.0	0.0	0.0	0.0	191.7	704.3	500.3	1390.1	1388.6	829.1
76	564.6	260.0	0.0	0.0	0.0	17.0	377.7	731.3	1243.5	1695.7	1432.3	549.6
77	431.8	229.8	3.6	7.2	120.7	151.2	559.5	914.1	1489.6	917.0	1419.0	1113.0

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 1 HENDERSON - KERSEY.

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TOTAL REACH GAIN FLOW (CMS) :												
65	9.24	8.43	4.64	3.41	3.16	2.59	2.61	6.32	32.57	13.61	8.31	12.45
66	12.91	6.14	6.70	4.47	2.74	3.87	5.33	5.70	5.47	3.79	7.92	10.18
67	7.34	4.51	3.95	4.09	3.67	3.68	6.37	5.54	22.60	22.39	8.17	11.85
68	8.04	4.37	5.80	4.49	3.98	4.31	3.46	6.78	11.20	9.31	11.32	11.17
69	8.98	6.27	5.50	5.21	4.14	4.75	5.24	27.33	55.26	13.55	11.60	12.60
70	11.06	11.26	7.11	4.45	3.29	2.10	[illegible].18	21.52	22.45	19.99	12.72	12.22
71	7.05	5.33	4.63	5.98	4.35	3.48	5.49	24.44	23.57	17.20	9.35	10.80
72	6.05	4.34	4.56	3.99	3.34	3.64	1.56	5.94	12.58	8.32	9.37	8.99
73	6.35	5.17	4.80	3.64	4.43	4.63	5.39	81.25	96.37	13.12	10.43	9.95
74	6.38	6.12	3.96	2.33	4.36	2.21	4.23	8.62	12.59	9.25	11.29	10.70
75	6.00	5.45	4.26	3.45	1.77	3.09	2.12	6.69	14.54	8.81	10.63	12.27
76	9.18	6.49	5.95	5.54	5.86	5.88	5.11	8.79	7.72	7.98	9.70	11.58
77	8.29	6.35	4.79	3.09	5.33	3.19	7.24	9.46	6.92	6.35	9.05	11.38
SALINITY IN TOTAL REACH GAIN FLOW (MG/L) :												
65	1357.9	1433.6	1444.0	1530.7	2004.3	2104.5	1531.2	960.4	856.8	1399.1	2076.3	880.5
66	1682.9	1626.7	1440.3	1314.5	1768.5	1528.3	979.7	1657.1	1203.5	1711.9	1393.1	822.5
67	1479.4	1669.7	1858.2	1610.1	1793.2	1769.7	841.1	1174.0	794.6	729.8	1292.4	826.3
68	1415.7	1405.7	1437.9	1443.5	1575.9	1582.7	958.4	1104.6	1100.2	1400.1	1100.1	1041.1
69	1420.8	1290.7	1484.1	1305.2	1472.9	1416.5	979.0	1005.2	708.5	1058.2	1293.0	899.0
70	1731.1	2097.0	2425.2	1817.7	1794.6	2675.8	**********	1133.2	1282.4	1014.8	1018.8	940.5
71	1830.0	2348.1	2748.8	1667.3	1988.9	2018.1	1428.4	880.3	850.1	810.5	1151.3	842.3
72	1729.2	1991.0	1996.5	1598.2	1854.9	1564.2	2198.9	1434.4	930.0	1410.1	1057.2	848.4
73	1630.1	1858.6	1962.4	1818.3	1634.1	1751.0	1395.9	699.7	492.4	1200.8	1015.5	845.5
74	2162.2	1716.5	1923.9	2978.7	1987.3	4075.2	1980.3	1050.0	1109.5	1102.8	858.4	805.6
75	1910.9	1885.3	1832.0	1634.3	2677.4	1862.6	1717.0	960.4	1039.2	1494.5	1083.9	843.6
76	1393.7	1567.3	1648.9	1474.7	1428.6	1443.4	914.6	826.0	1258.2	1371.0	853.3	857.7
77	1558.0	1480.2	1707.7	1667.6	1367.2	2102.8	965.4	948.2	1576.5	750.5	1198.8	1045.8
SALINITY MASS IN TOTAL REACH GAIN FLOW (T/D) :												
65	1083.9	1044.3	578.4	451.3	546.5	470.8	345.3	524.5	2411.5	1645.5	1490.5	1054.4
66	1877.3	862.3	833.4	507.6	418.8	510.9	451.5	816.3	559.3	559.9	713.0	776.2
67	938.9	650.6	634.1	568.7	568.4	562.8	477.1	561.9	1551.7	1411.1	512.7	944.5
68	983.6	591.0	720.1	558.5	542.0	590.0	286.9	647.1	1064.9	1125.8	1085.6	1004.5
69	1102.1	698.9	705.0	587.6	526.5	560.8	443.1	2373.9	3382.9	1242.1	1395.7	1076.7
70	1653.9	2041.0	1489.8	698.1	510.6	484.8	**********	2106.9	2487.4	1752.5	1114.7	942.9
71	1114.0	1081.2	1098.4	860.8	747.3	606.6	677.6	1858.7	1751.3	1064.4	920.5	745.0
72	904.3	746.6	787.1	551.2	535.1	472.1	295.7	735.6	1010.5	1014.2	765.1	614.6
73	893.7	829.9	814.5	572.1	625.7	700.9	650.6	4842.0	4059.9	1380.3	914.5	812.7
74	1192.4	907.4	658.8	599.4	710.5	776.7	723.0	811.9	1206.9	985.5	934.9	744.8
75	991.3	887.1	674.0	487.7	409.2	497.9	314.8	555.2	1305.3	1130.4	995.6	945.4
76	1105.1	878.2	846.9	705.7	723.3	733.3	403.5	627.0	839.3	945.2	723.8	953.3
77	1116.5	811.9	707.1	444.9	629.6	580.0	603.9	775.1	942.4	411.5	929.2	1027.9

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 2 KERSEY - WELDONA.

TOTAL POINT INFLOW TO REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.00	0.00	0.00	0.00	0.00	0.00	.90	2.49	0.00	0.00	1.20	1.30
66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.24	1.91	2.21	2.39	.48
67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	7.00	.33
68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.90	3.58	2.67	.57
69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.35	4.88	.52
70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.22	2.52
71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.24	2.81	5.89	2.57
72	.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.57	4.79	3.45	0.00
73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.97	.30
74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.00	2.11	4.01	3.35
75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.68	0.00	7.73	2.61	11.42
76	6.03	0.00	0.00	0.00	0.00	0.00	0.00	.51	1.48	3.92	3.22	1.24
77	.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.24	3.50	3.54	.29

SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	1246.5	1246.5	0.0	0.0	1246.5	1246.5
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1321.8	1321.8	1321.8	1321.8	1321.8
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1496.1	1496.1	1496.1
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1438.8	1438.8	1438.8	1438.8
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1470.9	1470.9	1470.9
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1155.0	1155.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1122.0	1122.0	1122.0	1122.0
72	1122.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1283.7	1283.7	1283.7	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1259.4	1259.4
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1028.1	0.0	1028.1	1028.1	1028.1
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1274.6	0.0	1274.6	1274.6	1274.6
76	1274.6	0.0	0.0	0.0	0.0	0.0	0.0	1320.8	1320.8	1320.8	1320.8	1320.8
77	1320.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1430.2	1430.2	1430.2	1430.2

SALINITY MASS IN TOTAL POINT INFLOW TO REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	97.4	257.8	0.0	0.0	129.0	205.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	142.0	206.5	252.5	273.5	54.3
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	166.7	904.8	43.1
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	112.4	458.0	332.0	69.8
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	304.3	620.4	65.5
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	332.8	260.4
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.1	272.3	571.4	249.1
72	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.3	531.2	383.1	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	541.2	33.4
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.0	0.0	188.2	355.7	330.9
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.4	0.0	857.1	543.4	1257.8
76	664.4	0.0	0.0	0.0	0.0	0.0	0.0	57.8	168.3	436.2	367.9	141.2
77	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	276.4	432.5	449.6	35.3

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 2 KERSEY - WELDONA.

TOTAL OUTFLOW FROM REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	3.55	13.85	13.17	15.01	17.03	14.28	6.85	8.84	36.69	23.76	12.10	12.36
66	2.39	5.38	16.49	11.70	8.06	15.84	10.71	7.05	11.37	5.34	5.34	9.56
67	12.30	17.51	15.75	11.61	14.99	7.83	7.71	10.50	21.94	21.51	14.00	14.30
68	17.41	18.37	11.05	6.31	16.21	9.86	10.99	9.03	17.27	10.18	14.60	11.90
69	18.28	14.04	12.48	13.86	14.12	8.01	6.95	25.15	23.08	20.49	12.07	14.41
70	19.43	22.94	12.99	5.94	9.48	14.23	6.14	5.89	28.17	18.13	14.69	16.42
71	10.87	13.56	16.49	10.87	14.94	8.43	11.80	14.28	31.17	19.85	13.54	9.80
72	8.93	20.18	16.26	6.68	16.42	11.05	12.99	11.51	35.36	12.07	11.74	18.61
73	9.95	21.75	7.88	3.55	10.35	9.81	7.90	7.41	44.78	20.26	13.72	2.62
74	0.00	2.95	16.90	11.28	18.92	22.38	14.42	13.36	30.50	12.34	14.41	10.85
75	10.64	21.36	16.44	9.76	14.94	15.89	18.13	15.43	25.08	16.26	13.35	20.36
76	14.92	19.94	13.40	13.26	21.57	20.26	10.76	15.06	13.61	11.47	14.45	14.23
77	23.12	21.84	16.26	9.12	12.70	12.90	13.13	6.59	8.33	12.16	11.79	10.09

SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1561.8	1577.3	1643.1	1489.4	1389.1	1392.1	1147.4	1046.1	523.1	917.5	996.8	1103.6
66	1212.5	1304.6	1375.9	1274.0	1287.6	1362.8	1349.4	1630.7	1240.4	1470.5	1403.0	1273.4
67	1529.5	1613.7	1605.2	1381.1	1383.0	1414.8	1066.8	1270.2	672.9	995.9	1341.7	1309.6
68	1595.5	1603.8	1452.5	1315.6	1355.2	1330.5	1110.5	1216.1	1075.0	1387.0	1292.8	1310.4
69	1506.2	1617.3	1600.7	1408.7	1429.8	1381.1	1215.0	560.5	519.3	1185.0	1370.0	1276.9
70	1278.6	1229.9	1240.8	1178.5	1225.5	1254.0	712.8	634.4	521.7	1067.9	1222.4	1117.5
71	1324.4	1291.4	1311.3	1178.5	1211.8	1236.0	661.7	595.5	715.4	1203.6	1273.0	1050.5
72	1295.4	1371.5	1403.1	1240.2	1265.3	1335.0	1151.4	1271.5	811.6	1393.7	1242.5	1226.8
73	1456.7	1451.0	1398.6	1228.3	1226.2	1227.6	769.6	445.1	528.4	1070.9	1228.9	1071.3
74	1226.3	1252.3	1360.8	1188.0	1212.8	1179.6	792.7	928.0	787.5	1243.3	1229.1	1179.8
75	1370.8	1406.6	1414.1	1282.0	1298.0	1328.2	1033.6	937.2	672.1	1103.6	1151.7	1173.2
76	1384.3	1452.2	1374.0	1271.0	1302.9	1292.1	1123.2	1064.0	1151.8	1369.4	1183.3	1134.6
77	1523.4	1598.6	1422.0	1319.2	1352.9	1339.4	1127.9	1175.0	1498.9	1213.1	1316.9	1405.7

SALINITY MASS IN TOTAL OUTFLOW FROM REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	478.5	1887.2	1869.8	1932.0	2043.9	1717.2	679.3	799.2	1658.1	1883.8	1358.7	1157.9
66	250.9	606.1	1959.9	1287.5	896.2	1865.4	1248.4	992.7	1219.9	755.0	720.1	1060.9
67	1624.9	2441.7	2184.4	1384.9	1791.2	957.0	710.6	1152.3	1275.8	1850.8	1602.3	1685.3
68	2384.6	2545.4	1387.0	717.2	1898.4	1132.9	1054.7	948.4	1604.8	1222.4	1623.1	1346.9
69	2379.2	1961.6	1726.0	1687.2	1744.7	956.2	729.4	1411.7	1035.8	2098.2	1429.2	1511.7
70	2146.9	2437.4	1392.2	604.9	1005.0	1554.1	378.1	323.1	1269.8	1678.4	1551.5	1585.2
71	1243.6	1513.3	1867.9	1106.7	1564.2	900.0	674.7	734.5	1929.2	2064.1	1500.1	896.6
72	1000.0	2390.9	1970.7	715.5	1794.8	1274.8	1292.4	1264.8	2479.4	1450.9	1260.7	1371.8
73	1250.5	2726.5	951.6	376.3	1096.6	1040.4	525.3	285.1	2044.4	1874.9	1457.1	242.3
74	0.0	319.2	1987.2	1158.1	1982.2	2281.0	987.6	1070.8	2075.5	1325.4	1530.7	1067.6
75	1260.0	2619.9	2008.7	1081.4	1675.4	1823.2	1615.2	1249.3	1514.3	1550.0	1385.5	2063.8
76	1784.6	2501.8	1590.9	1456.5	2427.9	2262.2	1043.7	1334.4	1401.4	1356.7	1443.3	1384.9
77	3043.0	3017.0	1997.3	1039.3	1494.0	1492.3	1280.0	668.5	1078.8	1274.3	1341.4	1223.3

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 2 KERSEY - WELDONA.

TOTAL REACH GAIN FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	2.03	5.74	2.15	4.53	6.17	6.67	4.62	4.22	-26.41	-10.87	8.01	3.05
66	1.87	6.04	7.26	9.26	11.16	8.75	6.94	6.98	8.81	6.83	5.62	5.31
67	7.22	7.46	3.96	1.86	7.34	-.46	4.63	7.71	-14.77	-2.94	6.89	8.68
68	7.05	6.24	3.87	2.62	7.80	4.92	4.91	7.44	6.54	8.19	8.48	8.20
69	6.61	4.53	1.31	3.54	5.56	5.91	6.87	-25.91	-39.04	13.03	8.33	8.02
70	.26	.52	4.51	6.20	9.01	6.57	-3.39	-21.07	6.87	8.00	8.86	10.54
71	3.44	2.39	3.57	6.98	8.47	8.47	4.92	-2.48	4.57	10.53	9.33	9.64
72	10.07	7.23	2.82	2.48	6.69	6.56	9.15	10.26	11.23	8.73	7.23	6.68
73	5.47	7.42	-.44	2.87	9.81	9.40	8.82	-56.73	-37.44	11.01	10.43	4.93
74	7.31	6.40	7.98	4.82	5.99	10.79	5.91	7.69	4.27	5.15	10.02	6.68
75	1.68	6.89	6.61	5.99	9.54	7.35	6.89	10.06	3.87	-.03	2.27	4.58
76	1.09	6.88	6.81	5.95	9.13	12.56	6.18	9.17	9.27	7.13	4.35	3.90
77	5.58	7.09	6.95	8.69	4.21	5.27	8.14	4.82	5.75	2.85	6.42	5.35

SALINITY IN TOTAL REACH GAIN FLOW (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	2316.3	3163.2	3792.4	1969.9	1784.9	1625.4	1526.1	1716.9	-466.1	-1011.5	2939.6	4122.2
66	2879.0	1668.7	1914.2	1537.6	1400.9	1518.5	1651.7	1547.0	1351.4	1568.2	1609.4	1935.0
67	1877.0	2174.9	2817.7	2572.0	1619.3	-2092.5	1654.8	1535.0	-169.5	-5443.5	1484.8	1656.3
68	2175.7	2389.8	2257.8	1997.5	1628.9	1692.1	1771.9	1463.9	1762.7	1520.4	1626.7	1658.5
69	2142.4	2493.9	5055.0	2025.7	1728.9	1488.2	1376.0	-260.3	-197.3	1501.7	1489.3	1782.3
70	24036.8	15111.6	2185.2	2065.4	1607.8	1784.1	-2366.4	-123.5	4236.1	2913.3	1743.5	1835.5
71	2390.2	3227.7	2699.8	2032.2	1794.1	1605.4	1986.5	-6942.3	3459.4	1769.8	1672.4	2224.3
72	1481.9	1962.4	3152.0	2634.8	1792.6	1545.8	1442.4	1386.3	1627.7	1592.3	1715.9	2203.2
73	1927.9	2145.4	-6788.0	2407.5	1585.2	1596.9	1445.5	-434.5	-350.1	2110.1	1549.3	3161.3
74	1425.4	1559.0	1821.6	2331.2	2193.8	1822.7	2078.5	1402.4	3331.4	1689.4	1701.3	2270.8
75	3639.0	2154.3	1994.0	1685.3	1528.2	1639.7	1738.9	1285.0	4045.4	-271721.3	3380.7	2345.5
76	4750.4	2147.6	1849.9	1792.7	1695.0	1521.6	1547.7	1419.9	1349.5	1636.5	2304.2	3246.0
77	2639.2	2435.0	1970.6	1453.8	1850.4	1742.0	1459.2	1549.1	1616.2	2732.9	1666.7	1770.7

SALINITY MASS IN TOTAL REACH GAIN FLOW (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	406.1	1072.5	705.6	770.7	951.5	936.9	608.9	626.6	1063.7	950.2	2033.1	1087.0
66	464.6	870.5	1201.2	1230.0	1350.5	1147.9	995.8	993.9	1028.1	924.8	781.5	888.0
67	1170.9	1401.6	963.9	413.4	1027.1	83.5	561.3	1022.8	216.3	1392.5	882.4	1272.4
68	1325.3	1289.1	754.7	452.2	1057.8	719.4	752.3	540.8	996.4	1075.3	1123.3	1150.7
69	1223.1	976.6	573.5	619.4	830.0	760.0	817.3	882.6	665.4	1580.7	1072.5	1335.6
70	530.9	674.7	851.0	1105.8	1252.0	1013.1	693.9	334.7	2514.2	1736.5	1304.3	1371.4
71	711.0	667.8	632.1	1225.3	1313.0	1175.2	844.4	1495.4	1366.1	1605.5	1344.3	1651.2
72	1233.0	1225.3	767.1	564.0	1030.1	876.6	1140.5	1229.3	1579.2	1301.4	1074.9	1278.0
73	911.9	1375.4	258.0	596.6	1343.4	1286.6	1101.4	2129.3	1132.5	2003.5	1337.3	1315.0
74	899.8	862.3	1255.4	971.3	1134.9	1698.5	1061.4	958.6	1228.3	1335.4	1421.7	1310.3
75	529.6	1282.0	1139.1	872.7	1260.1	1041.5	1034.9	1117.2	1351.1	884.0	553.1	928.9
76	449.2	1275.8	1089.2	931.8	1337.5	1651.0	826.9	1125.5	1081.3	1008.5	887.3	1112.0
77	1272.5	1451.4	1183.8	1061.9	673.7	792.9	1025.7	645.2	803.2	673.4	924.7	910.2

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 3 WELCONA - BALZAC.

TOTAL POINT INFLOW TO REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.38	.46	0.00	0.00
68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.14	.05	0.00	0.00
69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.14	.55	.83	0.00
70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.32	.52
71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.97	.14	0.00
72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.74	.18	0.00
73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.23	.83	.52
74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.14	.97	0.00	0.00
75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.29	.83	.64	0.00
76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.28	0.00	0.00	0.00	0.00
77	0.00	0.00	.23	.23	.41	.65	.29	.88	.43	1.34	.18	.14

SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
66	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
67	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
68	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
69	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
70	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
71	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
72	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
73	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
74	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
75	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
76	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
77	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0

SALINITY MASS IN TOTAL POINT INFLOW TO REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.9	39.8	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3	4.0	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3	47.7	71.5	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.6	45.2
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.6	11.9	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.7	15.8	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	71.5	45.2
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3	83.8	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	71.6	55.7	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.9	0.0	0.0	0.0	0.0
77	0.0	0.0	19.9	19.9	35.2	55.7	24.7	75.6	37.0	115.4	15.8	12.3

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 3 WELDONA - BALZAC.

TOTAL OUTFLOW FROM REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	3.45	5.38	5.62	5.16	6.12	7.41	5.71	5.20	20.08	11.88	15.66	8.85
66	15.66	7.61	0.00	0.00	2.60	8.01	4.52	3.64	5.19	2.67	3.13	3.24
67	7.83	6.90	5.99	9.86	8.72	6.95	4.05	6.45	13.37	7.97	6.36	6.81
68	7.74	7.38	9.07	11.51	11.17	5.57	6.00	5.71	5.47	3.22	5.53	[illegible]
69	9.98	7.23	6.82	9.44	9.01	11.97	6.61	17.09	8.23	7.58	4.27	[illegible]
70	20.95	13.23	12.75	0.00	3.52	6.08	.38	10.36	12.08	11.85	7.39	7.82
71	19.48	16.08	10.87	6.68	1.27	4.34	2.14	6.17	15.66	7.03	4.33	11.56
72	21.00	12.09	7.09	5.02	2.14	3.36	5.33	5.30	12.94	4.47	4.38	3.04
73	11.14	11.23	10.91	8.11	7.50	7.37	1.76	5.71	17.32	5.63	9.07	4.03
74	11.74	18.85	5.66	0.00	0.00	3.55	5.81	7.74	12.23	6.22	6.31	12.14
75	15.43	12.61	9.63	11.38	6.42	8.63	3.52	6.17	15.23	9.89	6.34	7.66
76	15.12	11.04	13.26	8.98	10.30	5.76	7.00	6.03	4.00	5.11	5.39	10.33
77	9.21	7.38	13.59	13.85	11.88	6.08	8.47	6.72	5.14	4.97	4.14	3.93

SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1522.1	1578.8	1689.4	1524.9	1459.2	1440.3	1277.8	1250.4	656.5	1297.6	1330.6	1379.3
66	1289.8	1341.4	1411.9	1384.3	1374.6	1424.8	1539.2	1502.9	1333.2	1473.7	1464.7	1457.1
67	1540.3	1664.2	1663.6	1447.7	1436.4	1462.0	1219.9	1297.4	853.3	1335.1	1463.0	1479.1
68	1613.2	1552.6	1495.7	1397.4	1426.9	1410.1	1291.9	1350.9	1319.0	1468.5	1462.8	1464.4
69	1546.8	1660.8	1646.9	1468.8	1467.6	1409.4	1296.6	734.1	591.2	1418.1	1453.5	1462.5
70	1391.3	1328.0	1316.8	1349.8	1354.2	1392.0	853.0	730.1	652.9	1359.2	1424.0	1373.3
71	1367.0	1362.0	1377.5	1354.2	1371.2	1366.4	902.0	743.5	902.0	1422.8	1429.2	1337.5
72	1347.3	1435.4	1453.4	1374.7	1395.3	1406.8	1294.3	1352.2	1074.5	1469.1	1427.9	1453.3
73	1447.1	1520.6	1435.1	1364.6	1364.4	1364.8	885.7	608.8	714.9	1359.4	1407.8	1344.5
74	1285.4	1311.2	1401.5	1361.4	1383.4	1366.0	934.1	1068.7	1021.4	1425.6	1416.2	1376.7
75	1428.2	1478.2	1455.8	1388.0	1397.1	1420.0	1198.0	1090.6	844.5	1376.9	1392.4	1404.2
76	1429.4	1513.0	1413.8	1392.6	1423.1	1404.2	1252.8	1242.3	1288.9	1478.1	1425.1	1392.4
77	1603.4	1652.9	1472.7	1368.1	1428.5	1424.5	1330.7	1307.6	1554.8	1455.5	1461.9	1520.5

SALINITY MASS IN TOTAL OUTFLOW FROM REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	454.2	733.5	820.1	679.6	771.4	922.7	630.5	562.2	1139.0	1332.1	2260.7	1034.3
66	1744.9	882.4	0.0	0.0	308.8	986.4	601.2	472.4	597.5	340.1	402.1	407.4
67	1041.9	992.2	860.5	1232.7	1083.0	878.4	425.3	717.2	985.9	919.0	803.3	663.6
68	1079.4	1059.6	1172.4	1390.1	1376.6	678.9	664.1	666.5	623.7	409.0	698.5	746.6
69	1200.2	1037.9	969.8	1198.1	1015.0	1478.0	741.0	1083.6	491.7	949.3	628.5	751.6
70	2518.5	1518.0	1451.3	0.0	414.7	731.1	29.1	707.3	681.9	1369.3	946.2	892.2
71	2334.5	1892.8	1293.5	781.3	151.0	570.9	148.4	396.4	1220.2	871.9	608.5	1336.3
72	2444.5	1499.1	890.6	596.2	258.2	408.6	596.0	608.0	1201.7	567.0	533.7	1135.3
73	1432.0	1475.5	1353.3	955.6	883.5	859.9	134.9	300.4	1070.0	1130.5	1103.5	939.9
74	1304.2	2134.9	685.9	0.0	0.0	418.5	468.6	714.4	1079.3	766.3	772.0	1443.4
75	1903.7	1610.6	1210.6	1364.1	775.5	1120.9	361.4	581.5	1111.2	1188.9	786.7	929.5
76	1990.6	1443.3	1620.2	1080.5	1266.4	698.4	757.2	647.5	445.2	652.8	664.8	1242.3
77	1276.0	1059.7	1728.6	1632.5	1466.2	748.2	973.9	759.6	690.4	625.5	523.5	519.9

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 3 WELDONA - BALZAC.

TOTAL REACH GAIN FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	2.07	3.53	3.44	3.76	2.05	2.18	2.38	2.52	42.09	9.97	16.23	3.24
66	3.06	3.13	4.06	3.02	4.52	5.36	3.23	3.18	3.04	.60	.84	4.51
67	3.14	3.97	3.16	4.90	2.71	3.61	3.25	7.84	9.71	5.97	2.35	4.56
68	5.01	4.63	1.25	1.85	4.28	.96	3.47	4.63	2.30	.84	2.38	3.60
69	5.04	4.33	4.05	6.15	4.34	2.98	3.09	9.24	-16.09	9.19	1.87	3.56
70	3.84	5.55	6.03	4.04	4.13	3.87	3.16	-1.74	41.75	9.38	6.34	3.84
71	5.16	7.08	6.25	.74	5.35	2.96	-4.20	3.99	6.19	3.94	1.85	-1.72
72	3.36	4.08	4.17	2.06	3.08	2.84	4.86	4.61	5.08	1.70	1.80	4.08
73	4.13	4.99	6.51	3.21	5.12	4.44	1.95	-30.19	-2.48	4.35	3.82	1.62
74	1.55	3.26	4.43	5.58	5.80	4.22	3.86	5.31	4.53	1.95	1.73	4.78
75	5.63	4.96	4.11	5.52	3.89	4.86	5.56	5.26	5.08	4.43	2.45	3.95
76	6.92	4.82	6.11	7.06	6.65	4.23	5.41	4.79	5.69	3.51	2.03	.56
77	5.86	5.02	5.33	2.20	5.60	3.18	4.75	4.72	3.47	1.82	2.23	1.91

SALINITY IN TOTAL REACH GAIN FLOW (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	724.7	1214.0	1488.6	1454.4	1331.6	1344.8	1352.6	1356.2	791.9	2234.1	1812.5	2060.1
66	2080.5	1210.3	856.7	1869.6	1833.2	1416.0	1483.2	1383.3	1302.7	900.0	1144.8	1417.6
67	1230.6	1489.7	1442.2	1398.7	1357.7	1329.1	1178.9	1081.6	1126.6	2631.5	1374.8	1407.1
68	1427.5	1511.3	855.1	1551.3	1388.5	1609.2	1291.3	1302.2	1406.8	1124.4	1375.8	1387.2
69	1362.5	1495.7	1454.7	1423.9	1405.4	1404.0	1290.3	1533.8	-288.8	1517.7	1523.8	1393.5
70	1424.9	1375.2	1438.0	2571.6	2051.6	1599.6	1959.9	-2419.8	1002.4	1303.9	1516.2	2123.7
71	1299.5	1287.0	1204.9	5978.4	1802.2	2203.9	-290.1	3306.4	1434.9	1639.2	1505.6	-1971.8
72	1470.2	1233.9	1053.6	2192.1	1631.5	1511.4	1225.2	1269.1	1371.1	1484.0	1534.9	1415.9
73	1244.2	1338.9	1210.4	2103.8	1974.4	1935.4	2252.5	-656.2	-4949.1	2286.4	1729.4	5340.9
74	3017.6	1730.1	1046.7	1958.2	1667.7	1994.0	1405.8	1175.1	1373.5	1785.4	1720.9	1684.3
75	1278.6	1291.9	1148.2	1533.7	1541.6	1422.2	1087.2	1145.8	1809.7	1970.3	2085.6	1586.5
76	1322.8	1314.4	1230.0	1499.3	1416.7	1501.2	1215.1	1246.0	1213.3	1377.4	1556.4	3309.0
77	1481.8	1513.2	1314.6	1654.0	1435.0	1502.4	1433.7	1340.0	1584.6	1711.4	1363.7	1329.4

SALINITY MASS IN TOTAL REACH GAIN FLOW (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	129.5	370.4	443.0	473.0	235.3	253.0	278.7	295.2	2879.8	1925.4	2540.1	576.4
66	550.1	327.3	301.1	487.0	716.6	656.0	414.5	380.3	341.7	46.6	83.3	551.9
67	333.3	511.5	394.0	592.7	317.7	433.8	330.5	733.1	995.1	1361.0	350.7	555.0
68	617.8	604.0	92.5	247.6	513.8	134.0	386.7	521.2	303.4	81.7	318.9	431.7
69	592.8	559.2	508.9	736.1	526.8	361.1	344.9	1224.0	401.6	1207.1	245.4	441.2
70	472.9	694.9	748.7	897.9	731.8	535.0	535.9	364.0	3615.9	1462.5	829.9	725.1
71	578.9	787.1	650.4	380.6	910.2	562.8	105.4	1141.0	767.4	558.2	237.9	293.2
72	425.3	435.5	379.5	391.1	433.5	370.9	514.6	513.7	602.2	219.5	254.0	499.5
73	444.3	577.3	681.1	583.0	829.7	742.2	379.5	1737.6	1060.8	859.7	[illegible]	746.0
74	403.0	486.7	400.4	943.9	835.6	726.3	469.3	535.4	537.8	301.4	[illegible]	751.9
75	621.8	554.1	407.9	730.9	512.7	597.7	522.6	520.5	794.4	754.4	443.5	561.7
76	791.0	547.0	649.5	915.1	813.8	548.6	568.3	614.9	386.4	417.8	273.3	170.6
77	750.0	656.9	605.2	313.9	694.0	412.2	588.4	546.1	475.4	268.7	267.2	219.3

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 4 BALZAC - JULESBURG.

TOTAL POINT INFLOW TO REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.00	0.00	.05	.23	.25	.28	.29	.23	.67	.37	1.06	.71
66	.23	.29	.28	.23	.25	.32	.29	2.58	1.43	2.86	2.58	.62
67	.28	.24	.23	.23	.25	.23	.24	.28	.71	1.34	5.62	.33
68	.28	.29	.28	.32	.41	.37	.43	.37	1.43	3.64	1.24	.38
69	.28	.29	.23	.23	.31	.37	.33	.28	.29	2.44	4.37	.19
70	.23	.29	.28	.28	.31	.32	.33	.28	.19	.31	3.27	.14
71	.18	.19	.18	.18	.25	.23	.24	.28	.43	2.53	2.76	.19
72	.18	.19	.18	.18	.20	.23	.19	.18	.52	2.67	3.35	.19
73	.18	.24	.18	.23	.25	.32	.38	.28	.19	.74	3.18	.43
74	.23	.24	.23	.18	.20	.23	.24	.28	.71	3.68	1.98	.14
75	.14	.19	.14	.14	.15	.18	.29	.23	.14	1.70	2.53	.52
76	.29	.14	.14	.18	.20	.18	.19	.69	.38	4.56	1.34	.14
77	.09	.10	.09	0.00	0.00	0.00	0.00	0.00	0.00	2.90	1.98	.43

SALINITY IN TOTAL POINT INFLOW TO REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1015.0	1094.2	1082.2
66	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1360.0	1342.6	1376.2	1317.7	1000.0
67	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1037.1	1114.4	1034.4
68	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1328.7	1350.1	1334.8	1154.1
69	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1197.5	1206.9	1053.4
70	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1242.2	1323.6	1000.0
71	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1266.2	1272.2	1070.4
72	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1263.4	1357.7	1340.0	1000.0
73	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1243.4	1286.5	1166.4
74	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1086.5	1212.5	1258.9	1253.2	1029.5
75	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1359.0	1355.0	1301.0
76	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1297.3	1278.7	1367.8	1358.9	1247.7
77	1000.0	1000.0	1000.0	0.0	0.0	0.0	0.0	0.0	0.0	1413.0	1413.0	1413.0

SALINITY MASS IN TOTAL POINT INFLOW TO REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	0.0	0.0	4.0	19.9	22.0	23.9	24.7	19.9	57.6	32.3	100.1	57.1
66	19.9	24.7	23.9	19.9	22.0	27.9	24.7	303.0	165.6	339.5	293.6	53.5
67	23.9	20.6	19.9	19.9	22.0	19.9	20.6	23.9	61.7	125.4	541.0	29.8
68	23.9	24.7	23.9	27.9	35.2	31.8	37.0	31.8	163.9	437.0	143.4	35.0
69	23.9	24.7	15.9	19.9	26.4	31.8	28.8	23.9	24.7	252.1	451.4	17.3
70	19.9	24.7	23.9	23.9	26.4	27.9	28.8	23.9	16.4	54.4	373.9	12.3
71	15.9	16.4	15.9	15.9	22.0	19.9	20.6	23.9	37.0	277.1	303.7	17.6
72	15.9	16.4	15.9	15.9	17.6	19.9	16.4	15.9	57.4	313.3	389.2	16.4
73	15.9	20.6	15.9	19.9	22.0	27.9	32.9	23.9	16.4	77.2	353.2	43.2
74	19.9	20.6	19.9	15.9	17.6	19.9	20.6	26.0	74.8	400.7	214.4	13.4
75	11.9	16.4	11.9	11.9	13.2	15.9	24.7	19.9	12.3	199.9	307.3	58.8
76	8.0	12.3	11.9	15.9	17.6	15.9	16.4	77.4	42.1	538.9	156.9	15.4
77	8.0	8.2	8.0	0.0	0.0	0.0	0.0	0.0	0.0	354.2	241.9	42.3

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 4 BALZAC - JULESBURG.

TOTAL OUTFLOW FROM REACH (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	7.51	4.76	2.76	3.41	.36	2.58	6.90	9.76	2.95	3.96	14.05	9.80
66	0.00	0.00	0.00	0.00	0.00	1.66	2.90	9.95	9.14	11.28	10.13	9.33
67	3.32	2.28	0.00	0.00	.20	4.01	10.42	7.32	0.00	12.53	15.84	8.85
68	5.54	3.00	.18	.09	0.00	3.04	8.23	8.66	10.23	11.79	9.47	5.99
69	4.74	1.81	0.00	0.00	0.00	.51	5.23	5.30	6.76	15.[illegible]	13.46	5.90
70	5.62	.33	.09	.55	0.00	1.98	0.00	10.73	11.80	24.79	18.84	15.23
71	4.10	.57	.28	.14	0.00	.18	.38	2.53	13.47	18.01	14.97	12.18
72	.97	.29	.09	0.00	0.00	1.61	8.99	9.86	8.04	11.61	13.[illegible]	7.80
73	4.28	4.00	0.00	.09	.56	.28	.52	2.49	11.18	21.60	20.34	7.57
74	.41	.05	0.00	0.00	0.00	1.06	4.00	20.72	15.59	15.34	14.65	13.37
75	6.54	3.66	.05	.14	.31	2.53	4.71	13.56	8.28	23.53	20.13	14.99
76	6.22	1.95	.18	0.00	.36	1.89	9.04	11.56	11.51	12.43	11.1[illegible]	5.42
77	4.51	3.09	2.39	1.20	.71	.09	4.38	10.96	9.14	11.28	13.31	7.09

SALINITY IN TOTAL OUTFLOW FROM REACH (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1611.2	1562.3	1569.0	1589.3	1545.7	1568.6	1446.2	1440.4	745.4	1344.7	1349.1	1380.7
66	1354.0	1364.4	1370.5	1449.0	1431.2	1453.7	1406.8	1508.2	1393.5	1449.0	1477.4	1428.9
67	1511.0	1518.8	1507.3	1518.5	1520.2	1564.9	1458.2	1320.6	973.3	1338.4	1475.5	1487.6
68	1528.3	1517.7	1478.4	1485.1	1496.7	1499.3	1301.9	1405.3	1404.2	1494.1	1513.2	1416.6
69	1508.7	1512.0	1495.0	1505.3	1510.4	1516.4	1390.1	873.8	932.6	1341.6	1473.7	1417.5
70	1436.2	1375.3	1363.5	1402.9	1421.1	1460.7	547.6	923.8	801.6	1352.5	1473.7	1406.6
71	1428.0	1400.0	1396.1	1443.1	1430.9	1439.7	992.5	872.2	1035.1	1457.9	1511.7	1384.4
72	1435.3	1435.7	1422.9	1492.7	1454.0	1482.2	1342.0	1405.7	1242.7	1497.4	1462.0	1421.8
73	1528.5	1505.0	1433.3	1454.8	1435.8	1440.0	981.2	753.4	854.9	1389.2	1432.3	1355.1
74	1342.8	1369.0	1390.9	1417.0	1428.0	1431.7	1024.8	1222.2	1187.1	1506.9	1505.2	1417.0
75	1500.5	1506.7	1446.6	1479.4	1465.6	1518.1	1175.9	1191.0	978.7	1453.6	1450.3	1431.4
76	1499.1	1488.3	1421.6	1461.6	1479.0	1473.5	1333.6	1369.9	1448.6	1514.5	1525.3	1466.9
77	1566.7	1579.0	1514.4	1548.3	1523.7	1482.7	1330.0	1314.4	1461.3	1486.9	1471.0	1472.7

SALINITY MASS IN TOTAL OUTFLOW FROM REACH (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	1045.0	642.4	374.6	468.0	47.7	349.5	862.2	1215.1	190.0	460.2	1636.1	1163.4
66	0.0	0.0	0.0	0.0	0.0	208.2	352.8	1296.3	1100.1	1412.6	1293.3	1151.5
67	432.9	299.7	0.0	0.0	26.8	541.7	1313.0	835.5	0.0	1448.5	2019.8	1137.5
68	784.5	393.1	23.5	11.8	0.0	393.7	926.0	1051.2	1241.3	1521.9	961.9	1223.1
69	618.3	236.2	0.0	0.0	0.0	66.4	748.7	359.8	486.1	1852.3	1718.0	1143.7
70	726.3	39.6	10.9	67.0	0.0	249.9	0.0	856.4	817.4	2895.3	2309.3	1350.7
71	505.7	69.1	33.3	17.2	0.0	22.9	32.6	190.9	1205.6	2262.0	1556.8	1457.2
72	119.9	35.4	11.3	0.0	0.0	206.4	1042.8	1197.0	863.5	1501.4	1752.7	959.7
73	565.6	519.8	0.0	11.6	69.6	34.4	44.4	161.5	826.0	2592.4	2541.6	886.5
74	43.1	5.6	0.0	0.0	0.0	131.0	353.9	2198.3	1630.2	1536.6	1506.7	1637.2
75	847.8	477.0	5.8	17.7	38.8	332.2	478.7	1426.4	700.2	2955.5	2521.9	1953.9
76	805.3	250.9	22.6	0.0	45.6	240.4	1041.8	1368.2	1453.3	1637.1	1475.3	1194.1
77	610.9	422.0	313.3	160.2	94.0	11.8	503.1	1244.7	1153.6	1449.5	1651.5	702.2

Table F-3. (continued)

M O N T H L Y   R E S U L T S   RIVER REACH : 4 BALZAC - JULESBURG.

TOTAL REACH GAIN FLOW (CMS) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	3.37	3.95	4.51	5.30	4.14	5.18	4.26	5.54	13.41	3.74	7.37	7.06
66	6.56	7.79	9.10	2.11	7.76	14.91	9.18	6.80	8.07	6.62	4.62	4.62
67	5.83	7.17	5.99	6.09	6.18	6.34	5.38	4.15	14.40	19.62	7.97	6.60
68	7.77	7.38	6.45	7.95	8.43	6.22	10.14	7.49	8.79	4.68	33.93	10.45
69	7.26	6.95	6.15	7.39	6.90	6.59	6.07	5.73	14.31	22.70	5.77	5.10
70	8.70	1.97	4.86	10.98	10.69	7.49	9.18	8.29	-53.92	19.12	7.27	3.88
71	11.77	4.57	3.88	.62	4.34	5.46	-8.00	3.12	13.26	8.58	4.94	1.90
72	3.59	8.54	4.62	-4.36	5.12	4.51	7.32	8.72	7.23	5.37	4.04	9.07
73	4.99	7.27	1.64	1.63	7.22	5.57	7.87	19.34	29.50	11.25	12.01	3.70
74	10.49	10.06	5.32	7.06	8.45	7.30	8.41	12.78	9.75	5.40	5.75	5.08
75	6.61	5.35	4.20	4.32	6.38	5.73	9.89	9.92	10.29	10.09	9.11	7.05
76	7.38	6.17	5.34	4.70	8.40	5.85	8.00	7.85	7.79	4.48	3.55	3.93
77	6.09	4.31	3.79	2.86	5.95	5.64	11.27	11.52	11.29	4.17	7.41	6.43

SALINITY IN TOTAL REACH GAIN FLOW (MG/L) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	2001.6	1734.9	1641.9	1717.1	1743.5	1716.5	1679.5	1660.9	1825.9	-330.4	604.3	1176.5
66	1606.9	1574.7	1537.2	1941.6	1479.9	1511.9	1325.4	1613.3	1456.6	1489.3	1612.4	1440.1
67	1630.7	1582.5	1585.8	1669.1	1668.7	1701.3	1808.1	1727.3	1291.9	937.9	1753.3	1541.6
68	1509.4	1584.7	1584.3	1622.5	1624.0	1722.8	1332.0	1499.3	1461.2	1633.0	1185.3	1403.3
69	1605.6	1583.1	1584.5	1637.5	1653.1	1659.8	1510.5	2498.1	1691.7	1202.5	1722.4	1557.0
70	1534.5	2323.8	1733.2	1235.5	1405.3	1625.3	1617.0	1908.0	283.1	1153.4	1595.2	1175.4
71	1518.6	1754.5	1835.0	2881.0	1510.7	1577.6	82.7	5125.9	1345.1	1521.6	1765.4	427.0
72	1809.6	1545.1	1710.4	1056.8	1657.2	1801.4	1448.0	1483.3	1382.6	1624.4	1602.2	1418.4
73	1674.5	1593.3	2233.4	2169.6	1518.9	1582.7	1595.3	2347.8	1277.1	1242.2	1458.0	105.6
74	1472.4	1513.1	1687.7	1335.1	1451.4	1484.2	1457.5	1392.4	1348.6	1768.4	1687.5	1309.7
75	1647.2	1640.0	1707.7	1792.4	1654.0	1713.1	1233.8	1345.2	1526.4	1476.7	1436.7	1410.6
76	1611.3	1594.1	1652.3	1708.2	1614.4	1697.7	1455.2	1515.3	1609.1	1740.6	1758.7	1521.5
77	1630.4	1667.1	1698.9	1890.4	1669.7	1673.0	1280.2	1329.1	1430.8	1633.7	1514.4	1494.6

SALINITY MASS IN TOTAL REACH GAIN FLOW (T/D) :

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	582.4	592.1	640.1	786.8	623.0	767.7	618.9	795.0	2115.3	-106.7	385.0	717.7
66	911.2	1059.8	1208.3	353.7	991.6	1947.2	1050.7	948.5	1015.1	852.1	644.3	575.0
67	821.8	980.6	820.4	878.8	891.4	932.0	840.9	619.5	1606.9	1589.6	1207.9	878.6
68	1030.9	1009.9	883.1	1114.4	1183.4	925.3	1167.3	969.9	1109.2	660.8	3471.2	1266.7
69	1006.9	950.3	841.9	1045.5	985.0	951.2	792.4	1237.4	2091.9	2358.7	858.3	686.3
70	1153.0	395.9	728.3	1172.1	1297.8	1052.5	1282.4	1366.3	-1319.2	1905.4	1002.3	393.9
71	1544.9	693.0	615.7	154.3	566.5	744.7	-57.2	1381.2	1541.0	1128.1	753.5	56.4
72	561.3	1139.7	682.4	-398.2	733.7	702.7	915.9	1117.3	864.1	753.6	559.2	1111.2
73	721.8	1000.6	317.0	306.5	947.0	761.3	1084.5	3922.6	3254.8	1207.0	1513.5	34.1
74	1334.8	1314.7	775.6	814.9	1061.1	936.5	1059.6	1537.9	1135.7	824.9	838.5	574.6
75	940.1	758.5	620.0	669.6	912.3	848.1	1054.4	1152.9	1356.9	1287.5	1042.0	859.3
76	1027.4	850.1	762.5	693.9	1171.3	858.2	1005.9	1027.1	1082.7	673.6	539.2	517.3
77	857.9	620.7	556.3	466.7	860.2	815.5	1246.1	1322.9	1395.6	588.6	969.6	830.4

Table F-4. Revised seasonal and annual averages of flow, salt concentration and salt mass flow, for return flows to reach Kersey-Weldona, South Platte River, water years 1965-77.

WATER YEAR	SEASONAL AVERAGE				ANNUAL AVERAGE
	FALL	WINTER	SPRING	SUMMER	
	Total reach return flow (m^3/s)				
65	3.9	5.8	4.4	-	4.8
66	5.1	9.7	7.6	5.9	7.0
67	6.2	4.5	6.2	7.8	6.2
68	5.7	5.0	6.3	8.3	6.3
69	5.6	5.0	6.9	9.8	7.0
70	4.5	7.2	-	9.1	7.6
71	3.5	8.0	4.8	9.5	7.1
72	8.7	5.2	10.2	7.6	7.9
73	6.4	7.3	8.8	10.7	8.1
74	7.2	7.2	6.0	8.7	7.3
75	6.6	7.6	8.5	4.6	7.2
76	6.8	9.2	8.2	6.1	7.8
77	6.5	6.1	6.2	5.1	6.0
	Salinity in total reach return flow (mg/l)				
65	2203.5	1771.4	1618.8	-	1830.2
66	1938.7	1482.6	1538.1	1688.6	1623.6
67	2196.3	1828.0	1579.0	1601.1	1833.0
68	2270.7	1716.5	1645.1	1603.9	1787.5
69	2282.6	1703.2	1376.0	1573.0	1709.6
70	2185.2	1798.8	-	2007.7	1939.5
71	2547.8	1796.8	1986.5	1872.3	1927.9
72	1678.4	1819.5	1490.3	1809.6	1672.0
73	2051.3	1702.1	1445.5	1837.4	1782.0
74	1611.1	2034.9	2069.6	1840.3	1877.9
75	2074.4	1608.4	1466.0	2346.5	1740.2
76	1997.0	1635.6	1425.4	1910.9	1676.0
77	2327.3	1624.2	1530.8	1908.8	1854.3
	Salt mass in total reach return flow (T/d)				
65	733.8	884.2	617.9	-	764.3
66	845.2	1239.2	1005.8	864.5	987.2
67	1176.4	704.7	845.0	1074.2	977.6
68	1121.2	745.1	897.0	1149.1	979.6
69	1101.9	733.3	817.3	1334.0	1027.3
70	851.0	1119.4	-	1569.6	1274.8
71	771.6	1235.4	844.4	1538.5	1189.4
72	1257.7	816.7	1315.5	1181.8	1133.7
73	1139.9	1070.0	1101.4	1701.8	1252.6
74	1007.4	1272.7	1080.4	1376.5	1184.0
75	1209.4	1051.4	1076.8	928.9	1082.4
76	1181.0	1302.3	1012.5	998.0	1129.1
77	1314.0	858.8	822.7	835.3	958.6