AN ANALYSIS OF WATER RIGHTS IN THE SEVIER RIVER BASIN

Part 1. Zone A, Section A

Upper River

By

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FOREWORD

This paper is submitted as the writers' understanding of definition, limitation, and administration of the water rights in the area of the Sevier River Basin presently known as Zone A, Section A. The purpose for the analysis contained herein is to clarify the actual day-to-day operation of the river system in this region. Documentation from the Cox Decree which sets forth these rights has been provided throughout as far as possible. Where the Decree does not sufficiently define an administrative policy either the historical practice or the practices conforming to the authors' understanding of the Decree have been presented.

The writer's invite any interested party to review this work and delineate any errors that have been made. It is realized that the responsibility for the administration of water rights lies with the Utah State Engineer and this paper is not intended to circumvent this responsibility.

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INTRODUCTION

Section A water rights in the Sevier River Basin divert water from the main stem between Piute Reservoir and Vermillion Dam. The hydrologic area requiring evaluation in order to define these rights begins at four inlets; (1) a diversion from the East Fork into Otter Creek Reservoir; (2) the Otter Creek outlet; (3) the U.S. Geological Survey gauging station on the East Fork known as, "East Fork of the Sevier River near Kingston"; and (4) the U.S. Geological Survey gauging station on the South Fork known as, "Sevier River near Kingston". The outlet is the Sevier River Water Users' gauging station, "Sevier River below Vermillion Dam". Water flows in this reach, located in Fig.1, can be divided into six segments;

(1) Otter Creek Reservoir releases;

(2) East Fork flows not resulting from Otter Creek reservoir releases;

(3) South Fork flows past the Kingston gauging station;

(4) A stipulated acretion of 34 cfs steming from springs and irrigation return flows that were left indeterminant by construction of the Piute Reservoir;

(5) Piute Reservoir releases; and

(6) Tributary and irrigation return flows between Piute Reservoir and Vermillion Dam.

A fraction or all of the flows identified in these six segments are necessary parts of the Section A primary computation.

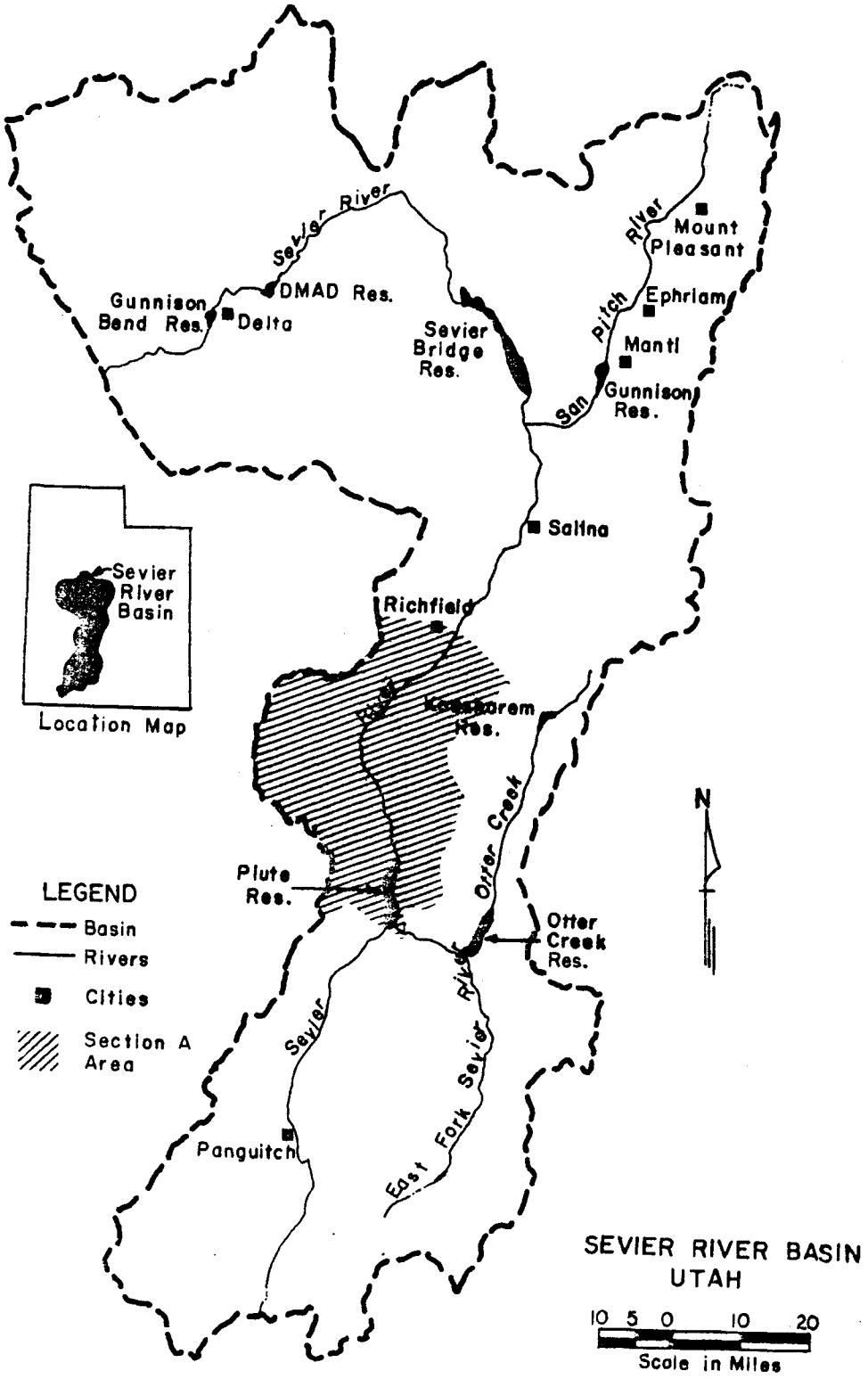


Fig. 1. Location of Section A in the Sevier River Basin.

However, various limitations have been defined in the Cox Decree and subsequent Court or State Engineer actions from which it is possible to give more detailed understanding of the importance of these flows to the Section A water rights. This writing is intended to describe these water rights and their administration as understood by the writers. Detailed flow charts of the computational and operational procedure are presented for those who may wish to make their own calculations and to provide the technical outline for possible computer applications.

Although all the water supply in the Sevier River Basin has been totally appropriated, it is important that any water diverted be identifiable as a right belonging to that diversion. The procedure outlined in this paper can be utilized to show the chain of title to the waters and thereby allows a complete accounting of the measured waters in this section of the river.

DESCRIPTION OF WATER RIGHTS

The Section A primary rights are described and defined primarily on pp. 2-8 of the Cox Decree, pp. 92-98 of Bacon's Bible, and subsequent agreements, stipulations, State Engineer actions, and judicial decisions. Even so, the day-to-day administration of the river is largely a matter left to the Sevier River Commissioner. Only a few if any of the irrigators themselves fully understand their rights and the limitations thereof. Occasionally, these circumstances lead to conflicts when the allocations differ from expectations. Thus, a

detailed description of the water division procedures should be helpful to the individual water interests as well as insuring consistant administrative practices.

The Cox Decree identifies five basic rights to the Section A primary flow. These are listed in their order of priority as follows:

(1) A first priority right to Monroe South Bend Canal Company;

(2) "First Class" rights commonly referred to as the "a to 1" rights;

(3) A "Second Class" right to Sevier Valley Canal Company;

(4) A "Third Class" right to Monroe South Bend Canal Company; and

(5) All flows above those necessary to satisfy the four above listed rights accrue to the Piute and Sevier Bridge Reservoir storage rights.

A summary of these rights is presented in Table 1 along with the associated conditions and limitations. It might be worth emphasizing that first class rights do not receive water until the first priority to Monroe South Bend Canal Company is satisfied and likewise in turn for the second class, third class, and storage rights.

Primary water rights originally diverted flows directly from water available in the Sevier River and were thus subject to the seasonal variation in run-off and return flow. After

Table 1. Summary of the Primary Rights in Section A, Zone A of the Sevier River Basin, All units in cubic feet per second (cfs)

Right	Irrigation System	Period in Irrigation Season		
		April 1-15	April 16-30	May 1 - Sept. 30
a.	Richfield Irr. Can. Co.	85.90	85.90	85.90
b.	Anabella Irr. Can. Co.	30.40	30.40	30.40
c.	Elsinore Can. Co.	18.92	18.92	18.92
d.	Brooklyn Can. Co.	29.77	29.77	29.77
e.	Monroe Can. Co.	47.90	47.90	47.90
f.	Isaacson Ditch 1/	2.90	2.90	2.90
g.	Wells Irr. Co 1/	10.90	10.90	10.90
h.	Joseph Irr. Co.	25.90	25.90	25.90
i.	Mills Ditch 1/	1.33	1.33	1.33
j.	Elsinore Bench Irr. Co.	2.00	2.00	2.00
k.	Sevier Valley Can. Co.	53.14	53.14	3.14
l.	Sevier Valley Can. Co. 2/	0	0	68.00
m.	Vermillion Irr. Co. 3/	37.80	37.80	37.80
n.	Monroe So. Bend Can. Co. 4/ 3/	30.00	31.25	1.25
o.	Monroe So. Bend Can. Co. 5/ 3/	11.50	11.50	41.50
	Total First Priority	30.00	31.25	1.25
	Total 100% First Class	346.86	346.86	296.86
	Total 100% Second Class	0	0	68.00
	Total 100% Third Class	11.50	11.50	41.50

Notes

1/ See page 3 of Cox Decree additions

2/ Second Class right

3/ Use or lose

4/ Right against all parties and not subject to prorata

5/ Third Class right - Use or lose

Rights a-k and m prorate when 100% primary is unavailable. The percentage of prorata is as follows: May-Sept.

a = 28.94%	g = 3.67%
b = 10.24%	h = 8.72%
c = 6.37%	i = 0.45%
d = 10.03%	j = 0.67%
e = 16.14%	k = 1.06%
f = 0.98%	m = 12.73%

Piute Reservoir was constructed, the "a to 1" rights agreed to relinquish their winter irrigation rights for temporary storage privileges in the new reservoir. The conditions for storage are clearly outlined on p. 4 of the Cox Decree. Several of the provisions mentioned need description here. The "a to 1" water users may at their option utilize available storage capacity to store their primary entitlements and have this water released upon demand without diminution. This point, however, does not cover such losses that may occur in conveyance from the reservoir to their canal intakes. In addition, this storage right is limited to 9,000 acre-feet when Piute Reservoir has filled. In each and every year, the storage credits in Piute Reservoir that remain after November 1, are forfeited to the Piute and Sevier Bridge Reservoir storage rights.

One further aspect of the river administration in this area is the so called "regulating stream". Its purpose and operation will be discussed in a later section. However, with the exception of special provisions provided for in this agreement, <u>all</u> water passing over Vermillion Dam belongs to the Piute and Sevier Bridge Reservoir storage rights (Cox Decree, p. 194). This is an important point since such flows may be comprised of: (1) transfers between the two principal reservoirs as part of their individual rights; (2) water bypassed in Section A; (3) primary flows allocated to these storage rights; and/or (4) regulating stream water. In the operation of the river, each of these flows must be delineated in order to properly allocate the water resources.

COMPUTATION OF PRIMARY FLOW

The first step in administering the river's Section A is to compute the daily volume of the primary flow. This should be undertaken in five segments as follows:

(1) East Fork Primary;

(2) South Fork Primary;

(3) Primary through Piute Reservoir;

(4) Primary between Piute Reservoir and Vermillion Dam; and

(5) River losses assigned to transferring Piute and Sevier Bridge storage waters to maintain the integrity of the primary flows.

A pictorial description for computing the Section A primary is given as a flow chart in Fig. 2. It should be noted that for the purpose of this paper, only the period from April 1st through September 30th is considered.

East Fork Primary

Prior to 1917, the flows out of the East Fork of the Sevier River were adjudicated to the Kingston Irrigation Company, miscellaneous other users, and the Section A primary rights. On January 30th and 31st of 1917, the former two rights were transferred to the Otter Creek Reservoir through two agreements filed as deeds with the Piute County Recorder on pages 213, 217, 218, and 219 in Book 2 of Water Claims. A copy of these records is included in the 1953 Annual River Report. However, in the

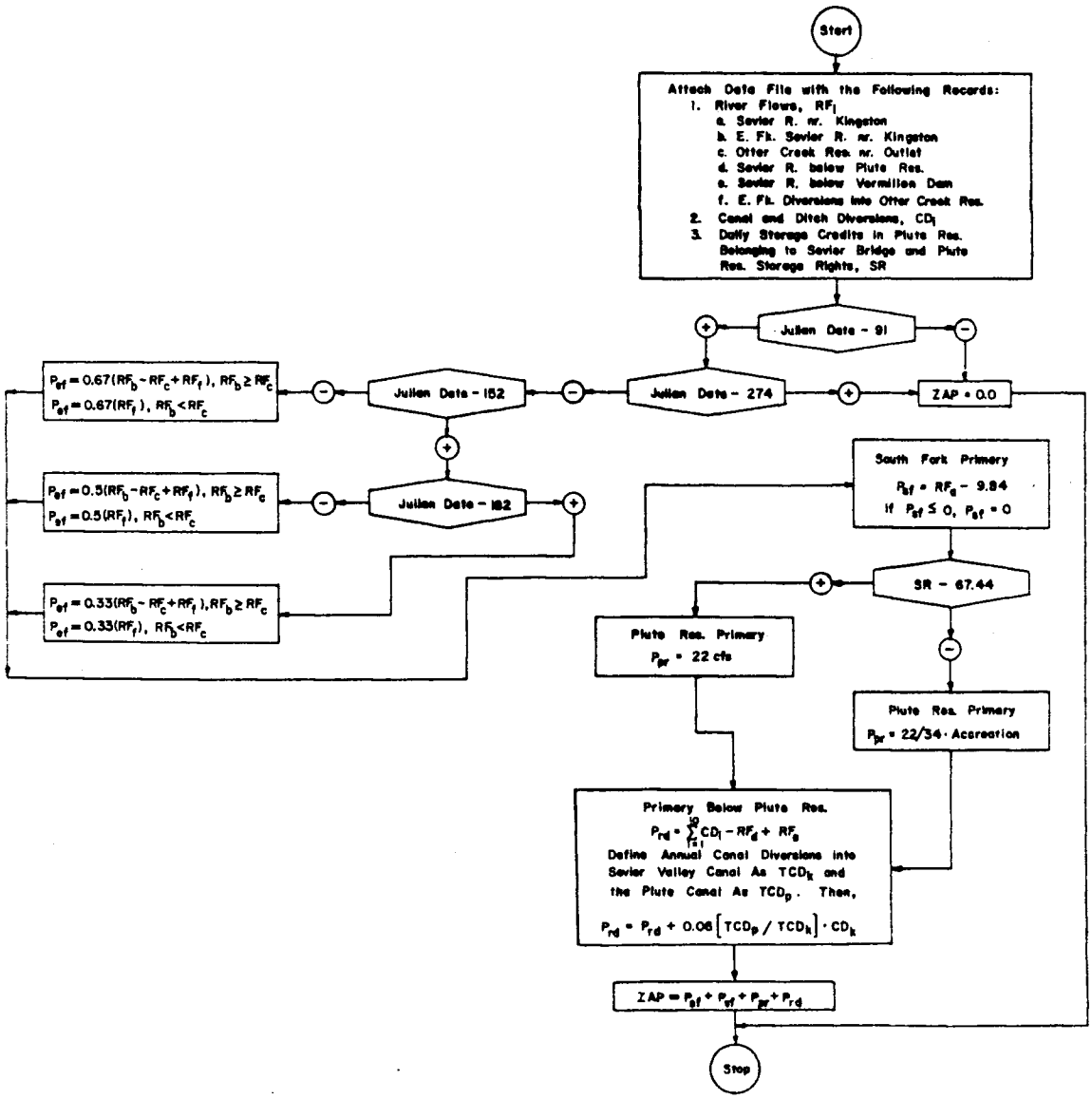


Fig. 2. Flow chart of the procedure for calculating the Section A primary.

general case all of the East Fork flows are diverted into Otter Creek Reservoir through a feeder canal.

On pages 30 and 31 of the Cox Decree, the existing rights are detailed. Otter Creek Reservoir Company is entitled to one-third of the East Fork flow from April 1st to May 31st, one-half of the flow during June, and two-thirds of the flow from July 1st to October 1st. Otter Creek Reservoir then supplies both the kingston Irrigation Company and the miscellaneous users. The remainder of the flows in each case should be credited to the Section A primary rights until these rights are supplied in full. Then the remaining flow accrues to Otter Creek Reservoir. The flows past the Kingston gauging station on the East Fork are therefore one or a combination of the following:

(1) East Fork flow not diverted into Otter Creek Reservoir;

(2) Releases from Otter Creek Reservoir to Kingston Irrigation Company and the miscellaneous users;

(3) Releases from Otter Creek Reservoir to the Company's stockholders in Sevier Valley; and/or

(4) Releases of the Section A primary waters from Otter Creek Reservoir.

It is important to note that primary water not identified by comparing releases from Otter Creek Reservoir with the flows passing the East Fork gauging station near Kingston can only be determined by allocation of the diversions into the reservoir through the feeder canal. The allocation of these diversions should be determined on a daily basis in order to be congruent

with the primary calculations in the other segments downstream. A measurement station on the feeder canal has been abandoned for some time so that a daily allocation of East Fork flows cannot be made and thus, the periodic data that are reported should be distributed over the intervals between measurments.

South Fork Primary

During the irrigation season, the flows recorded at "Sevier River near Kingston" minus 9.84 cfs constitute the South Fork primary. The 9.84 cfs are flows composed of four rights to South Fork flows upstream of Section A but which were transferred into the section by their holders. At the time of the Cox Decree, the Sevier Valley Canal Company held two rights of 6 cfs and 4 cfs respectively from what is known as "Mitchell Slough". They filed for a transfer to their point of diversion below Piute Reservoir which was approved subject to a 2.5 cfs assessment for river conveyance loss (Cox Decree, pp. 13-14). A third right of 1.5 cfs from Mitchell Slough was granted Mr. O. C. Snow and Mr. John Snow by the Sixth Judicial District Court on April 7, 1941, a copy of which is included in the 1953 Annual Sevier River Report. This right allows for the 1.5 cfs to be diverted by Monroe South Bend Canal without diminution. Finally, the Piute Reservoir and Irrigation Company has a right to 0.84 cfs from the South Fork (Cox Decree, p.14). In the event the flow passing the Kingston gauging station is not at least 9.84 cfs, the above noted rights, excluding the 1.5 cfs, must prorate with each other. The South Fork primary is then defined as zero.

Piute Reservoir Primary

Prior to the construction of Piute Reservoir there were substantial inflows to the river within its confines from irrigation return flows and Barnson Springs. The river commissioners measured the accretion in this section of the river and established it at 34 cfs. In the Cox Decree (p.7) 22 cfs of these flows were allocated and guaranteed to the Section A primary while 12 cfs were given to the Piute Reservoir and Irrigation Company. If there is insufficient water flowing to make up these rights, the deficit is made up out of the storage waters belonging to Piute and Sevier Bridge Reservoirs. In other words, these flows are one of the factors determining reservoir loss. If no storage waters belonging to Piute or Sevier Bridge are impounded in the reservoir against which to make up any deficit, the 22 cfs and the 12 cfs shall prorate. Neither of these flows can be filled by waters stored in Piute Reservoir that are storage credits of the Section A primary rights or Otter Creek Reservoir storage being held in Piute.

Primary in the Main Stem

The river inflows that occur between Piute Reservoir and Vermillion Dam constitute the fourth segment of the Section A primary. The primary inflows are computed by comparing the measured inflows to the measured outflows. A modification instituted by the river commissioners over the years is to use the previous day's release from Piute Reservoir in this computation. It should also be mentioned that the diversions

into the ten Section A canals and the flows over Vermillion Dam constituting the outflows must be adjusted for certain conveyance losses from Piute Reservoir, releases from Three Creek Reservoir in the Clear Creek drainage, and compensation for flows from Taylor's Fish Ponds. The latter two are rights owned by Sevier Valley Canal Company. It is assumed that water is supplied to both the Mills Ditch and the Isaacson Ditch through one or two of the other canals listed in Table 1 since no records are available.

Adjusted Piute Reservoir releases. When water is released from Piute Reservoir, a fraction is lost in conveyance. Since the primary flow rights are prior in appropriation, the river loss is charged against whatever storage water which may be present. For example, if 50 cfs is the primary accumulation in the river between Piute Reservoir and Vermillion Dam and 50 cfs of storage water is released to Piute Canal, years of record have determined that 97 cfs will be the total outflow. To maintain the integrity of the primary flow, a 6% river loss is charged against Piute's call for water. Piute Canal would be delivered 47 cfs of the 50 cfs released and the primary accumulation would still be 50 cfs. To deliver storage water to Vermillion Dam, a 100 cfs storage release would yield 50 cfs primary and 85 cfs over Vermillion Dam. Thus, a 15% river loss would be charged against the 100 cfs storage release to maintain the primary flow. In determining the primary accretion below Piute Reservoir, therefore, the inflow to the section should include the net storage water being delivered.

Diversions by the Piute Reservoir and Irrigation Company are conveyed initially through the Sevier Valley Canal. The daily flows at the canal head for delivery to the Piute Canal are not available from the Commissioner's Annual Reports. The use of annual reports to compute these rights requires using the yearly ratio of Piute deliveries to the total diversions into the Sevier Valley Canal and assuming that the daily diversion ratio would be the same. This flow rate would then be the net storage delivered and would be 6% less than released at Piute Reservoir. This assumption should not result in any large errors, although for current computations, the daily flows delivered as Piute water should be available.

Adjusted Sevier Valley Canal diversions. Among the water rights owned by the Sevier Valley Canal Company are two that require consideration in determining the Section A primary below Piute Reservoir. The first is the Three Creek Reservoir right in the Clear Creek drainage as described on page 34 of the Cox Decree. The reservoir having a capacity of approximately 1000 acre-feet impounds the flows of Three Creek Springs, Birch Creek, Charlesworth Creek, and Dry Creek. The Sevier Valley Canal Company right includes storing these flows to the extent possible and releasing them when deemed necessary for irrigation on lands under the main canal in Sevier Valley. Proper administration of the river in Section A would require the river commissioner to credit the company with these flows when they enter the Sevier River. Consequently, if these waters are entering the river through Clear Creek, the Section A primary below Piute

Reservoir should be adjusted accordingly.

The second right involves flows available from Taylor's Fish Ponds near Beaver Creek. A Mr. Orson Olsen originally was listed as the right holder (p.76 Bacon's Bible) but in the Cox Decree (p.32) it is listed as belonging to the Sevier Valley Canal Company. Flows not to exceed four cubic feet per second are to be used for irrigation from April 1st to November 25th. Again, the Section A primary should be adjusted for this right.

In both of these cases, it appears that no current efforts are made to measure the respective flows and as such an accounting cannot be effectively made. For this reason, the computational algorithms presented herein do not incorporate these adjustment.

ALLOCATION OF SECTION A PRIMARY

Section A primary water should be computed on a daily basis although it is generally allocated to the respective rights when the monthly records are collected and summarized. This practice is sufficient for the first and second class rights having storage privileges in Piute Reservoir. However, the Vermillion Canal right as well as the first priority and third class rights must be diverted as the water becomes available. Storage rights to the Section A primary when such water is present should also be computed daily as the data are reported. Thus, careful monitoring of the Section A primary is prerequisite to efficient water management in this area of the river.

In any given year, it is generally possible to assume the first priority rights will be filled (no recorded data indicate otherwise). Consequently, the first allocation decision is whether or not the first class water is totally available. If it is, the allocation is according to the values listed in Table 1. Vermillion Canal is entitled to the make below Annabella Dam up to 37.80 cfs. When this water is not yielded between the Annabella Dam and Vermillion Canal, then the other primary rights prorate equally with Vermillion Canal. Because the yield between Annabella and Vermillion Dam is usually indeterminate, the Vermillion Canal's right is computed the same as and a part of the other primary rights.

It should be noted that diversion rights are defined as a part of a given flowrate figure accumulating in a section and therefore, are the same whether or not the water is diverted. When a canal on a use or lose basis does not divert the water in the stream, a computation as outlined by the Cox Decree would not enlarge the remaining rights. Thus, it is the interpretation of the writers that the primary rights are limited to their prorated percentage of the flow when the first class rights are being filled or the values in Table 1 when more water is available.

During the high run-off periods in the spring or after the periodic summer rains, there is often flow exceeding the first priority and first class requirements. The excess up to the limits of the second class rights are so allocated. Remaining flows are given as third class rights and Piute and Sevier Bridge

Reservoir storage rights in their respective turns. An illustrative summary of the Section A primary allocation procedures is presented in flow chart format in Fig. 3.

DESCRIPTION OF THE REGULATING STREAM

The reader familiar with irrigation systems in the western United States will sense the inherent difficutly in administering Section A in the Sevier River Basin. When water is being delivered to a sequential series of diversions, the fluctuation in the deliveries increase drastically from one end of a system to the other. These conditions were evident in Section A prior to the so-called "Regulating Stream". The regulating stream was not intended as a water right, but rather a device to compensate for the deviations in flow beyond the ability to determine through measurement or manage through careful flow regulation. The stipulation between the involved parties along with the commissioners description of the regulating stream are presented in the 1968 Annual Report for the Sevier River. This explanation was printed to solicitate comment during the trial period, but there existed disagreement between the commissioners as to the proper method. The 1971 Annual Report contains a description which the lower river commissioner considered correct. Since the regulating stream represents an issue still to be resolved, the following discussion is given as a proposal for a regulating stream calculation procedure.

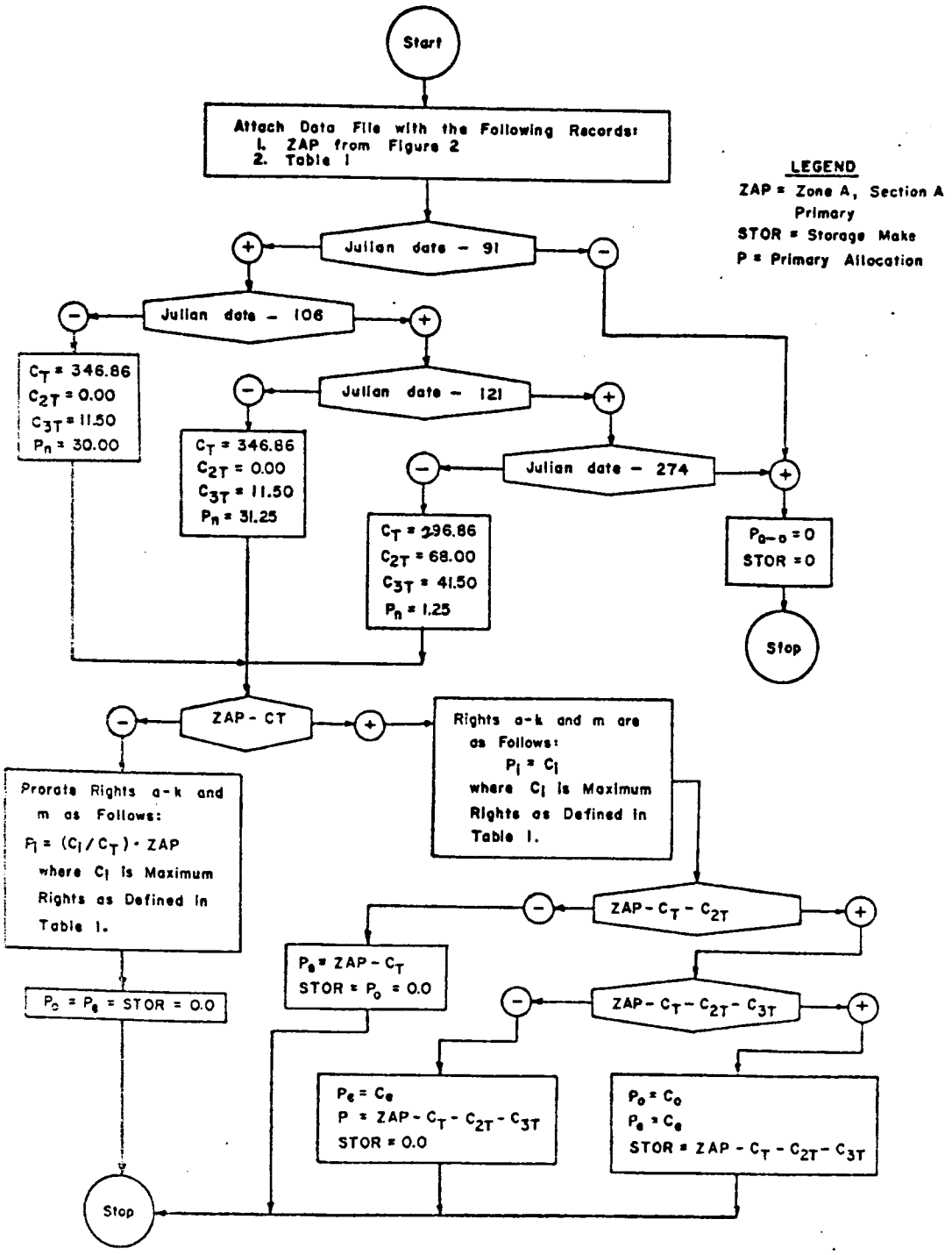


Fig. 3. Flow chart of Section A primary right allocation.

Computation of the Regulating Stream

The regulating stream is defined as:

> "a stream released from Piute Reservoir in excess of the expected intake at the various diversions for the purpose of making adjustments of time rate of flow, or compensate for regulating problems."

This flow is physically a fraction of the water passing over Vermillion Dam during periods when water is not being delivered to Sevier Bridge Reservoir under provisions of the storage filings and is limited to the April 1st through September 30th period. Conveyance and storage losses must be assessed against these flows, but the resulting credits are transferable from Sevier River to Piute Reservoir.

The calculation of the regulating stream as proposed requires the following daily records:

(1) Sevier River below Piute Reservoir;

(2) A segregation of daily flows assigned to Piute Canal;

(3) Sevier River below Vermillion Dam;

(4) Section A allocations;

(5) Storage water being conveyed to Sevier Bridge Reservoir as part of the division of the storage rights; and

(6) Contents of Piute Reservoir.

In order to formulate a rational computation procedure, it is necessary to determine the regulating stream after the irrigation season. This delay is not important because the regulating stream credits can be adjusted in the annual

accounting of the storage rights.

The regulating stream must be determined at Vermillion Dam initially and then reduced for conveyance and storage losses to Sevier Bridge Reservoir. Seven steps are proposed in an iterative procedure:

(1) The maximum daily flow over Vermillion Dam, not a part of a previous iteration, and around which there are at least seven days, is determined;

(2) The maximum seven day total flow over Vermillion Dam encompassing the flow selected in step (1) is determined;

(3) Fifteen percent of the total release from Piute Reservoir during the same seven-day interval is subtracted from the value calculated in step (2). Any negative value is redefined as zero;

(4) The seven days used in the preceding steps are indexed so they will not be selected again in subsequent iterations;

(5) Steps (1) through (4) are repeated until no additional seven day periods are possible;

(6) The total regulating stream at Vermillion Dam to be credited to the primary rights is then determined as follows:

$$RSC = \sum^{K} \left[R_4(K) - S_1(K) - S_3(K) \right] - \sum^{L} S_2(L) \quad . \quad . \quad . \quad . \quad (1)$$

where,

RSC = regulating stream credits, in acre-feet;

R_4 = daily flow over Vermillion Dam, in acre-feet;

S_1 = daily storage make in Section A, in acre-feet;

S_2 = values determined in step 3, in acre-feet;

S_3 = daily storage water being transferred between the two reservoirs as part of their joint rights, in acre-feet;

L = number of time S_2 was defined; and

K = Julian date during irrigation season (91 through 273).

(7) The total storage rights at Vermillion Dam are defined as:

$$TS = \sum^{K} \left[S_1(K) + S_3(K) \right] + \sum^{L} S_2 (L) \quad . \quad . \quad . \quad . \quad . \quad (2)$$

in which TS is the storage water in acre-feet.

The seven steps listed above should be limited by several operational rules in order to protect existing rights below Vermillion Dam. Two detrimental instances which have accurred recently serve to illustrate this necessity. In 1969, the "a to 1" rights diverted 100% of their first class primary rights in every month except August and September. Nevertheless, they were given additional credits in Sevier Bridge for waters determined by the regulating stream. These rights were therefore enlarged clearly beyond their appropriated limits as defined by the Cox Decree. During 1972, carefull flow regulation resulted in a total of 4694 acre-feet over Vermillion Dam resulting in 3,500 acre-feet of regulating stream credits. However, in 1975 the total water over Vermillion Dam was 14,373 acre-feet. If the same degree of control had been exercised as in 1972, a considerable part of the 14,373 acre-feet would have remained in the upper zone. Part of this water would have been foreited

to the storage rights after November 1, 1975 and since the remainder could not have been held in Piute Reservoir in the spring of 1976 due to filling of the reservoir, this water would have added to the 1976 storage in Sevier Bridge Reservoir.

For such a procedure as a regulating stream to be complete, it should include limitations to encourage efficient flow regulation in Section A. Otherwise, conditions will arise when allocation of water in the lower zone will be adversely affected. The capability for flow regulation in the reach between Piute Reservoir and Vermillion Dam was demonstrated in 1972 and could therefore serve as a starting point to establishing a maximum allowable volume of regulating water. In addition, the regulating credits in Sevier Bridge are reduced approximately 17% annually to compensate for conveyance and storage losses. It might therefore be appropriate to point out that the regulating stream credits should be as low as possible so that most of the water can be applied to croplands rather than lost by evaporation.

In addition to the limitations suggested above, others that might be considered include:

(1) In the event the total outflows over Vermillion Dam accumulated for three days exceed the unused capacity of Piute Reservoir, the provisions of the regulating stream would not apply prior to this time for the current year. This rule is suggested to define water being by-passed because of insufficient regulating capacity.

(2) Anytime the flow of the river below Piute Reservoir is less than or equal to 9 cfs and/or the flow of the

river below Vermillion Dam are 2 cfs or less the water over Vermillion Dam should accrue to the storage rights. These flows represent leakage and not part of any attempt to control flows.

(3) The seven day period is used only when the accretions below Piute Reservoir cause excess water to go over Vermillion Dam.

(4) Whenever the flows over Vermillion Dam cannot be compared to a seven day period of release from Piute Reservoir because a seven day interval is not possible in the iterative procedures above, these flows should be computed on a daily basis.

Other Provisions.

There are two major provisions in the present regulating stream operation in addition to those described above that ought to be maintained. The first is the loss for conveyance to and storage in Sevier Bridge Reservoir. Flows passing over Vermillion Dam to the credit of the primary rights in Section A are assessed the same river loss as any other waters entering the lower zone. Specifically, a two percent loss is assessed in conveying water from Vermillion Dam to Sevier River near Sigurd. Then a ten percent loss is taken from Sigurd to Sevier Bridge Reservoir until July 1, and twelve percent thereafter. Evaporation losses from Sevier Bridge Reservoir during the irrigation season for the regulating stream credits would be their proportionate share of the total losses as indicated by the loss tables

developed by the commissioners. And finally, all hold-over storage is reduced five percent during the non-irrigation season.

The second major provision is that the regulating water is subject to the same provisions as all other hold-over water in Sevier Bridge Reservoir as defined by the Cox Decree. Again, a more detailed explanation of this limitation will be given in a subsequent paper on the allocation of the storage rights.

A flow chart of the regulating stream as suggested herein is shown in Fig. 4.

SUMMARY

This paper has outlined the detailed procedure for determining and administering Section A water rights in the Sevier River Basin. Most of these rights also have storage filings on water captured in Otter Creek Reservoir but a discussion of such is omitted from this writing. Documentation has been included so far as possible to minimize the potential disparity in water claims that might otherwise be created.

It has been the intention of the authors to lay out the proper operation of the Sevier River within Section A for all those who have an interest but are not familiar with the Cox Decree and its interpretation by the river commissioners and the Utah State Engineer. Additionally, as the public attitudes change with respect to existing water law concepts to more fully provide for alternative uses of water with greater public benefits, the Sevier River water rights may be redefined. The flow charts included in this writing are intended for use in

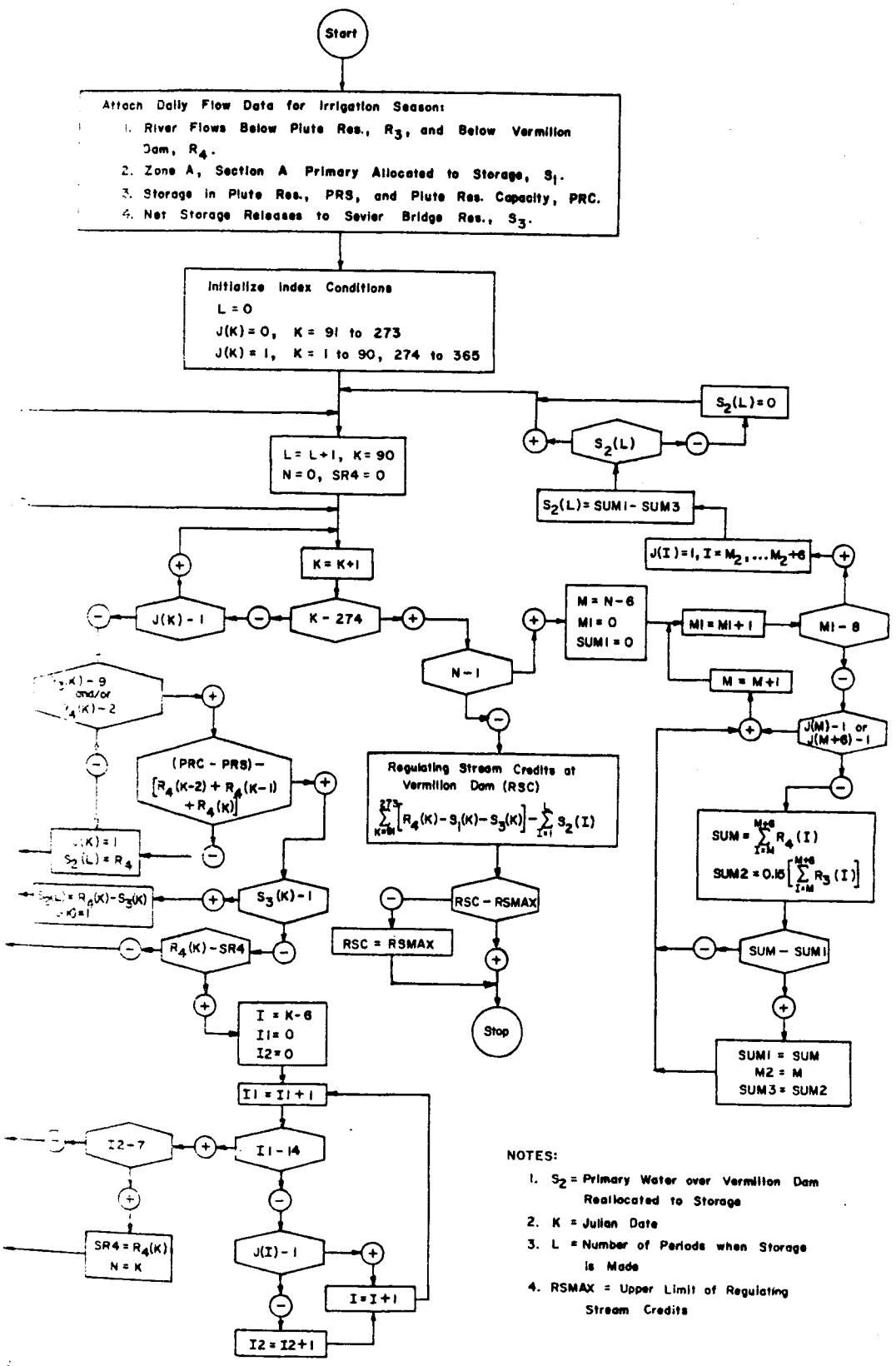


Fig. 4. Schematic flow chart of a suggested computational procedure for determining the regulating stream from Section A.

computerization of the river administration which when given the historical records in the basin would allow the various water users to assess the impact of a potential change on their individual water supplies. In order to demonstrate the analysis described in this paper, a detailed example is presented in the appendix for 1974.

For the technical analysist, the hydro-salinity system in the Sevier River Basin poses some interesting problems, especially if alternatives are proposed for altering the existing water allocation procedures. Because of the highly managed nature of the system, traditional hydro-salinity models may be inadequate in simulating the natural processes unless these allocation procedures are principal inputs. For example, a substantial fraction of surface flow can be attributable to the river allocation procedure rather than stochastic hydrologic events. Consequently, verification under a wide range of conditions will be impossible without input from the water management system.

Table 2. Primary flows from the East Fork of the Sevier River at Otter Creek Reservoir Inlet - 1974.

	MONTH					
Day	April[1]	May[1]	June[2]	July[3]	August[3]	September[3]
1	59	29	0	0	0	0
2	59	29	0	0	0	0
3	59	29	0	0	0	0
4	59	29	0	0	0	0
5	59	29	0	0	0	0
6	59	29	0	0	0	0
7	59	29	0	0	0	0
8	59	29	0	0	0	0
9	59	29	0	0	0	0
10	59	29	0	0	0	0
11	59	24	0	0	0	0
12	59	19	0	0	0	0
13	59	13	0	0	0	0
14	59	8	0	0	0	0
15	59	3	0	0	0	0
16	60	0	0	0	0	0
17	60	0	0	0	0	0
18	60	0	0	0	0	0
19	60	0	0	0	0	0
20	60	0	0	0	0	0
21	56	0	0	0	0	0
22	51	0	0	0	0	0
23	47	0	0	0	0	0
24	43	0	0	0	0	0
25	39	0	0	0	0	0
26	35	0	0	0	0	0
27	31	0	0	0	0	0
28	29	0	0	0	0	0
29	29	0	0	0	0	0
30	29	0	0	0	0	0
31		0		0	0	
	1,574 cfs	357 cfs	-	-	-	-
	3,122 af	708 af	-	-	-	-

[1] Values equal 67% of linearly extrapolated data.

[2] Values equal 50% of linearly extrapolated data.

[3] Values equal 33% of linearly extrapolated data.

Table 3. East Fork primary as determined by positive differences between the Kingston gauging station and Otter Creek Reservoir Outlet - 1974.

Day	April[1]	May[1]	June[2]	July[3]	August[3]	September[3]
	MONTH					
1	19	1	0	0	0	51
2	23	0	0	0	0	51
3	22	0	0	0	0	51
4	20	0	0	0	0	51
5	19	0	0	0	34	51
6	18	0	0	0	34	65
7	18	0	0	0	35	68
8	19	0	0	0	35	66
9	19	0	0	0	34	27
10	20	0	0	0	34	15
11	21	0	0	0	13	9
12	21	0	0	0	0	8
13	13	0	0	0	0	10
14	13	0	1	61	0	11
15	13	0	0	9	7	11
16	15	0	1	2	14	11
17	12	0	1	0	9	12
18	11	0	0	0	1	13
19	13	0	1	0	29	14
20	13	0	1	3	54	14
21	13	0	0	0	76	13
22	13	0	0	0	77	13
23	22	0	0	0	75	13
24	25	0	0	0	28	13
25	14	0	0	0	9	12
26	14	0	1	0	6	12
27	13	0	2	0	4	12
28	13	0	0	0	3	11
29	3	0	0	0	2	11
30	1	0	0	0	7	11
31		0		0	50	
	473 cfs 938 af	1 cfs 2 af	8 cfs 16 af	75 cfs 149 af	670 cfs 1,329 af	730 cfs 1,448 af

[1] 67% of the positive difference.

[2] 50% of the positive difference.

[3] 33% of the positive difference.

Table 4. Primary from the South Fork as determined by flows past the Kingston gauging station minus 9.84 cfs - 1974.

	MONTH					
Day	April	May	June	July	August	September
1	127	7	0	0	0	0
2	142	3	0	0	0	0
3	154	2	0	0	0	0
4	145	1	0	0	0	0
5	148	1	0	0	0	0
6	145	0	0	0	0	0
7	136	0	0	0	0	0
8	130	0	0	0	0	0
9	116	0	0	0	0	0
10	124	0	0	0	0	0
11	133	0	0	0	0	0
12	133	0	0	0	0	0
13	124	2	0	0	0	0
14	121	11	0	0	0	0
15	118	4	0	0	0	0
16	118	0	0	0	0	0
17	105	0	0	0	0	1
18	100	0	0	0	0	0
19	89	0	0	0	0	0
20	75	0	0	0	0	0
21	62	0	0	0	0	1
22	41	0	0	0	0	1
23	28	0	0	42	0	1
24	19	0	0	6	0	1
25	21	0	0	0	0	1
26	13	0	0	0	0	1
27	14	0	0	0	0	1
28	5	0	0	0	0	1
29	4	0	0	0	0	1
30	6	0	0	0	0	1
31		0		0	0	
	2,696 cfs	31 cfs	-	48 cfs	-	11 cfs
	5,348 af	61 af	-	95 af	-	22 af

Table 5. Definition of columns in Tables 6-11 following.

Col.	Description
1	Diversions into Monroe South Bend Canal
2	Diversions into Sevier Valley Canal
3	Diversions into Joseph Canal
4	Diversions into Wells Canal
5	Diversions into Monroe Canal
6	Diversions into Elsinore Canal
7	Diversions into Brooklyn Canal
8	Diversions into Richfield Canal
9	Diversions into Annabella Canal
10	Diversions into Vermillion Canal
11	Discharge over Vermillion Dam
12	Total Outflows
13	Estimated diversions into the Piute Canal*
14	Piute Releases minus 6% of Col.13. Some notes say 7%
15	Primary between Piute Reservoir and Vermillion Dam

* These diversions are estimated by applying the annual percentage diversions by the Piute Canal to daily readings at the head of Sevier Valley Canal.

Table 6. Primary flow between Piute Reservoir and Vermillion Dam-April 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	0	0	0	0	0	0	0	0	0	15	63	78		0	78	
2	0	0	0	0	0	0	0	0	0	26	62	88		0	88	
3	0	0	0	0	0	0	0	0	0	27	65	92		0	92	
4	0	0	0	0	0	0	0	0	0	26	63	89		0	89	
5	0	0	0	0	0	0	0	0	0	26	59	85		0	85	
6	0	0	0	0	0	0	0	0	0	26	61	87		0	87	
7	0	0	0	0	0	0	0	0	0	26	63	89		0	89	
8	0	0	0	0	0	0	0	1	0	26	63	90		0	90	
9	0	0	0	0	0	0	0	1	0	26	64	91		0	91	
10	0	0	0	0	0	0	0	2	0	26	63	91		0	91	
11	0	0	0	0	0	0	0	2	0	28	64	94		0	94	
12	0	0	0	0	0	0	0	2	0	27	63	92		0	92	
13	0	0	0	0	0	0	0	2	0	26	64	92		0	92	
14	0	0	0	0	0	0	0	2	0	26	63	91		0	91	
15	0	0	0	0	0	0	0	2	0	26	69	97		0	97	
16	13	0	0	0	0	0	0	2	0	26	73	114		0	114	
17	17	0	0	0	0	0	0	1	0	41	75	134		0	134	
18	25	0	0	0	0	0	0	2	0	38	73	138		0	138	
19	10	0	0	0	0	0	0	2	0	37	65	114		0	114	
20	34	0	0	0	0	0	0	2	0	38	57	131		0	131	
21	39	8	0	0	0	0	0	0	0	36	37	120	5	0	120	
22	39	7	0	0	0	0	5	0	0	45	21	117	4	0	117	
23	40	8	0	0	15	0	6	0	0	41	17	127	5	0	127	
24	43	11	0	0	22	0	8	1	0	37	11	133	7	0	133	
25	45	28	11	0	17	0	4	0	0	36	10	151	18	0	151	
26	46	42	14	0	16	4	4	0	0	28	6	160	27	37	123	
27	49	47	20	2	13	7	4	5	0	20	2	169	30	83	86	
28	49	74	18	4	13	8	2	13	0	18	2	201	47	98	103	
29	59	97	19	5	10	15	3	24	0	18	2	252	62	252	0	
30	59	133	19	8	9	15	8	28	14	16	2	311	85	311	0	
31																
	567	455	101	19	115	49	44	94	14	858	1402	3718	290	781	2937	cfs
															5826	af

Table 6. Primary flow between Piute Reservoir and Vermillion Dam-April 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0	0	0	0	0	0	0	0	0	15	63	78		0	78
2	0	0	0	0	0	0	0	0	0	26	62	88		0	88
3	0	0	0	0	0	0	0	0	0	27	65	92		0	92
4	0	0	0	0	0	0	0	0	0	26	63	89		0	89
5	0	0	0	0	0	0	0	0	0	26	59	85		0	85
6	0	0	0	0	0	0	0	0	0	26	61	87		0	87
7	0	0	0	0	0	0	0	0	0	26	63	89		0	89
8	0	0	0	0	0	0	0	1	0	26	63	90		0	90
9	0	0	0	0	0	0	0	1	0	26	64	91		0	91
10	0	0	0	0	0	0	0	2	0	26	63	91		0	91
11	0	0	0	0	0	0	0	2	0	28	64	94		0	94
12	0	0	0	0	0	0	0	2	0	27	63	92		0	92
13	0	0	0	0	0	0	0	2	0	26	64	92		0	92
14	0	0	0	0	0	0	0	2	0	26	63	91		0	91
15	0	0	0	0	0	0	0	2	0	26	69	97		0	97
16	13	0	0	0	0	0	0	2	0	26	73	114		0	114
17	17	0	0	0	0	0	0	1	0	41	75	134		0	134
18	25	0	0	0	0	0	0	2	0	38	73	138		0	138
19	10	0	0	0	0	0	0	2	0	37	65	114		0	114
20	34	0	0	0	0	0	0	2	0	38	57	131		0	131
21	39	8	0	0	0	0	0	0	0	36	37	120	5	0	120
22	39	7	0	0	0	0	5	0	0	45	21	117	4	0	117
23	40	8	0	0	15	0	6	0	0	41	17	127	5	0	127
24	43	11	0	0	22	0	8	1	0	37	11	133	7	0	133
25	45	28	11	0	17	0	4	0	0	36	10	151	18	0	151
26	46	42	14	0	16	4	4	0	0	28	6	160	27	37	123
27	49	47	20	2	13	7	4	5	0	20	2	169	30	83	86
28	49	74	18	4	13	8	2	13	0	18	2	201	47	98	103
29	59	97	19	5	10	15	3	24	0	18	2	252	62	252	0
30	59	133	19	8	9	15	8	28	14	16	2	311	85	311	0
31															
	567	455	101	19	115	49	44	94	14	858	1402	3718	290	781	2937 cfs
															5826 af

Table 7. Primary flow between Piute Reservoir and Vermillion Dam - May 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	23	186	17	7	6	17	11	76	21	33	12	409	129	409	(0)
2	17	180	16	6	20	17	21	81	22	55	118	553	115	433	120
3	15	236	19	5	19	17	21	89	23	57	67	568	150	409	159
4	15	234	37	5	51	20	24	94	21	54	39	594	149	393	201
5	15	238	36	4	59	23	27	95	23	46	9	575	152	422	153
6	33	244	44	4	66	24	31	101	23	38	4	612	156	501	111
7	36	265	42	4	70	26	32	115	29	36	4	659	169	544	115
8	46	276	42	5	73	27	33	118	30	54	12	716	176	591	125
9	41	276	43	5	83	28	37	118	33	59	29	752	176	591	161
10	42	276	19	6	76	25	41	118	36	59	60	758	176	591	167
11	37	291	33	11	78	26	45	118	36	48	113	836	186	521	315
12	25	287	21	10	75	30	49	118	33	41	73	762	183	455	307
13	24	298	30	9	77	30	46	118	30	40	22	724	190	451	273
14	26	291	30	9	69	26	38	118	29	39	19	694	186	499	195
15	34	293	32	8	67	27	28	118	31	37	20	695	187	561	134
16	36	293	34	8	53	31	30	118	30	41	37	711	187	569	142
17	20	265	32	8	40	30	36	113	22	42	145	753	169	438	315
18	6	255	31	7	31	26	30	111	23	39	80	639	163	421	218
19	0	250	30	6	34	20	22	111	23	39	59	594	159	341	253
20	13	244	16	6	34	18	21	100	12	38	28	530	156	369	161
21	22	244	11	9	37	18	23	84	11	40	21	520	156	431	89
22	20	244	12	7	32	21	26	63	12	41	51	539	156	435	104
23	40	244	10	7	32	21	32	50	14	40	108	598	156	431	167
24	40	244	10	7	27	21	41	48	16	31	72	557	156	361	196
25	37	244	14	9	28	15	26	45	18	22	52	510	156	330	180
26	37	244	11	8	42	12	26	44	16	20	39	499	156	303	196
27	53	244	14	7	52	6	22	36	17	23	11	485	156	377	108
28	64	244	31	6	56	6	27	32	12	33	26	537	156	461	76
29	67	244	30	2	60	9	28	31	10	41	138	660	156	461	199
30	65	244	26	2	60	8	22	30	9	38	161	665	156	284	381
31	47	244	30	2	61	4	25	29	9	15	94	560	156	231	329
cfs	1006	7862	803	199	1568	629	921	2640	674	1239	1723	19264	5020	13614	5650
af	1995	15594	1593	395	3110	1248	1827	5236	1337	2458	3418	38210	9957	27003	11208

Table 8. Primary flow between Piute Reservoir and Vermillion Dam - June 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	40	304	33	2	62	0	30	31	6	27	10	545	194	323	222	
2	39	298	33	3	66	0	38	40	14	34	6	571	190	379	192	
3	38	298	34	4	63	7	37	52	15	38	6	592	190	379	213	
4	38	300	26	2	65	10	36	55	14	27	3	576	191	399	177	
5	37	326	8	3	51	11	32	81	18	22	2	591	208	419	172	
6	33	337	0	2	30	10	29	81	18	36	12	588	215	389	199	
7	38	295	0	3	30	9	24	78	18	41	46	582	188	355	227	
8	28	284	9	9	33	9	14	73	25	30	34	548	181	395	153	
9	25	293	11	7	34	9	12	70	26	30	44	561	187	420	141	
10	24	234	10	6	34	7	11	67	26	33	81	533	149	246	287	
11	25	209	3	6	37	6	11	65	22	30	30	444	133	247	197	
12	32	227	14	6	35	7	12	56	6	28	3	426	145	261	165	
13	33	236	10	7	38	9	17	65	10	22	1	448	150	322	126	
14	26	242	0	7	36	13	19	80	20	24	1	468	154	354	114	
15	18	215	4	7	26	19	19	85	21	47	3	464	137	304	160	
16	13	189	8	6	14	18	16	84	19	32	36	435	120	244	191	
17	24	177	14	3	18	18	12	83	19	31	20	419	113	241	178	
18	26	175	19	6	26	19	12	70	13	29	4	399	112	259	140	
19	30	193	28	8	37	19	14	63	12	20	2	426	123	344	82	
20	40	229	26	6	42	7	18	61	11	20	2	462	146	385	77	
21	57	244	31	6	42	15	22	60	13	19	2	511	156	461	50	
22	63	252	27	8	43	15	30	63	19	29	4	553	161	522	31	
23	66	265	30	10	43	21	29	69	21	30	3	587	169	587	0	
24	69	289	39	10	47	24	21	67	26	46	32	670	184	605	65	
25	69	291	43	9	54	25	24	79	25	48	24	691	186	600	91	
26	71	291	41	9	49	25	24	105	24	45	7	691	186	600	91	
27	76	289	34	10	55	22	26	104	24	34	5	679	184	596	83	
28	75	293	32	7	54	20	25	102	23	34	4	669	187	591	78	
29	75	302	34	6	53	18	30	102	28	20	2	670	193	586	84	
30	71	326	24	6	48	18	35	100	20	18	2	668	208	582	86	
	1299	7903	625	184	1265	410	679	2191	556	924	431	16467	5040	12395	4072	cfs
	2577	15676	1240	365	2509	813	1347	4346	1103	1833	855	32662	9997	24585	8079	af

Table 9. Primary flow between Piute Reservoir and Vermillion Dam - July 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	63	313	22	6	50	26	36	97	16	10	6	645	200	582	63
2	61	324	18	10	52	15	36	99	21	26	1	663	207	577	86
3	61	335	1	9	56	15	35	98	21	23	1	655	214	572	83
4	60	331	1	10	53	16	36	97	21	23	1	649	211	572	77
5	55	306	18	7	52	16	36	96	20	25	1	632	195	568	64
6	46	298	0	5	52	15	35	94	21	28	1	595	190	565	30
7	45	284	22	5	59	12	33	93	22	34	2	611	181	565	46
8	45	287	18	1	64	11	33	92	25	36	3	615	183	561	54
9	44	284	22	0	59	13	33	90	28	32	2	607	181	561	46
10	44	282	28	0	54	6	36	84	28	33	1	596	180	556	40
11	43	280	26	0	60	4	32	84	29	34	1	593	179	552	41
12	42	280	28	0	59	4	32	72	29	34	1	586	179	547	39
13	46	269	28	6	59	4	32	62	29	37	2	574	171	518	56
14	46	263	16	12	53	8	29	52	29	39	2	549	168	513	36
15	18	263	4	10	52	8	29	50	27	57	10	528	168	496	32
16	37	242	2	6	46	10	28	49	21	53	32	526	154	457	69
17	42	225	0	7	49	15	20	44	23	36	39	500	143	448	52
18	42	223	0	7	57	16	3	42	14	6	82	492	142	409	83
19	40	209	0	5	46	11	3	44	8	41	53	460	133	285	175
20	34	175	10	2	39	7	2	45	6	32	10	362	112	201	161
21	20	161	9	3	35	7	11	37	6	24	3	316	103	279	37
22	0	193	9	6	30	7	11	40	6	21	2	325	123	282	43
23	0	179	8	6	15	7	16	36	6	50	7	330	114	278	52
24	0	149	4	6	8	6	25	24	6	55	24	307	95	242	65
25	0	142	0	3	4	0	27	7	6	46	44	279	91	221	58
26	11	142	6	6	3	0	27	0	4	40	36	275	91	207	68
27	24	128	10	6	15	0	25	0	4	16	49	277	82	170	107
28	23	115	9	4	36	0	23	0	4	17	17	248	73	164	84
29	23	104	9	3	35	0	20	0	9	21	6	230	66	222	8
30	22	154	12	3	44	5	22	4	7	16	3	292	98	268	24
31	32	149	18	2	34	6	22	39	7	13	1	323	95	323	0
	1069	7089	358	156	1330	270	788	1676	503	958	443	14640	4522	12761	1879 cts
	2120	14061	710	309	2638	536	1563	3324	998	1900	879	29038	8969	25311	3726 af

Table 10. Primary flow between Piute Reservoir and Vermillion Dam - August 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	29	149	10	3	22	6	24	70	10	25	18	366	95	329	37	
2	28	149	12	2	24	6	27	71	8	30	29	386	95	321	65	
3	28	149	6	0	27	6	29	73	1	31	15	365	95	353	12	
4	31	143	0	2	27	10	29	70	0	31	36	379	91	346	33	
5	42	142	0	4	29	11	29	71	0	23	40	391	91	391	0	
6	56	145	0	5	36	13	35	79	0	23	53	445	92	445	0	
7	64	188	11	4	36	14	36	82	0	24	72	531	120	481	50	
8	58	186	17	5	30	16	31	82	0	24	53	502	119	383	119	
9	52	175	24	6	30	16	26	71	0	23	20	443	112	379	64	
10	51	175	29	6	32	16	24	67	0	22	19	441	112	371	70	
11	51	173	24	6	34	15	23	67	0	21	9	423	110	371	52	
12	51	175	26	5	27	15	23	71	7	24	8	432	112	395	37	
13	51	180	28	8	27	16	24	70	11	25	6	446	115	415	31	
14	53	182	33	14	32	16	30	70	11	23	4	468	116	468	0	
15	56	197	28	10	33	22	35	70	27	23	2	503	126	462	41	
16	57	201	29	6	37	22	36	70	27	23	2	510	128	462	48	
17	57	205	32	3	40	22	36	70	27	22	2	516	131	458	58	
18	57	207	30	0	41	21	37	70	15	21	2	501	132	454	47	
19	57	209	26	3	44	19	39	70	17	20	5	509	133	454	55	
20	60	207	17	7	50	18	27	70	10	20	7	493	132	449	44	
21	60	223	7	9	54	19	25	72	3	19	8	499	142	444	55	
22	58	238	0	7	56	19	19	71	0	19	5	492	152	439	53	
23	50	227	0	4	54	17	28	72	0	19	17	488	145	439	49	
24	44	217	12	5	52	17	32	74	0	18	20	491	138	432	59	
25	43	203	17	3	48	13	24	74	0	18	24	467	129	427	40	
26	35	199	19	0	48	11	24	74	0	18	32	460	127	418	42	
27	29	195	16	3	41	11	7	74	0	7	55	438	124	407	31	
28	30	201	14	5	21	10	16	74	0	3	75	449	128	374	75	
29	36	164	8	4	21	8	0	74	0	18	68	401	105	349	52	
30	35	157	8	6	20	7	13	73	0	24	43	386	100	318	68	
31	34	157	10	6	16	7	29	74	0	22	11	366	100	314	52	
	1443	5718	493	151	1089	439	817	2240	174	663	760	13987	3647	12548	1439	cfs
	2862	11342	978	300	2160	871	1621	4443	345	1315	1507	27743	7234	24889	2855	af

Table 11. Primary flow between Piute Reservoir and Vermillion Dam - September 1974.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	34	152	18	6	20	8	23	74	0	19	3	357	97	306	51
2	34	152	19	6	22	6	22	58	0	19	4	342	97	302	40
3	34	150	17	6	29	8	22	36	0	22	8	332	96	287	45
4	32	147	8	4	30	10	18	31	0	22	14	316	94	253	63
5	30	147	0	2	24	8	0	38	0	23	6	278	94	188	90
6	26	117	0	2	25	9	0	36	0	24	4	243	75	186	57
7	19	92	0	3	25	7	0	17	0	24	13	200	59	124	76
8	7	86	0	0	19	0	0	1	0	25	40	178	55	120	58
9	7	86	0	2	9	0	3	0	0	26	38	171	55	120	51
10	7	83	0	5	7	0	0	0	0	22	41	165	53	108	57
11	7	72	0	2	11	0	0	0	0	21	38	151	46	91	60
12	16	59	0	2	14	0	0		0	25	30	146	38	72	74
13	12	47	0	2	16	0	0	0	0	25	24	126	30	46	80
14	9	32	0	2	14	0	0	0	0	26	19	102	20	46	56
15	8	31	0	2	8	0	0	0	0	10	30	89	20	44	45
16	8	31	0	2	3	0	0	0	0	1	40	85	20	44	41
17	7	31	0	2	0	0	0	0	0	1	42	83	20	18	65
18	6	29	0	1	0	0	0	0	0	1	41	78	18	6	72
19	5	22	0	1	0	2	0	0	0	1	38	69	14	5	64
20	5	22	0	0	0	0	0	0	0	1	38	66	14	5	61
21	0	21	0	0	10	0	0	0	0	1	32	64	13	5	59
22	11	43	0	1	10	4	0	6	0	1	27	103	27	103	0
23	18	66	0	1	9	11	0	56	0	1	17	179	42	163	16
24	6	47	0	0	5	7	0	52	0	1	52	174	30	148	26
25	7	44	0	2	0	0	0	51	0	1	67	172	28	143	29
26	6	43	0	4	0	3	0	45	0	1	72	174	27	99	75
27	6	40	3	3	0	4	4	40	0	1	54	155	26	97	58
28	8	37	5	2	0	0	0	36	0	1	42	131	23	98	33
29	11	31	9	2	3	0	0	2	0	1	57	116	20	98	18
30	11	31	7	0	8	0	0	4	0	1	49	111	20	98	13
31															
	397	1991	90	67	321	87	92	583	-	348	980	4956	1271	3423	1533 cfs
	787	3949	179	133	637	173	182	1156	-	690	1944	9830	2521	6789	3041 af

Table 12. Section A primary for April 1974.

Day	East Fork Primary Table 2	East Fork Primary Table 3	South Fork Primary Table 4	Piute Res. Primary	Primary below Piute Res. Table 6	Total April Primary
1	59	19	127	22	78	305
2	59	23	142	22	88	334
3	59	22	154	22	92	349
4	59	20	145	22	89	335
5	59	19	148	22	85	333
6	59	18	145	22	87	331
7	59	18	136	22	89	324
8	59	19	130	22	90	320
9	59	19	116	22	91	307
10	59	20	124	22	91	316
11	59	21	133	22	94	329
12	59	21	133	22	92	327
13	59	13	124	22	92	310
14	59	13	121	22	91	306
15	59	13	118	22	97	309
16	60	15	118	22	114	329
17	60	12	105	22	134	333
18	60	11	100	22	138	331
19	60	13	89	22	114	298
20	60	13	75	22	131	301
21	56	13	62	22	120	273
22	51	13	41	22	117	244
23	47	22	28	22	127	246
24	43	25	19	22	133	242
25	39	14	21	22	151	248
26	35	14	13	22	123	207
27	31	13	14	22	86	166
28	29	13	5	22	103	172
29	29	3	4	22	0	58
30	29	1	6	22	0	58
31						
	1,574	473	2,696	660	2,937	8,341 cfs 16,544 af

Table 13. Section A primary for May 1974.

Day	East Fork Primary Table 2	East Fork Primary Table 3	S. Fork Primary Table 4	Piute Res. Primary	Primary Below Piute Res. Table 7	Total May Primary
1	29	1	7	22	0	59
2	29	0	3	22	120	174
3	29	0	2	22	159	212
4	29	0	1	22	201	253
5	29	0	1	22	153	205
6	29	0	0	22	111	162
7	29	0	0	22	115	166
8	29	0	0	22	125	176
9	29	0	0	22	161	212
10	29	0	0	22	167	218
11	24	0	0	22	315	361
12	19	0	0	22	307	348
13	13	0	2	22	273	310
14	8	0	11	22	195	236
15	3	0	4	22	134	163
16	0	0	0	22	142	164
17	0	0	0	22	315	337
18	0	0	0	22	218	240
19	0	0	0	22	253	275
20	0	0	0	22	161	183
21	0	0	0	22	89	111
22	0	0	0	22	104	126
23	0	0	0	22	167	189
24	0	0	0	22	196	218
25	0	0	0	22	180	202
26	0	0	0	22	196	218
27	0	0	0	22	108	130
28	0	0	0	22	76	98
29	0	0	0	22	199	221
30	0	0	0	22	381	403
31	0	0	0	22	329	351
	357	1	31	682	5,650	6,721 cfs
	708	2	61	1,353	11,208	13,332 af

Table 14. Section A primary for June 1974.

Day	East Fork Primary Table 2	East Fork Primary Table 3	S. Fork Primary Table 4	Piute Res. Primary	Primary Below Piute Res. Table 8	Total June Primary
1	0	0	0	22	222	244
2	0	0	0	22	192	214
3	0	0	0	22	213	235
4	0	0	0	22	177	199
5	0	0	0	22	172	194
6	0	0	0	22	199	221
7	0	0	0	22	227	249
8	0	0	0	22	153	175
9	0	0	0	22	141	163
10	0	0	0	22	287	309
11	0	0	0	22	197	219
12	0	0	0	22	165	187
13	0	0	0	22	126	148
14	0	1	0	22	114	137
15	0	0	0	22	160	182
16	0	1	0	22	191	214
17	0	1	0	22	178	201
18	0	0	0	22	140	162
19	0	1	0	22	82	105
20	0	1	0	22	77	100
21	0	0	0	22	50	72
22	0	0	0	22	31	53
23	0	0	0	22	0	22
24	0	0	0	22	65	87
25	0	0	0	22	91	113
26	0	1	0	22	91	114
27	0	2	0	22	83	107
28	0	0	0	22	78	100
29	0	0	0	22	84	106
30	0	0	0	22	86	108
31	0		0	0		
	-	8	-	660	4,072	4,740 cfs
	-	16	-	1,309	8,079	9,404 14

Table 15. Section A primary for July 1974.

Day	East Fork Primary Table 2	East Fork Primary Table 3	South Fork Primary Table 4	Piute Res. Primary	Primary Below Piute Res. Table 9	Total July Primary
1	0	0	0	22	63	85
2	0	0	0	22	86	108
3	0	0	0	22	83	105
4	0	0	0	22	77	99
5	0	0	0	22	64	86
6	0	0	0	22	30	52
7	0	0	0	22	46	68
8	0	0	0	22	54	76
9	0	0	0	22	46	68
10	0	0	0	22	40	62
11	0	0	0	22	41	63
12	0	0	0	22	39	61
13	0	0	0	22	56	78
14	0	61	0	22	36	119
15	0	9	0	22	32	63
16	0	2	0	22	69	93
17	0	0	0	22	52	74
18	0	0	0	22	83	105
19	0	0	0	22	175	197
20	0	3	0	22	161	186
21	0	0	0	22	37	59
22	0	0	0	22	43	65
23	0	0	42	22	52	116
24	0	0	6	22	65	93
25	0	0	0	22	58	80
26	0	0	0	22	68	90
27	0	0	0	22	107	129
28	0	0	0	22	84	106
29	0	0	0	22	8	30
30	0	0	0	22	24	46
31	0	0	0	22	0	22
	-	75	48	682	1,879	2,684 cfs
	-	149	95	1,353	3,727	5,324 af

Table 16. Section A primary for August 1974.

Day	East Fork Primary		South Fork Primary	Piute Res. Primary	Primary Below Piute Res.	Total August Primary
	Table 2	Table 3	Table 4		Table 10	
1	0	0	0	22	37	59
2	0	0	0	22	65	87
3	0	0	0	22	12	34
4	0	0	0	22	33	55
5	0	34	0	22	0	56
6	0	34	0	22	0	56
7	0	35	0	22	50	107
8	0	35	0	22	119	176
9	0	34	0	22	64	120
10	0	34	0	22	70	126
11	0	13	0	22	52	87
12	0	0	0	22	37	59
13	0	0	0	22	31	53
14	0	0	0	22	0	22
15	0	7	0	22	41	70
16	0	14	0	22	48	84
17	0	9	0	22	58	89
18	0	1	0	22	47	70
19	0	29	0	22	55	106
20	0	54	0	22	44	120
21	0	76	0	22	55	153
22	0	77	0	22	53	152
23	0	75	0	22	49	146
24	0	28	0	22	59	109
25	0	9	0	22	40	71
26	0	6	0	22	42	70
27	0	4	0	22	31	57
28	0	3	0	22	75	100
29	0	2	0	22	52	76
30	0	7	0	22	68	97
31	0	50	0	0	52	124
	-	670	-	682	1,439	2,791 cfs
	-	1,329	-	1,353	2,855	5,537 af

Table 17. Section A primary for September 1974.

Day	East Fork Primary		South Fork Primary	Piute Res. Primary	Primary Below Piute Res.	Total September Primary
	Table 2	Table 3	Table 4		Table 11	
1	0	51		22	51	124
2	0	51		22	40	113
3	0	51		22	45	118
4	0	51		22	63	136
5	0	51		22	90	163
6	0	65		22	57	144
7	0	68		22	76	166
8	0	66		22	58	146
9	0	27		22	51	100
10	0	15		22	57	94
11	0	9		22	60	91
12	0	8		22	74	104
13	0	10		22	80	112
14	0	11		22	56	89
15	0	11		22	45	78
16	0	11		22	41	74
17	0	12	1	22	65	100
18	0	13	0	22	72	107
19	0	14	0	22	64	100
20	0	14	0	22	61	97
21	0	13	1	22	59	95
22	0	13	1	22	0	36
23	0	13	1	22	16	52
24	0	13	1	22	26	62
25	0	12	1	22	29	64
26	0	12	1	22	75	110
27	0	12	1	22	58	93
28	0	11	1	22	33	67
29	0	11	1	22	18	52
30	0	11	1	22	13	47
31						
	-	730	11	660	1,533	2,934 cfs
	-	1,448	22	1,309	3,041	5,820 af

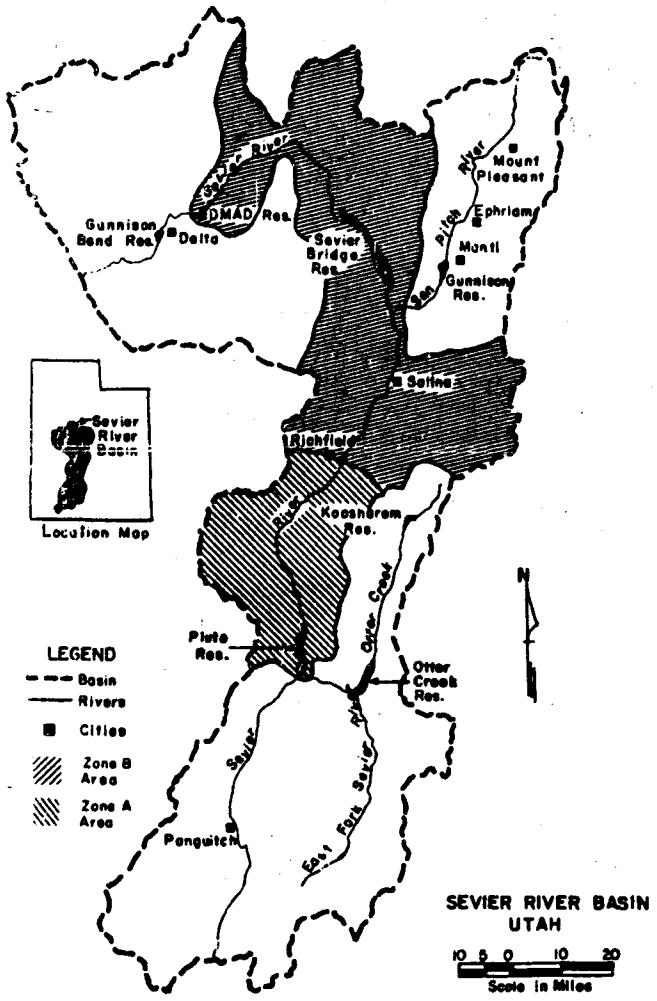
Table 18. 1974 monthly summary of Section A primary calculations.

Budget Item	Monthly Flow, Acre-Feet						
	April	May	June	July	August	September	Total
1. Monroe South Bend	1,125	1,995	2,577	2,120	2,862	787	11,466
2. Sevier Valley	902	15,594	15,676	14,061	11,342	3,949	61,524
3. Joseph	200	1,593	1,240	710	978	179	4,900
4. Wells	38	395	365	309	300	133	1,540
5. Monore	228	3,110	2,509	2,638	2,160	637	11,282
6. Elsinore	97	1,248	813	536	871	173	3,738
7. Brooklyn	87	1,827	1,347	1,563	1,621	182	6,627
8. Richfield	186	5,236	4,346	3,324	4,443	1,156	18,691
9. Annabella	28	1,337	1,103	998	345	0	3,811
10. Vermillion	1,702	2,458	1,833	1,900	1,315	690	9,898
11. Sevier R. below Vermillion Dam	2,781	3,418	855	879	1,507	1,944	11,384
Total Outflows	7,374	38,211	32,664	29,038	27,774	9,830	144,861
12. Piute Releases (Net)	1,549	27,003	24,585	25,311	24,889	6,789	110,603
Primary	5,825	11,208	8,079	3,727	2,855	3,041	34,258
13. Piute Res. Primary	1,309	1,353	1,309	1,353	1,353	1,309	7,985
14. East Fork Primary	4,060	710	16	149	1,329	1,448	7,712
15. South Fork Primary	5,348	61	0	95	0	22	5,526
Total Primary	16,542	13,332	9,404	5,324	5,537	5,820	55,959
16. First Priority	935	87	84	87	87	79	1,359
17. First Class	15,607	12,684	9,298	5,237	5,450	5,741	54,017
18. Second Class	0	488	22	0	0	0	510
19. Third Class	0	73	0	0	0	0	73
20. Storage	0	0	0	0	0	0	0
	75.6%	69.5%	52.6%	27.[illegible]	31.9%	32.5%	

Table 19. Calculation of Regulating Stream for 1974 assuming an upper limit of 4,000 acre-feet.

No. of Periods	Interval of Maximum Flow	Maximum 7-day Flow over Vermillion Dam (cfs)	15% of Piute Res. Releases (cfs)	Regulating Stream (cfs)	Cummulation Credits (af)
1	May 25-May 31	521	377	377	748
2	May 17-May 23	492	440	440	1,620
3	May 1-May 7	253	480	253	2,122
4	May 9-May 15	336	562	336	2,788
5	July 15-July 21	229	395	229	3,242
6	June 6-June 12	250	358	250	3,738
7	Aug 24-Aug 30	317	416	132	4,000

ANALYSIS OF WATER RIGHTS IN THE SEVIER RIVER BASIN



PART 3
RESERVOIR OPERATIONS

by

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Delta, Utah 84624
March 1977

ANALYSIS OF WATER RIGHTS IN THE SEVIER RIVER BASIN