NEEDS FOR SPECIAL WATER SUPPLY FORECASTS TO MEET UNUSUAL WATER RIGHTS AND IRRIGATION REQUIREMENTS FOR THE SEVIER RIVER BASIN IN UTAH

By

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The Sevier River is formed by the junction of the South and East Forks which meet near Kingston, Utah, as shown in Figure 1. It then flows in a northerly direction to about Leamington where the river runs southwesterly and terminates at Sevier Lake. That is, it formerly emptied into the Lake - practically nothing has gone there for years because the river is so thoroughly utilized.

From the headwaters at elevation of about 12,000 feet, the Sevier River meanders more than 200 miles through a long narrow basin and is 4,470 feet above sea level at the mouth. The main tributaries of the Basin are the San Pitch River, Salina and Clear Creeks. For our purposes today we will forget the San Pitch and East Fork Rivers, since they operate as separate hydrologic units and contribute little or no water except during abnormally high years. The main reservoirs within the Basin are Otter Creek (capacity 52,500 acre-feet), Piute (capacity 74,010 acre-feet) and Sevier Bridge (capacity 236,000 acre-feet).

The waters of the Sevier River are divided in accordance with a court decree. This decree specifies that the primary flow rights and the upstream irrigators be satisfied first. Secondary water rights belong first to the downstream water users. When streamflow is insufficient to deliver full primary rights, the Basin is divided into sections. Within each section, all users receive the same percentage of primary water. With this type of a water distribution system we have a number of "dry dams" along the river after the high water has gone. When the streamflow recedes to the point that there is only enough water to satisfy the primary rights in the various sections, all flow ceases past the last diversion point of the section.

To illustrate, when the total amount of water - river flow plus return flow from diversions within the section - is just enough to satisfy all primary rights in the Panguitch Valley, there is no more river flow past the last diversion dam. When this happens the only water available to supply Circle Valley is return flow from diversions, plus contribution from springs and tributaries between the two valleys. Similarly, the same thing happens below Circle Valley for primary rights in Sevier Valley and involves the section of the river from Kingston to Vermillion. This is also true for the final section below Vermillion Dam, which is treated as a single unit for dividing primary waters.

With such a complex system it becomes important to have some foreknowledge of the approximate date to which full primary rights will be available, and then to know what percent of the primary right can be expected for the balance of the irrigation season.

In the Panguitch Valley, the primary rights are no longer fully satisfied after approximately the time that streamflow at the Hatch gaging station drops below 100 cfs;in Circle Valley, the critical flow is represented by a flow of 90 cfs at the gage near Circleville.

For the Sevier Valley and the section below Vermillion Dam there are no stream gages at which specific flow values represent full primary rights. It is very seldom that flows are high enough to produce full primary rights for as long as a month at a time. When full primary rights are satisfied, it is generally for only a short period during the peak runoff season. For Sevier Valley, the water for primary rights comes principally from the South Fork below Circle Valley and from Clear Creek. Total primary rights in the Sevier Valley are approximately 400 cfs, while for the reach below Vermillion Dam they total about 360 cfs. For all practical purposes no more water gets into the Sevier River from Clear Creek, after the date streamflow drops to 5 cfs. Following these dates the water received from return flow is not sufficient to satisfy primary rights. Of major concern to users dependent on natural flow, is the percent of primary water they can expect during the season. A knowledge of the total inflow expected for this reach of the river during the April-June period is of value for this purpose.

Below Vermillion Dam the companies on natural flow are most interested in the percent of primary water they will get. This is dependent upon the total inflow during the March-June period. Storage rights on the river are also of major concern to us. During the non-irrigation season the river is considered as a single unit for storage. The first 89,280 acre-feet of water is owned by Sevier Bridge Reservoir users. In practice, both Piute and Sevier Bridge Reservoirs store water all winter. If

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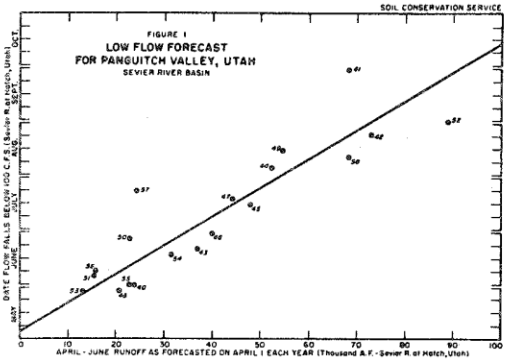
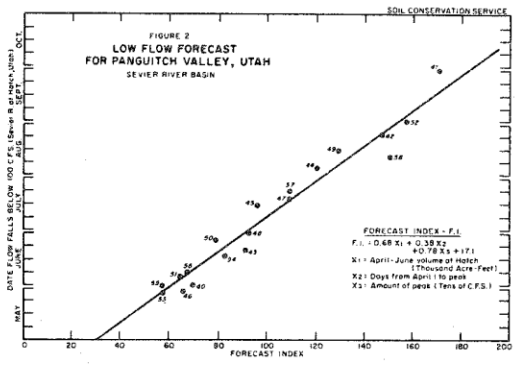
89,280 acre-feet is not stored in Sevier Bridge Reservoir from winter flow, storage of the current season in Piute Reservoir must be released to satisfy the shortage. If spring runoff is high enough for flows to exceed other rights and supply water for storage, this also counts toward making up the 89,280 acre-feet. In recent years this has seldom happened and during some years the total storage has not been sufficient to supply this amount. In such cases, the users with storage rights in Piute Reservoir get no storage water. In most years they get to keep only a part of the winter storage. Since the water can't be brought back up river after it has once been released, Piute users quite understandable don't want to let water go if there is any chance of spring runoff being high enough to supply water to fill any deficit due Sevier Bridge Reservoir users.

An advance knowledge of how much the river can be expected to produce for storage during the winter months and also during the high water period in the spring months, thus becomes of utmost importance to the irrigation companies using water stored in Piute and Sevier Bridge Reservoirs.

I have not discussed all the water right problems on our river in which water supply forecasting can be helpful to us, but these I have described are the most important ones. They are of such a nature that we are fully aware that the only way we can manage our river intelligently and most economically is to have water supply forecasts that are fitted to our needs.

In conclusion, I would like to emphasize that the special water supply forecast bulletins we are now receiving are very helpful to us. They deal only with answers to the water forecast problems of our river, going into much greater detail that was possible in the statewide bulletins. Several of our river officials feel that every farmer in the basin should receive a copy of the new Sevier River Basin Bulletin, rather than have it go only to officers of the various irrigation companies.


SOIL CONSERVATION SERVICE
FIGURE 1
LOW FLOW FORECAST
FOR PANGUITCH VALLEY, UTAH
SEVIER RIVER BASIN
DATE FLOW FALLS BELOW 100 C.F.S. (Sevier R. at Hatch, Utah)
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
APRIL - JUNE RUNOFF AS FORECASTED ON APRIL 1 EACH YEAR (Thousand A.F. - Sevier R. at Hatch, Utah)


SOIL CONSERVATION SERVICE
FIGURE 2
LOW FLOW FORECAST
FOR PANGUITCH VALLEY, UTAH
SEVIER RIVER BASIN
DATE FLOW FALLS BELOW 100 C.F.S. (Sevier R. at Hatch, Utah)
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
FORECAST INDEX = F.I.
F.I. = 0.68 X1 + 0.38 X2 + 0.78 X3 + 17.1
X1 = April - June volume at Hatch (Thousand Acre-Feet)
X2 = Days from April 1 to peak
X3 = Amount of peak (Tens of C.F.S.)
FORECAST INDEX

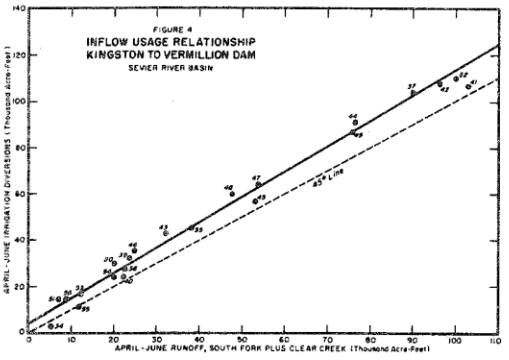
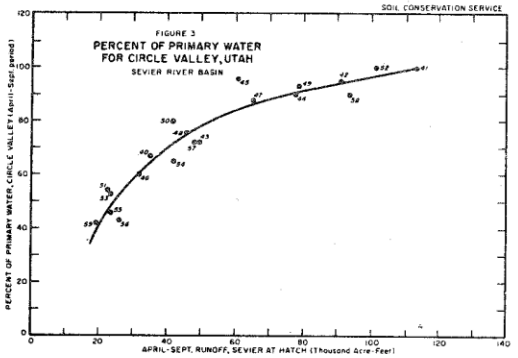
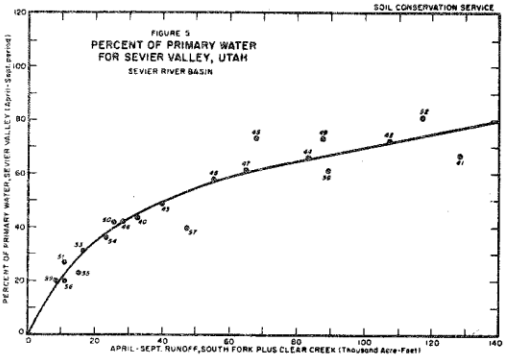


FIGURE 4
INFLOW USAGE RELATIONSHIP
KINGSTON TO VERMILLION DAM
SEVIER RIVER BASIN
APRIL - JUNE IRRIGATION DIVERSIONS (Thousand Acre-Feet)
45° Line
APRIL - JUNE RUNOFF, SOUTH FORK PLUS CLEAR CREEK (Thousand Acre-Feet)


SOIL CONSERVATION SERVICE
FIGURE 3
PERCENT OF PRIMARY WATER
FOR CIRCLE VALLEY, UTAH
SEVIER RIVER BASIN
PERCENT OF PRIMARY WATER, CIRCLE VALLEY (April - Sept. period)
APRIL - SEPT. RUNOFF, SEVIER AT HATCH (Thousand Acre-Feet)


SOIL CONSERVATION SERVICE
FIGURE 5
PERCENT OF PRIMARY WATER
FOR SEVIER VALLEY, UTAH
SEVIER RIVER BASIN
PERCENT OF PRIMARY WATER, SEVIER VALLEY (April - Sept. period)
APRIL - SEPT. RUNOFF, SOUTH FORK PLUS CLEAR CREEK (Thousand Acre-Feet)

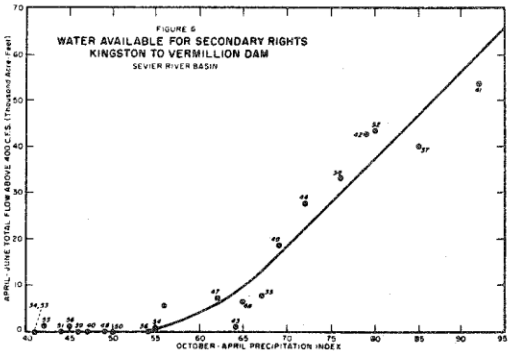


FIGURE 6
WATER AVAILABLE FOR SECONDARY RIGHTS
KINGSTON TO VERMILLION DAM
SEVIER RIVER BASIN
APRIL - JUNE TOTAL FLOW ABOVE 400 C.F.S. (Thousand Acre-Feet)
OCTOBER - APRIL PRECIPITATION INDEX