

WATER-SUPPLY FORECAST FOR UTAH, 1933

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In Utah, agriculture is dependent on irrigation and the entire economic and social structure of the people is built upon the adequacy and reliability of the water-supply. If there is any truth in the saying that to be forewarned is to be forearmed, then a knowledge of the probably water-supply in advance of its occurrence is of great value in making the most complete utilization of the water when it comes. Water-supply forecasts provide this advance knowledge and form the basis of the planting program of the farmer, the generating program of the power company, and the water conservation program of the municipality.

Approximately 80 per cent of the runoff for April-September, inclusive, in Utah is derived from precipitation which falls on the high watersheds in the form of snow. This accumulated precipitation may be measured in advance of its appearance as runoff. The Utah Agricultural Experiment Station has for many years been studying the relationship of the accumulated snow cover to the runoff. Under cooperative agreement between the Utah Agricultural Experiment Station, the United States Forest Service, and the United States Weather Bureau the high watersheds of the State of Utah have been covered with a network of courses which are measured each spring at the end of the precipitation season. These snow surveys form the basis of the seasonal water-supply forecasts.

During the period from March 26 to April 2, snow surveys were completed at all of the snow courses throughout the major watersheds of the state. The snow-survey data at this time, therefore, may be taken as indicative of the April-September and July-September runoff with, of course, later modification of estimates in accordance with subsequent storms and temperature conditions.

This report presents:

1. Forecasts of July - September and April - September runoff for the streams on whose drainage areas, snow surveys have been conducted for a sufficient number of years to make it possible to forecast stream flow quantitatively.
2. A brief statement of conditions on other watersheds of the state, based on available records.
3. Results of the annual snow surveys grouped according to stream basins.

BEAR RIVER AREA ABOVE BEAR LAKE

There are no snow courses on this area, but Blacks Fork course and the Lost Lake course are just over the divides on the south and west, respectively, of the headwaters of Bear River. Both of these courses show a snow cover only 75 per cent of last year. The snow pack is of rather low density and the ground under the snow open and dry. These conditions are conducive to high absorption losses and diminished runoff. The runoff from this area during 1933 will probably not exceed 70 per cent of the 1932 runoff.

BEAR LAKE DRAINAGE

The October-March precipitation has been generally deficient in this area. The Garden City snow course shows 17.7 inches, or 56 per cent of that for 1932. The ground is fairly dry under the snow and a high absorption loss is to be expected. With a normal April-May precipitation the runoff in the Bear Lake area will probably not exceed 50 per cent of that for 1932.

BEAR RIVER AREA BELOW BEAR LAKE

This area includes all that portion of the state north of Ogden Valley and east of Boxelder County. The principal streams draining this area are: Cub River, Maple Creek, High Creek, Summit Creek, Logan River, Blacksmith Fork River, Little Bear River, Bear River, and several smaller creeks.

The October-November precipitation was highly deficient on these watersheds and the soil was dry and open when the snows started accumulating. The seasonal snow surveys over these areas, while showing a snow pack extending to lower elevations than usual, revealed a water content of approximately 71 per cent of 1932 and 74 per cent of the long-time average. The temperatures have been fairly low to date, and except for the Little Bear River the spring runoff has not yet started.

CUB RIVER DRAINAGE

The Franklin Basin snow course is representative of the snow course on the Cub River watershed. The snow cover at this station this year has a water content of 28.2 inches as compared to 38.6 inches for 1932. With normal spring temperatures and April-May precipitation the runoff from Cub River this year should be about 75 per cent of that for 1932.

MAPLE CREEK, HIGH CREEK, SUMMIT CREEK, AND PROVIDENCE CREEK

These drainage areas are all on the west side of the Bear River range and are relatively short and steep. The snow pack is about 70 per cent of that for 1932. A few warm days will start the runoff in these streams, but they should maintain a fair runoff up to mid-June.

LOGAN RIVER DRAINAGE

Deficient October-March precipitation left the watersheds in a dry open condition when snow began accumulating. The flow of springs and the late summer flow of the river indicated a much better ground storage condition than that in the fall of 1931. The absorption losses in the dry watershed should, therefore, be less than in 1932.

The snow pack on the high areas is 71 per cent of 1932 and 74 per cent of a long-time average. The low snow is slightly above average. Based on a long-time average snow cover-runoff relationship the April-September runoff this year should be approximately 125,000 acre-feet as compared to 196,000 acre-feet in 1932. The July-September runoff should be approximately 41,700 acre-feet as compared to 59,670 acre-feet for 1932. There will probably be no exceptionally high water this spring, but the flow should be well sustained throughout the season.

BLACKSMITH FORK AND LITTLE BEAR RIVERS

The water content of the snow pack on these areas is only about 55 per cent of a long-time average and about 50 per cent of that for 1932. Due to the greater area of these watersheds being lower in elevation and having a larger southern exposure, the runoff starts from 2 to 3 weeks before the Logan River. The runoff has already started from the Little Bear and will soon start from the Blacksmith Fork. The runoff from the Blacksmith Fork River will probably not exceed 40,000 acre-feet during the period April-September and 14,000 acre-feet during the period July-September. This is a decrease of 42 per cent over 1932 for April-September and 34 per cent over 1932 for the July-September runoff. A cold, backward spring will tend to increase the July-September runoff.

WEBER RIVER

The major portion of the water in the Weber River comes from the four main branches: Chalk Creek, Lost Creek, East Canyon, and the Main stream above Oakley. The main flow comes from the area above Oakley. Snow courses on this watershed are located at Smith and Morehouse, Redden Mine, and Washington-Long Lake on the headwaters of the Provo River.

The average water content of the snow pack on the Weber River drainage above Oakley is 70 per cent of 1932, which year was a normal water year. The April-September runoff this year should approximate 108,000 acre-feet and the July-September runoff 23,000 acre-feet. Abnormal spring precipitation and temperatures will modify somewhat these figures.

SALT LAKE CITY WATERSHED

Prospects for water this year are better on the Salt Lake watersheds than on any other watershed in the state. The snow cover is approximately 83 per cent of that for last year. The recent rains have increased the snow cover on the high areas, so that the runoff this year will probably be at least 85 per cent of that for 1932.

PROVO RIVER DRAINAGE

Snow courses on the Provo River are located at the Daniels Creek summit and on the headwaters of the main stream near Lake Tryol. The water content of the snow pack on this area this year is 68 per cent that for 1932 and 59 per cent of a long-time average based on stream-flow records. The low snow cover is still more deficient, it being only 57 and 54 per cent, respectively. In the absence of abnormally heavy rains during April and May the runoff from the Provo River at Provo during the period April-September, inclusive, will probably not exceed 121,000 acre-feet as compared to 186,000 in 1932; the runoff during the period July-September, inclusive, will probably not exceed 33,000 acre-feet as compared to 48,800 acre-feet for 1932.

AMERICAN FORK RIVER DRAINAGE

A snow course at the Dutchman Ranger Station shows a snow pack 76 per cent of that for 1932. The snow cover is well packed, and with normal spring rains the runoff from the American Fork River drainage this year should be about 76 per cent of that for 1932.

HOBBLE CREEK, SPANISH FORK RIVER, PAYSON CREEK, ETC.

The seasonal runoff from these streams will probably not exceed 75 per cent of that for 1932.

UNITAH BASIN STREAMS

The Daniels Creek Strawberry course is at the headwaters of the Strawberry River. The snow pack in the Strawberry drainage above the Strawberry Reservoir is only about 76 per cent of that for 1932 and in the absence of abnormally heavy spring rains the runoff into the Strawberry reservoir will probably not exceed two-thirds that of last year.

There are four snow courses on the south side of the Uintah Mountains which are indicative of the snow cover conditions on this slope. Measurements made on these courses show a snow pack 67 per cent of last year over most of the area, but only a 25 per cent pack at the Kings Cabin course north of Vernal. These records indicate that a runoff of not more than 67 per cent of last year can be expected and that the runoff will probably be much less near the east end of the range around Vernal.

DAGGETT COUNTY AREA

The two snow courses in this area are located one near Smiths Fork and the other near Hole-in-Rock Ranger Station. Measurements on these courses show a snow pack of about 74 per cent of that for 1932.

SEVIER VALLEY AREA

Sevier River is so long and drains such a varied topography that there are many factors other than snow cover which effect the runoff. Several snow courses have been established on this watershed, but the records are limited. Short records are available at Fish Lake, Harris Flat Ranger Station, Gooseberry Ranger Station, Kimberly, and Escalante Summit. These snow courses this year show the average water content of the snow pack to be only 67 per cent of that for last year.

COAL CREEK AND THE VIRGIN RIVER

Two snow courses are located on the divide between the headquarters of the Virgin River and Coal Creek. The water content of the snow pack averages approximately 55 per cent of that for 1932. Unless abnormally heavy spring rains occur, the seasonal runoff from Coal Creek will probably not exceed 60 per cent of that for 1932.

BEAR RIVER AREA

A snow course is located at Merchants Valley (elevation 8900 feet), and miscellaneous snow cover measurements have been made at higher elevations near Puffer's Lake. The water content of the snow pack this year is only about 68 per cent of that for 1932. With normal spring rains and temperature the runoff from the Beaver River will probably not exceed 65 per cent of that during 1932.

PRICE RIVER, HUNTINGTON, FERRON, AND COTTONWOOD CREEKS

These streams drain the north end and the east side of the Wasatch Plateau. Snow courses are located on the Gooseberry and Huntington watersheds which give representative measurements on the Price River and Huntington Creek. The snow courses at the head of Seeley Creek and at the Alpine Ranger Station are

representative of conditions on Ferron and Cottonwood Creeks. The water content of the snow pack on the Price and Huntington watersheds is about 78 per cent of that for 1932 and about equal to the average during the past eight years.

The water content of the snow pack on the Cottonwood and Ferron Creek watersheds average 73 per cent for 1932.

SANPETE VALLEY

Most of the streams supplying water to Sanpete Valley drain off the west slope of the Wasatch Plateau. Six snow courses are located along this plateau, varying in elevation from 7500 to 10,200 feet. The snow pack on the west side of the Wasatch Plateau this year averages 81 per cent ~~of that~~ for 1932. With a normal spring precipitation and temperature the seasonal runoff will probably be 20 per cent less than in 1932.

FILLMORE CHALK CREEK AREA

The snow pack in this area averages about 87 per cent of that for 1932.

MILL CREEK-LA SAL MOUNTAINS

The snow cover on the LaSal Mountains seems to be slightly heavier than in 1932, the water content of the snow pack being 7.5 as against 5.6 last year.

MONTEZUMA CREEK -ABJOE MOUNTAINS

The snow pack is quite deficient on the Abjoe Mountains, the water content reported being only 40 per cent of that for last year.

SUMMARY

The year 1932 was almost a normal water year over the entire state. Most of the state can depend on a water-supply this year of from 70 to 75 per cent of that for 1932. The Uintah Basin will probably fall to 67 per cent and the Sevier Drainage to 60 per cent of 1932.

The unusually dry condition of the ranges last fall will no doubt cause excessive absorption losses if the snow melts slowly. If the spring temperatures are abnormally low it will reduce the runoff so as to eliminate high water on many streams.

These comments on water-supply prospects for 1933 are based on relatively short records and consequently will necessarily have to be modified as the melting season advances if abnormal conditions occur.

UTAH CO-OPERATIVE SNOW SURVEYS

TABLE 1

SNOW SURVEY DATA FOR ALL COURSES

Drainage Area and Snow Courses	Elev. in feet	Date of Survey	Depth of Snow (inches)	Density in per cent	Water Content (inches)	Corresponding Water Content (inches)	Normal Seasonal Accumulated Water Content (in.)	Percentage of Seasonal Water Content to Date of Survey	Corresponding Percentage of Normal Seasonal Water Content last year
<u>FRANKLIN BASIN</u> Franklin Basin	8200	4/2/33	69.9	40.3	28.2	38.6	39.0	72.3	99.0
<u>LOGAN RIVER</u> Franklin Basin	8200	2/2/23	69.9	40.3	28.2	38.6	39.0	72.3	99.0
Tony Grove Lake	8300	2/1/33	88.9	43.2	38.4	54.2	47.6	80.7	114.0
Tony Grove R., S.	8250	3/30/33	28.0	46.8	13.1	16.1	8.8	143.0	183.0
Mt. Logan	8070	"	48.9	37.4	28.4	42.3	20.5	87.0	100.0
Spring Hollow No. 1	7000	"	73.4	35.0	15.5	36.5	33.9	45.5	107.0
Spring Hollow No. 2	8000	"	73.4	35.0	25.6	36.5	33.9	45.5	107.0
<u>BLACKSMITH FORK RIVER</u> Mt. Logan	9000	3/30/33	75.9	32.4	28.4	42.3	42.5	67.0	100.0
Blacksmith Fork	9000	4/1/33	42.7	35.2	15.0	32.3	37.0	40.5	87.0
<u>OGDEN RIVER</u> Monte Cristo	8500								
<u>BEAVER RIVER</u> Smith and Morehouse	7600	3/29/33	35.8	33.0	11.8	17.0	**		
Redden Mine	7700	3/28/33	51.9	35.6	18.4	25.4	**		
Beaver Creek Nursery	7500	3/28/33	16.9	32.6	5.4	9.8	**		
<u>BEAR LAKE DRAINAGE</u> Garden City Creek	8200	3/31/33	46.6	38.0	17.7	31.4	*		
Monte Cristo	8500								
<u>NOTION CREEK</u> <u>SAN FITCH RIVER</u> Mammoth R., S.	8700	3/31/33	52.9	33.8	20.0	25.5	*		
Horseshoe Basin-Huntington	9700	3/31/33	64.3	35.0	22.5	30.6	*		
<u>EPHRAIM CREEK</u> G. B. E. S. Oaks	7800	3/28/33	21.6	29.2	6.3	7.8	*		
G. B. E. S. Headquarters	8700	3/28/33	45.3	33.7	15.3	18.0	*		
G. B. E. S. Meadows	9500	3/29/33	60.4	33.0	17.0	21.0	*		
G. B. E. S. Alpine	10200	3/29/33	54.2	35.0	19.0	26.5	*		

1 Snow courses common to more than one drainage are listed under each area. *Record not long enough to establish normal

LEAS CO-OPERATIVE SNOT SURVEYS

TABLE 1 (continued)

SNOT SURVEY DATA FOR ALL COURSES

Drainage Area and Snow Courses	Elev. in feet	Date of Survey	Depth of Snow (inches)	Density in Fer cent	Water Content (inches)	Corresponding Water Content (inches)	Normal Accumulated Water Content (in.)	Percentage of Seasonal Water Content to Date of Survey	Corresponding Percentage of Normal Seasonal Water Content last year
BIG COTTONWOOD CREEK Silver Lake	8700		65.6	38.2	25.0	30.1	*		
AMERICAN FORK RIVER DITCHMAN R.S.	8500	3/31/33	35.7	50.0	17.9	23.5	*		
JUNTAH BASIN Daniels Creek Strawberry Lake Fort Mt-Moon Lake Mosby Mt. Paradise Park Kings Cabin	8100 10500 8900 10500 8900	3/31/33 3/27/33 3/30/33 3/31/33 3/30/33	42.5 30.2 25.4 30.5 18.1	32.0 27.8 33.4 31.8 23.8	13.6 8.4 8.5 9.7 4.3	20.7 11.4 13.2 15.3 17.1	* * * * *		
FRICE RIVER Gooseberry Reservoir Site Mammoth R.S. Hunting or Distone Basin Indian Canyon	8300 8700 9100 9200	3/31/33 3/31/33 3/31/33 3/31/33	51.1 52.9 64.3 28.3	40.5 38.4 35.0 35.0	20.7 20.0 22.5 9.9	24.9 25.5 30.6 15.3	* * * *		
GOAL CREEK Co-on Flat Webster Flat	9500 9200	3/25/33 3/26/33	43.6 43.6	31.4 31.2	13.7 13.6	22.7 28.7	* *		
MILL CREEK Tasol Mt.	9000	3/30/33	21.0	35.7	7.5	5.6	*		
MONTTEZUMA CREEK Buckboard Flat	9000	4/1/33	29.7	21.8	6.5	15.9	*		
VIRGIN RIVER Harris Flat R.S. Co-on Flat Webster Flat	7500 9500 9200	3/28/33 3/25/33 3/26/33	24.2 43.6 43.6	33.4 31.4 31.2	8.3 13.7 13.6	16.4 22.7 28.7	* * *		
BEAVER RIVER Merchants Valley	8900	4/1/33	25.2	24.6	6.2	10.5	*		

* - Record too short to establish normal

Table 1 (continued)

UTAH CO-OPERATIVE SNO7 SURVEYS
SNO7 SURVEY DATA FOR ALL COURSES

Drainage Area ¹ and Courses	Elev. in feet	Date of Survey	Depth of Snow (inches)	Density in Far Cent	Water Content (inches)	Corresponding Water Content last year (in.)	Normal Seasonal Accumulated Water Content (in.)	Percentage of Seasonal Water Content to Survey	Percentage of Normal Seasonal Water Content last year
<u>SEELEY CREEK</u> Seeley Creek R.S.	10000	3/29/33	51.9	34.2	17.7	23.5	*		
<u>SALINA CREEK</u> Gooseberry R.S.	6700	3/31/33	31.8	22.0	7.0	12.2	*		
<u>CHALK CREEK</u> Fillmore Chalk Creek	9000	3/27/33	40.9	30.5	12.5	14.4	*		
<u>CLEAR CREEK OF SEVIER</u> Kimberley Mine	9000	4/5/33	26.3	38.3	10.1	14.0	*		
<u>EAST FORK SEVIER</u> Fish Lake	6790	4/3/33	6.0	50.0	3.0	4.8	*		
<u>WITTSOE-ROSCALANTE</u> Wittsloe- Roscalante Street	9500	3/29/32	21.2	29.7	6.3	11.0	*		
<u>UTEPER SEVIER</u> Harris Flat R.S. Panquitch Lake	7500 8000	3/28/33 4/2/33	24.2 19.8	33.4 27.2	8.3 5.4	16.4 10.2	*		
<u>BEAR RIVER (A. OVE</u> Bear Lake) Black Fork Hole in the Rock Lost Lake	9500 9300 10000	3/31/33 3/31/33 4/2/33	40.0 16.1 59.2	22.0 24.8 31.3	7.2 4.0 18.5	9.6 5.4 25.9	*		
<u>PROVO RIVER</u> Joans Ferry Lake Lost Lake Washington-Long Lake Devils Creek-Strawberry	7800 7650 7500 7300 7200	4/2/33 4/2/33 3/3/33 4/1/33 3/31/33	27.5 65.3 59.2 73.8 42.5	30.4 30.4 31.3 32.2 32.0	8.3 20.0 18.5 23.7 13.6	14.1 29.3 25.9 36.0 20.7	*		

¹Record is too short to establish normal

(Res. checked)