
NEWS CIRCULAR---Utah Agricultural Experiment Station

No. 31.

Logan, Utah, April 25, 1927

SEASONAL SNOW SURVEY AND STREAM FLOW FORECAST,

CACHE VALLEY AREA, April 1, 1927

By George D. Clyde
Utah Agricultural Experiment Station

The heavy storms during the last of March and the first half of April have done much to conserve the snow cover in the mountains. The snow cover is practically continuous above the 7000-foot contour and there is considerable snow on the north slopes below the elevation. The range below the snowline is well-saturated with water. Altho the accumulated precipitation at Logan from October 1 to April 1 was 1.12 inches short of the mean, the excess precipitation during the first half of April has overcome this deficiency.

Absence of precipitation records at high elevations and a poor correlation between the precipitation at the valley stations and on the high watersheds make it extremely hazardous to estimate the mountain water supplies from the precipitation at valley stations. To overcome this difficulty, snow surveys have been instituted as an Experiment Station problem to determine the accumulated precipitation on the mountain watersheds for the period of October 1 to April 1. This is the fourth year that these surveys have been made on the Logan watershed. Snow survey courses have been established at Franklin Basin near the headwaters of the Logan River; at Tony Grove Lake, six miles west of the Tony Grove Ranger station; at the Bear Sinks on the divide between Logan River and Bear Lake; at Mud Flat Ranger Station, and on Mount Logan. These courses are well distributed with respect to elevation and

geographic location and furnish a good index as to the probable water-supply.

The survey this year (1927) was made April 6 to 10 in extremely stormy weather, there being considerably new snowfall during those days at the higher elevations. There was little indication of winter melting above 7500 feet elevation, and the cover was continuous considerably below that elevation.

At Franklin Basin the snow cover was 86 inches deep containing 33.8 inches of water as compared with 52 inches depth and 18.4 inches of water last year. At Tony Grove Lake the difference was even more marked, there being 108 inches of snow containing 43.6 inches of water this year and 59 inches of snow containing 22 inches of water last year. The snow cover on Mt. Logan area is approximately twice what it was a year ago, there being 112 inches of snow containing 41 inches of water against 73 inches of snow containing 22 inches of water for last year. Between 6000- and 2500-foot elevation, where last year the ground was bare and dry, this year there is approximately 2 feet of snow containing about 9 inches of water.

The springs in Klondyke (Upper Logan Canyon) and the river at Tony Grove are lower this year than usual, it being easy to wade the creek at Tony Grove, a feat which has not been possible other years. Ricks Spring was still dry on April 9, and the early runoff even from the lower elevations had not started.

The accumulated precipitation as recorded at the Logan rain gage was 12 per cent below normal, while the accumulated precipitation as measured on the watershed was, after weighing it according to area, about 160 per cent of the 3-year mean. If the precipitation during May and June is normal, the probable runoff April 1 to September 1 from the Logan River will not exceed 167,000 acre-feet, and may be only 150,000 acre-feet due to depleted condition of ground storage. This probable runoff is almost twice the April-August runoff

SEASONAL SNOW SURVEYS AND STREAM
FORECASTS FOR UTAH, APRIL 1927

George D. Clyde
Utah Experiment Station.

Northern Utah.

The seasonal snow survey made on the Logan River watershed April 6-10 reveals snow stores which exceed anything yet recorded. These surveys cover an area which is representative of the watersheds of the Blacksmith Fork, Little Bear, Cub River, Maple Creek, High Creek and the other small streams draining the Bear River Range.

At Franklin Basin, which lies at the head of the Logan River and Cub River, there was on April 6 86 inches of snow containing 33.8 inches of water over the entire area. The elevation of Franklin Basin is about 8200 feet but the above snowcover extended down to about 7500 feet. The area in the vicinity of Tony Grove Lake at elevation 8200 feet was covered with 103 inches of snow containing 43.6 inches or over $3\frac{1}{2}$ feet of water. The Mt. Logan Area was covered with 112 inches of snow containing 41 inches or nearly $3\frac{1}{2}$ feet of water. The depth of snowcover decreased rapidly below 7500 feet elevation until it was about 2 feet deep at 6200 feet elevation and contained about 10 inches of water. There had been some winter melting below 7500 feet so the snowcover did not represent the accumulated precipitation. The snowcover this year over watersheds of Northern Utah is about 16 per cent of the three-year mean (1924-25-26). The winter season has been marked by alternate freezing and thawing spells and considerable drifting so that the snowcover is well-packed and in condition to support a good late-season streamflow.

The watershed was extremely dry at the beginning of the precipitation season due to three consecutive dry years. Many springs were dry. Logan River reached the record low stage of 130 c.f.s. on October 1, 1926. This indicated a badly depleted ground storage which must be replenished before

the normal portion of the snowcover will appear as runoff.

The normal April-August, inclusive, runoff from the Logan Drainage area is 165700 acre feet. The runoff during this period for 1924-25-26 was 106,000; 123,000; and 84,100 acre feet, respectively. The mean of these three years is 104,500 acre feet. Assuming that the April-june precipitation will be normal, the probable maximum runoff from the Logan area for the period April-August inclusive will not exceed 167,400 acre feet with a possible minimum of 150,000 acre feet due to depleted ground storage. Judging from the conditions on the Logan River, the other streams in Northern Utah should discharge nearly twice as much water during April-August 1927, as in 1926.

Provo, Weber, and Bear River Drainage Areas.

These streams are grouped in one class because they head in the same general area, the West end of the Uinta range. This area is high in elevation and practically inaccessible. For this reason there are no records of the snowcover in this area. The closest stations where records have been kept are Woodland, elevation 7000 feet; Silver Lake, 8700; Alta, 9300 feet; Park City, 7000 feet; Daniels Creek, 8000 feet; and Castle Creek, 6350 feet. The above high stations are considerably removed from the areas being considered but due to the general character of the winter storms it is believed that those stations are good indicators of the snowcover on the areas in question. The measurements at the above stations are made at snow stakes and the water content determined by weighing. Measurements are not made over established courses as on the Logan watershed and are, therefore, not strictly comparable year after year. However, they furnish the best records available and are given as indicators of the conditions on the watershed. The average water content in inches at Alta, Park City, Silver Lake, and Daniels Creek for 1923, 1924, 1925, 1926 is as follows: Alta, 24.5

Park City, 2.6 Silver Lake, 22.4; and Daniels Creek, 11.2. The 1927 measurements are as follows: Alta, 28.0; Park City, 3.0; Silver Lake, 30.7 and Daniels Creek, 20; or 114, 115, 137, and 179 per cent respectively. The mean per cent is 136. The mean annual runoff from the Weber over the same period is 146,000 acre feet. Multiplying this by 136 per cent, the probable runoff for 1927 will be approximately 198,000 acre feet. The mean annual runoff over the last 20 years has been 194,000 acre feet, so the probable runoff for 1927 is a little above normal. However, due to depleted ground storage following three years of dry seasons the conservative estimate of discharge for 1927 from the Weber River watershed is placed at 190,000 acre feet.

The mean April-August runoff from the Provo River for the period 1894 to 1925 is 191,500 acre feet. The runoff for 1924 was 92,000 and for 1925 114,000 acre feet. The mean snowcover at Alta, Silver Lake, Daniels Creek, and Park City for the years 1924-1925 was as follows: Alta, 22.5; Silver Lake, 20.8; Daniels Creek, 10.7; and Park City, .75 inches. The 1927 measurements in per cent of the 1924-25 measurements are as follows: Alta, 124; Silver Lake, 147; Daniels Creek, 187; and Park City, 133. The mean percent snowcover is 148 and the mean runoff for the same period is 103,000 acre feet. The discharge from the Provo River for the period April-August will probably approach the normal or about 190,000 acre feet. No records are available for the Bear River above Bear Lake but the snow cover over the watershed indicates that the river will probably reach a normal discharge this year.

San Pitch and Price River Drainage Areas.

Snowcover measurements have been made on the Wasatch Plateau at the Great Basin Experiment Station by the Forest Service since about 1922. In the spring of 1925 snow courses were established by the Utah Experiment Station on the Gooseberry Watershed which lies near the north end of the Plateau. The Price River, Huntington Creek, Cottonwood Creek and Ferron Creek all head in the east and north side of this plateau. The streams tributary to the San Pitch River

are fed by the melting snows on the West side of the Plateau. The snow measurements at the Great Basin Experiment Station show an average depth of 14.1 inches of water at 8700 feet elevation on the West side and 19.0 inches of water on top of the Plateau at elevation 10,200 feet. The snow survey course in upper Gooseberry indicated a snowcover in 1925 of 15.8, and 1926 of 14.1 inches of water. The snowcover at the Great Basin Experiment Station on April 1, 1927 was 17.8 inches of water at 8700 feet and 21.2 inches of water at 10,200 feet. The snowcover on Upper Gooseberry on April 20, 1927 averaged 25.8 inches of water or an increase of 173 percent over the two years (1925-1926) average.

With two feet of water on the watershed in the form of snow on April 1, the prospects are excellent for a good water supply both on the East and West sides of the Wasatch Plateau. The streams feeding off the Wasatch Plateau have very steep gradients and a sudden prolonged spell of high temperatures may cause damaging floods in addition to bringing the water off before it can be utilized for irrigation in the valleys. There is little storage available in the area and provision should be made to utilize the water to the fullest extent should the spring temperatures bring it off early.

Sevier River and Coal Creek Drainage Areas.

The Sevier River has passed through three dry seasons, 1924, 1925, and 1926 and the winter of 1926-27 brought little precipitation before the middle of February. Therefore, the section entered the replenishing season handicapped by a depleted ground storage. The above statement applies equally well to Coal Creek, draining West from the Kolob Plateau.

Considerable precipitation occurred over these areas during February, March, and the early part of April and it looked so good to the people in that section after so long a dry spell that the common opinion is that there will be plenty of water during the 1927 season.

Snow stake measurements have been made by the Forest Service at various points on the Sevier River watershed, for several years. During the last three years snow surveys have been conducted on the headwaters of the Sevier and on the Kolob Plateau. Measurements made at the Asa Vigrin Summit, Panguitch Lake, Kimberly Mine on Clear Creek, and on the West face of the Beaver Mountain since 1922 give an average snowcover which is only slightly below the snowcover this season. Three years out of the above record were extremely low runoff years. The snow survey courses are located at Panguitch Lake, Kimberly Mine and on the Kolob Plateau. There was no snow on the watershed at Panguitch on April 1, 1926 and only a few isolated patches and drifts on April 4, 1927. At the Kimberley Mine there was a cover containing 10 inches of water on April 4, 1927. This is the first year a survey has been made on the Kolob Plateau and the cover there averaged on March 26, 1927, approximately 16.4 inches of water.

The probable runoff from the Sevier River during April-August, 1927, will be considerably below normal due to the depleted ground storage left over from the preceding dry years and the relatively light precipitation during the replenishing season. Coal Creek on the West side of the Kolob Plateau received a greater amount of snow but even there it is doubtful if the runoff will reach a normal flow.

Uinta Basin Area.

The snowcover on the Uinta Basin Watersheds this year is not quite up to normal according to reports from Government Forest Service officials and the Weather Bureau. The snowcover, however, is more than double what it was on the same date in 1926. The above data is based on snow stake readings made at 13 stations between 6900 and 9000 foot elevations.

On April 1 of each year 1918 to 1927, inclusive, an average depth of 13 stations indicated a depth of water over the watershed as follows: 1918, 1.6; 1919, 3.3; 1920, 8.0; 1921, 3.6; 1922, 11.7; 1923, 9.7; 1924, 7.5; 1925, 3.3;

1926, 3.4 and 1927, 7.8 inches. The average for the 9 years preceeding 1927 is 5 inches, making the 1927 precipitation 135 percent of the 9-year average.

The streamflow records on Ashley Creek 1912 indicate that 1921-22 and 1922-23 were years of above normal runoff, and that 1920 with 8.1 inches of water on April 1 was approximately a normal runoff year. The runoff during April-August 1927 from the Uintah Basin streams should be only slightly below normal.

The low spring temperatures and copious April and May rains should help to hold the snow stores in the mountains later to furnish a good late summer supply of water for irrigation.

Outlook for Water Supplies on Salt Lake Watershed.

The prospect for an ample water supply from the Salt Lake watershed has not been better for many years. The snowcover on April 1, 1927 was deep and the water content high. Copious rains during April and May have added snow in the mountains and rain to soak up the ground in the valleys and foothills.

Salt Lake City has several storage reservoirs where water is stored for municipal use during the low water period. Because Salt Lake City is so vitally interested in the source of her water supply she has made, every year for several years, a seasonal survey of the snow cover on the Salt Lake Watershed to determine in advance, if possible, the available water supply. Surveys in the past have been conducted in City Creek, Parley's and Big Cottonwood Canyons. The years 1924, 1925 and 1926 carried a snowcover considerably below normal and a knowledge of this condition early in the season permitted plans to be made for the conservation of water before the reservoirs were emptied.

In addition to the surveys made by Salt Lake City, the Weather Bureau has maintained snow stakes at various points on the watershed. These data are used as a basis for forecasting the probable available water supply for the succeeding season. At Silver Lake in the Brighton Basin, there are several snow stakes, the average of which are reported as Silver Lake Station. The mean elevation these observatinns is about 9000 feet. Alta, in the head of Little Cotton-

Wood Canyon, also reports the snow depth and water content. Park City near the head of Parley's Canyon, at 7000 feet is also used as an indicator of the average snow cover. Snow surveys based on the fixed course and percentage relationship method have not yet been established on this watershed, and therefore the forecasts of available water supply must be based on the above-named stations. These stations are not sufficient to make an accurate forecast possible, but they are good indicators. The average water content of the snowcover at Silver Lake, Alta, and Park City on April 1 for each year since 1920 is as follows: Alta, 27 inches; Silver Lake, 24 inches; Park City 3.6 inches. The water content of the snowcover on April 1, 1927 was : Alta 28 inches; Silver Lake 30.8 inches and Park City 1.0 inch. The Park City record has little effect on the late season runoff from the Salt Lake watershed and, basing conclusions on the snowcover at the Silver Lake and Alta stations, the runoff from this watershed during April-August, 1927, should be not less than normal and probably ten percent above normal. The cool temperatures and copious rains during April and early May have conserved the snow supply, making the prospects for ample water for irrigation and municipal use during 1927 extremely favorable.

Summary.

The water supply prospects for the summer of 1927 are normal or better for Northern Utah, Provo, Weber and Bear River drainage basins, Salt Lake Watershed and the Uinta Plateau areas. The water prospects and forecasts are about normal in the Uinta Basin section but the Sevier River area, the West side of the Kolob Plateau and the Pohvent Range will probably be considerably below normal. The conditions, however, even in these sections are not alarming and crops may be planted with fair assurance of a sufficient water supply to bring them to maturity.