SEASONAL SNOW SURVEY
AND FORECAST OF STREAM FLOW

April 1, 1940

FEDERAL-STATE COOPERATIVE SNOW SURVEY*

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HUMBOLDT QUADRANGLE

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Progress.

During the past year further improvements have been made on the stream gaging stations located in the Upper Humboldt Basin. All gages were visited during the fall and repaired or reinstalled as required. A recorder well was placed on the North Fork above U. S. Highway 40 which will enable the hydrographer to obtain a better record for the stream this year. During the runoff period of 1939 the State Engineer provided a hydrographer to work under the general direction of the Nevada Agricultural Experiment Station and a satisfactory record of stream-flow was obtained. These activities cannot be overstressed for it is essential that the yield from the snow storage be known before forecasts can be made on the tributary streams of the Humboldt.

It has been the practice since 1935 to measure key snow courses on April 1 to give an indication as to the change in snow storage between March 1, the date of the principal survey, and April 1. From the results of these past five years it has been found that there is so great a variation during the month of March that it is desirable to wait until after the April 1 snow surveys before making the forecast of stream-flow. Under this plan much better accuracy is expected.

Well measurements have been continued in the Lamoille Valley and along the main Humboldt. As yet they serve merely as an indicator of the variation in yield of the river due to the different amounts of water still retained by the soil when irrigation begins. Naturally during irrigation the wells rise in response. When more data have been compiled on the factors affecting runoff these measurements may prove valuable in explaining some of the variations.

* The Federal-State Cooperative Snow Surveys in the Humboldt Basin include: The Nevada Cooperative Snow Surveys, Division of Irrigation of the Soil Conservation Service, Forest Service, Bureau of Reclamation, Weather Bureau, Nevada Agricultural Experiment Station, Geological Survey, Humboldt River Water Users, Nevada State Engineer, and the Elko-Lamoille Power Company.

Through cooperation with the Forest Service, the Weather Bureau, and the Nevada Agricultural Experiment Station, a battery of three storage precipitation gages was installed at the Terraces in Lamoille Canyon. These gages will give excellent information on the precipitation during the major runoff period and it is planned to install several more of these gages at other elevations in the Canyon. A snow survey course was also laid out in conjunction with the gages.

This year a forecast is given for South Fork at Bolton's based upon the past three years record. Such forecasts have not been possible in the past due to lack of runoff data. However, no forecasts will be attempted this year on any of the Northern tributaries of the Humboldt because of the decided difference of this season from those for which records are available. It is hoped that next year it will be possible to include more streams in the forecasts.

Present Season

On March 1 the snow cover averaged 56 percent of normal for the Upper Humboldt Basin, the northern tributaries receiving 43.2 percent of normal and the southern 68.7 percent of normal. The snow cover in the Jack Creek area was the poorest ever measured since the first course was laid out there in 1921. On April 1 the snow water content in the Ruby Mountains as determined from key courses had increased to about 83 percent of normal, the 9000 ft. course in Lamoille Canyon being approximately normal. The northern feeders, however, had no such increase. In fact, the key courses indicated that the water content had diminished leaving only 32 percent of normal.

The precipitation during the winter or November-February period averaged 96.4 percent, the northern regions receiving 85.1 percent of normal and the southern 107.8 percent of normal. The March precipitation was 110.1 percent of normal.

The temperature departure throughout the winter was uniformly high averaging over 5.5 degrees above normal. The March temperature averaged 2.1 degrees above the normal.

The runoff at Palisade for the November-February period was 23,710 acre feet or about 65 percent of normal. The March runoff was about 18,000 acre feet which compares favorably with that of 1936, 1937, and 1938 but is less than half as much as was received during the abnormally high runoff of the same month last year.

The water table elevations in Lamoille valley were the same on March 1 this year as they were in 1938 but were about .58 ft. lower this year than last. The series of wells along the main Humboldt were lower than either 1938 or 1939, being 1.71 ft. lower than last year and .65 ft. lower than in 1938. Therefore it is expected that more water will be used to prime the soil than either of the past two years.

The runoff at Palisade last year for the March-July period was 151,610 acre feet or about 60 percent of normal.

In the Little Humboldt Basin the snow cover on March 1 averaged 85.3 percent of normal. The April 1 survey at Upper Buckskin Mountain indicated that the snowcover had decreased about 20 percent during the month. The November-February precipitation was 114.9 percent of normal and the March precipitation at Paradise was 211.6 percent of its normal. Streams in Paradise Valley began to flow late in February due to rain and high temperature.

FORECAST

Humboldt River at Palisade.

The increased snow cover during March in the Ruby Mountains, which contribute heavily to the later runoff of the humboldt, makes the outlook more favorable than it was March 1. However, the failure of the snow storage to increase in the north, will offset some of the advantage gained in the Rubies because the heavy March runoff from the northern tributaries usually fills the valley of the main Humboldt and primes the channel for the unimpaired flow from the southern feeders. The danger of impairment the present season is strikingly illustrated by the well measurements along the main Humboldt which average 1.71 feet lower this year than last. With normal precipitation during the coming runoff period, it is expected that the yield of the Humboldt at Palisade for the March-July period will be about 140,000 acre feet or about 56 percent of normal. Lack of precipitation, however, may result in a decrease to as low as 100,000 acre feet or about 40 percent of normal.

Lamoille Creek at Power House.

The April 1 snow surveys indicate that the snow water storage in Lamoille Canyon is better than in 1937 but not as good as in 1938. It is expected that with normal precipitation during the runoff period, Lamoille Creek should yield about 25,000 acre feet for the April-July period or about 110 percent of normal. Even with lack of precipitation, the stream should flow 20,000 acre feet.

South Fork at Bolton's.

Only three years of runoff record are available at this station and a forecast therefore should not be treated too critically. From a study of available data it appears that the South Fork should yield about 38,000 acre feet during the April-July period. With below normal precipitation during the runoff period, however, this quantity may be decidedly reduced.

Martin Creek at U. S. Gaging Station.

It is expected that Martin Creek above diversions will yield about 15,000 acre feet for the March-July period provided the precipitation during the coming runoff period will be normal. With a lack of precipitation this forecast may be reduced to as low as 12,000 acre feet.

Northern Tributaries of Upper Humboldt.

The snow cover on April 1 was similar to that on the same date last year. However, the runoff will be considerably less for the March-July period for little runoff occurred this March whereas last year a very heavy runoff was received. The 1939 runoff from the north was abnormally high exceeding the runoff of 1938 by over 50 percent. It is expected that the 1940 runoff will be less than was received in 1938 or 1937.

DETAILED DATA

RUNOFF 1939

(Acre Feet)

Humboldt at Palisade (March-July) . . . . . or about 60 percent of normal	151,610
Lamoille Creek at Power House (April-July).	18,790
Lamoille Creek at McIntyre's (April-July)	10,866
Secret Creek above 71 Ranch (April-July	2,020
Starr Creek in Lower Starr Valley (April-July).	5,192
Mary's River in Cabin Field (April-July).	26,759
North Fork at U. S. Highway 40 (April-July)	16,294
South Ford at Bolten Ranch (April-July)	30,320
Maggie Creek at U. S. 40 (April-July)	2,390
Susie Creek at U. S. 40 (April-July)	735
Martin Creek at U. S. Gage (March-July. . . . . or about 86 percent of normal	12,353

WINTER RUNOFF - 1939-40

Acre Feet

	Humboldt at Palisado	Martin Creek near Paradise
November	2,300	350
December	3,510	450
January	5,900	500
February	12,000	1,690
	23,710	2,990

WINTER TEMPERATURE (NOV.-FEB.)
Departure from normal at Elko

November	+3.3
December	+8.3
January	+5.2
February	+5.9

WELL MEASUREMENTS

Lamoille Valley Average of 5 Wells
March 1

1935	5.03	Ft. from surface of ground to water level
1936	3.72	
1937	3.57	
1938	4.50	
1939	3.92	
1940	4.50	

Main Humboldt, Elko Co., Average of 7 Wells
April 1

1938	12.59 Ft. from sur-
1939	11.53 face of ground
1940	13.24 to water level

SURVEY OF SNOW COVER - HUMBOLDT BASIN
March 1

	Elevation Ft.	Depth of Snow Inches	Density percent	Water Content Inches	Normal Water Content March 1	Percentage of March 1 Normal	Nov.-Feb. precipitation in percentage of normal
Northern Feeders							
Upper Jack Creek	7800	25.0	35.6	8.9			
Lower Jack Creek	7000	4.2	31.0	1.3	7.7	16.9	North Fork Tuscarora
Rodeo Flat	7000	24.6	30.5	7.5			
Fry Creek	6800	21.7	30.0	6.5			
Big Bend	6800	21.4	29.9	6.4	11.5	55.7	
Gold Creek R.S.	6600	14.4	32.6	4.7	9.4	50.0	
Marys River	8000	51.6	28.5	14.7			
Bear Creek	8100	50.0	30.6	15.3			
Fox Creek	6900	20.4	27.9	5.7	11.3	50.4	
Taylor Canyon	5200	9.5	31.6	3.0			
Tremewan Ranch	5600	none					
Average Northern Feeders						43.2	85.1
Southern Feeders							
Corral Canyon	8500	51.0	28.2	14.4			Arthur
Green Mountain	8000	46.3	28.3	13.1			Hylton
Harrison Pass No. 1	6600	13.4	34.3	4.6			Lamoille
Harrison Pass No. 2	7400	16.6	28.8	4.9	7.9	60.8	Elko
Cave Creek	7000	45.3	37.3	16.9			
Hager Canyon	8500	52.2	37.0	19.3			
Lamoille Creek	9000	66.8	30.5	20.4	29.5	69.2	
Lamoille Creek Cross	9000	62.9	30.8	19.4			
Lamoille Creek	8500	52.0	28.3	14.7			
Lamoille Creek	8100	42.5	27.8	11.8			
Lamoille Creek	7600	33.9	26.8	9.1	12.7	81.9	
Lamoille Creek	7400	25.6	28.9	7.4			
Dorsay Basin	7900	46.5	24.3	11.3	13.0	86.9	
Dry Creek	6500	12.3	26.0	3.2			
Ryan Ranch	5775	1.6	31.2	0.5			
Trout Creek	8500	55.8	35.3	19.7			
Trout Creek	6900	16.4	45.1	7.4			
Average Southern Feeders						68.7*	107.8
AVERAGE FOR UPPER HUMBOLDT BASIN						56.0	96.4

LITTLE HUMBOLDT BASIN

	Elevation Ft.	Depth of Snow Inches	Dens. Percent	Water Content Inches	Normal Water Content March 1	Percentage of March 1 Normal	Nov.-Feb. precipitation in percentage of normal
Lamance Creek	7000	29.0	34.1	9.9			Paradise
Granite Peak	8600	44.1	34.0	15.0	13.7	109.5	
Martin Creek R. S.	7000	21.4	31.8	6.8	8.5	80.0	
Buckskin Mt.	8200	26.2	41.2	10.8	12.5	66.4	
Buckskin Mt.	6800	17.9	32.4	5.8			
Midas	7200	13.8	37.6	5.2			
AVERAGE FOR LITTLE HUMBOLDT BASIN						85.3	114.9

* The average for the Southern Feeders is computed by weighing the three groups of stations representing South Fork, Lamoille Creek, and Starr Creek on the basis of 2, 1, and ½, representing their relative contributions to the flow of the main Humboldt.

APRIL 1 SNOW SURVEY MEASUREMENTS AT KEY STATIONS

	Elevation Ft.	Depth of Snow Inches	Dens. Percent	Water Content Inches	March 1 Normal Water Content Inches	Percentage of Normal March 1
HUMBOLDT BASIN						
Lamoille	9000	75.2	39.2	29.5	29.5	100.0
	8500	49.4	37.4	18.5		
	8100	36.0	39.7	14.3		
	7600	26.3	36.5	9.6	12.7	66.1
	7400	21.8	33.5	7.3		
Big Bend	6800	12.3	30.9	3.8	11.5	33.0
Fox Creek	6900	11.0	31.8	3.5	11.3	31.0
LITTLE HUMBOLDT BASIN						
Upper Buckskin Mt.	8200	22.6	38.9	8.8	12.5	70.4

FORECAST SUMMARY

	Normal Runoff March-July	Probable Flow		Possible Minimum	
		Acre Feet	Percent of Normal	Acre Feet	Percent of Normal
Humboldt River at Palisade	250,000	140,000	56	100,000	40
Lamoille Creek at Power House	22,800	25,000	110	20,000	88
South Fork at Boltons		38,000		30,000	
Martin Creek near Paradise	14,300	15,000	107	12,000	84

Note:- No maximum is forecasted. In all cases the runoff could readily exceed normal by a considerable amount. The ground conditions at the present time afford an excellent opportunity for heavy spring and summer rains to raise the runoff above the forecasted amounts. The probable flow forecast is based upon the assumption that the precipitation at the U.S. Weather Bureau Stations in the Basin for the March-July period will be normal.

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REVIEW OF THE 1938-39 SEASON

The forecast of the stream flow for the March-July period 1939 at Palisade was 140,000 acre feet or 56 percent of normal. The actual obtained was 151,610 or about 60.6 percent of normal. This is well within the limits allowed and is the best forecast accuracy attained for a number of years. The precipitation during the runoff period was normal thus eliminating the chief disturbing factor that affects the forecasts and accounting in a great part for the accuracy of the forecasts.

The forecasted flow of Lamoille Creek for the April-July period at the Power House was 17,500 acre-feet or about 75 percent of normal. That attained was 18,790 or 82.4 percent of normal. This is a good forecast in view of the fact that it is based on only a few years of record.

The forecast of Martin Creek was only 7,150 acre feet for the March-July period or 50 percent of normal. The actual flow was 12,353 or about 86 percent of normal. Lack of data is the chief reason that the forecast was so far off, for at the time the forecast was made early in April, Martin Creek had already yielded 5,000 acre feet furing the month of March. Had the forecaster known this fact, the forecast certainly would not have been placed at the low figure. The forecasts on this stream were very good for a number of years but in recent years have been relatively poor. More study will be devoted to this stream during the coming year.

AGRICULTURAL EXPERIMENT STATION
April

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