There are a number of considerations in addition to snow storage which may tend to increase the apparent rainfall run-off ratio during the winter season.

(1) The stream gagings may be in excess, due to the accumulation of ice on dams or in streams, causing backwater. This is not true in the cases observed in April and May, and it is believed it does not materially affect any of the results here given.

It will be noted that gagings made by different methods, weirs, dams, mills, and by current meter, all lead to the same result, namely, the measured run-off during the winter season nearly equals and sometimes for several months exceeds the measured precipitation at nearby stations.

(2) The ground-water level is nearly always drawn down considerably in the course of a long, cold winter; hence, there should be added to the possible supply to the stream from direct precipitation the amount drawn from ground-water storage during the winter. In the case of areas like those listed in Table 6 it is not very large, probably not more than one or two inches, as a maximum.

(3) Regarding the measurement of winter precipitation, the U. S. Weather Bureau stations are mostly located in the valleys and at other than the highest elevations. The measured precipitation, even if correctly determined at these stations, would probably be somewhat deficient, as precipitation increases with altitude in many localities.

(4) The measurement of snowfall by catching it in a rain gage, in the same manner as rain, is likely to give deficient results inasmuch as the rain gage offers an obstruction and deflects the air currents. The snowflakes, owing to their small specific gravity, as compared with raindrops, do not enter the mouth of the gage, but are diverted to the side or carried over by the wind. This source of error is aggravated by the fact that nearly all the U. S. Weather Bureau rain gages are at considerable distances above ground and mostly in very open locations fully exposed to the wind.[1]

(5) As to distribution of snowfall, even though the snowfall were correctly measured at the points where the U. S. Weather Bureau stations are located, it can easily be seen that the results might not represent correctly the average snowfall even in the immediate locality. This was graphically illustrated at a rain-gage station in the Mohawk Valley last winter. The gage in question was located in the open, surrounded by cultivated fields. With some precaution the depth of snow which actually fell in the immediate vicinity of the gage was determined with fair accuracy. At no time in winter did the snow on the ground near the gage accumulate to a depth exceeding about one foot. The adjacent country comprises deep valleys occupied by streams, patches of woodland, and also clearings similar to that containing the gage. In the woodland and valleys within one-fourth mile of the rain gage, snow accumulated to a depth of three or four feet; thus it will be seen that the snowfall measured in the clearing, under conditions similar to those existing at many U. S. Weather Bureau stations, would represent very much less than the average of the entire region, including the woodland, valleys, and clearing, although it might be quite accurate as regards the snow that fell on the clearing itself.

With regard to the question whether the existing rainfall stations truly represent the average precipitation on the drainage basins, it may be said that the summer season rainfall-run-off ratios for these streams conform closely to existing notions, and it appears that the effect of this error, if any, is greatly exceeded by the other conditions described.

[1] For a number of years past the Weather Bureau has entirely disregarded gage measurements of snowfall whenever there was reason to believe that the gage was not collecting the full amount of fall. At such times measurements are made in some level place where it is apparent that an average depth can be obtained.—*H. C. F.*

The maximum flood discharge on northern streams may result chiefly from melting snow, accompanied by more or less rainfall.

TABLE 8.—*Melting-snow freshet, March, 1904; yield of small catchment areas near Utica, N. Y.*

Stream.	Drainage area, square miles.	Duration of freshet.			Average discharge in cubic feet per square mile per second.	Total yield during freshet. Depth run-off.
		From —	To —	Days.		
						Inches.
Starch Factory Creek	3.40	March 22,	March 29,	7	33.33	8.67
Reels Creek	4.42	March 24, noon,	March 29, noon.	5	29.92	5.56
Sylvan Glen Creek	1.18	March 22, noon,	March 27, noon.	5	19.06	3.55

Table 8 shows the run-off of Mohawk River and a number of its tributaries in March, 1904, during the melting-snow freshet. None of these streams have lake storage. The contemporaneous rainfall is shown in Table 9.

TABLE 9.—*Precipitation during spring flood, 1904, upper Mohawk River catchment area.*

Date.	Little Falls.	Savage reservoir.	Deerfield reservoir.	Rome.
March 21				0.20
March 22		0.07	0.72	0.30
March 23	0.71	0.61		
March 24				
March 25	0.35	0.05		0.20
March 26	0.18	0.23	0.45	0.33
March 27				
March 28				
March 29				
March 30				
March 31	0.08	0.35	0.45	0.15

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R. A. EDWARDS, Acting Librarian.

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