

An accurate knowledge of the amount or depth of snow in the high mountains and their foothills, with statements of the condition of the surface of ground when the snow first covered same and additional information as to whether the snow is loose or well packed, will render it possible to predict with considerable accuracy the run-off for the year. It is hoped that the Weather Bureau will be able to secure such data as to the snowfall at a number of stations in high altitudes so that the Reclamation Service may have at hand accurate information on which to regulate the Pathfinder Reservoir to the best advantage.

This regulation of the reservoir will also require a knowledge of the evaporation from the surface of same, and it is hoped that the Weather Bureau and Reclamation Service can cooperate to secure such records.

The Pathfinder Dam and Reservoir are parts of the North Platte Project, of which Mr. Andrew Weiss is Project Engineer and Mr. R. F. Walter, Supervising Engineer.

PROTECTION OF FRUITS FROM FROST, ETC.

Letter from the Secretary of the Missouri State Board of Horticulture to the Section Director at Columbia, Mo., and remarks by the latter.

I heartily agree with you that there ought to be close cooperation between the Weather Service and the various Departments of Agriculture. I certainly hope that in the near future it will be possible for the Weather Bureau to make a careful study of the reasons for crop failures, particularly fruit, in certain regions. In Missouri certain sections, for no apparent reasons based on topography or isotherms, nearly always escape injury. I particularly have in mind the famous peach region about the town of Koshkonong in Oregon County. As usual, that section suffered no injury from the blizzard of mid-April. The peaches at Koshkonong were absolutely unharmed. The peach district there extends a short way into Howell County, but I think not farther than Brandsville, as I know practically all of the fruit was destroyed in the northern and western parts of Howell County. This specially favored district seems to extend east into Ripley County, at least at Doniphan there was very little injury from the blizzard of April 24. However, at this place the fruits were badly winterkilled, whereas at Koshkonong there was no winter injury. However, I should explain that even in the vicinity of Koshkonong poorly kept orchards, or those located in low ground were injured by the cold weather of the winter.

The value of knowing the definite reasons why Koshkonong is such a favored place for fruit growing lies in the fact that there may be other regions just as good as the one spoken of; also if we knew why Koshkonong is favored above other places we might be in a position to give definite advice about the location of orchards in many parts of the State which have not been tried and, perhaps, on theoretical grounds, we might be able to forestall failures which are inevitable, owing to certain natural conditions of topography, physiography, temperature, etc.

It may not be possible to secure any definite information along the line I have mentioned without having a number of volunteer observers in and around the special districts to be studied. If it were feasible to undertake certain "climate surveys" of this kind, some very interesting statistics, I feel sure, would be quickly forthcoming.

Another line of work in which the fruit grower must look to the Weather Bureau for assistance is the matter of frost warnings in connection with the heating of orchards. Orchard heating is a new thing in this State and by no means old in other States. The great difficulty now in the way of heating orchards economically is that the growers either do not know the exact time at which to light their heaters, or being somewhat uncertain about the matter, become excited or, whatever the case may be, they light the fires too soon. In many instances the temperature does not fall quite low enough to make it

necessary to light the fires, but not knowing the danger point within a matter of 2° or 3°, a great deal of fuel may be consumed unnecessarily. Under such circumstances the grower finds that his neighbor who did not heat his orchard had just as much fruit as he did, and so loses faith. We have determined the exact temperatures representing the danger point at the different stages of development of fruit from the time the buds are dormant to the time the young fruit is of considerable size. It seems to me that it might be quite possible for the Weather Bureau to warn fruit growers, even in remote districts, of frosts and freezes in ample time for them to get everything ready for heating their orchards.

REMARKS BY GEORGE REEDER, SECTION DIRECTOR, IN CHARGE OF THE MISSOURI SECTION, U. S. WEATHER BUREAU.

The suggestion of Professor Howard that the Weather Bureau make careful study of the temperature effects in connection with the fruit crop with a view of ascertaining, if possible, why some localities appear to be more immune from killing frosts than other near-by regions is, while not new, an interesting one, and if followed out might lead to some valuable information that would be useful to the fruit grower.

The climatological records of southern Missouri probably cover too short a period of time to enable one to form a correct opinion as to whether Koshkonong lies within a "thermal belt" or "verdant zone." The data that we have however indicate that the locality in question is not appreciably more favored as regards weather changes than its neighbors.

Table 1 gives the average date of the last killing frost in spring, the latest date on which a temperature of 32° F. occurred, and the number of times that freezing temperatures occurred as late as May, at all stations in the southern tier of counties situated in about the same latitude as Koshkonong, from McDonald County on the west to Ripley County on the east, a strip of country averaging about 25 miles wide and 200 miles long.

TABLE 1.

County.	Station.	Latitude, north.		Longitude, west.		Elevation.	Record, years.	Average date of last killing frost in spring.	Latest date on which 32° F. occurred.	Year.	Number of times 32° F. occurred as late as May.
		°	'	°	'						
McDonald	Dean*	36	39	94	21	1000	12	Apr. 21	May 5	1906	3
Barry	Mineral Springs†	36	41	93	48	1475	12	Apr. 15	May 20	1894	2
Taney	Protem†	36	32	92	52	1000	5	Apr. 20	May 4	1903	1
Howell	Olden	36	50	91	54	1248	17	Apr. 16	May 9	1906	2
Oregon	Koshkonong	36	36	91	38	911	10	Apr. 16	May 1	1903	1
Ripley	Doniphan	36	37	90	49	440	7	Apr. 19	May 2	1909	1

*Near Anderson, P. O. †Closed in 1905. ‡Closed in 1906.

We find from the foregoing table that the section of the country extending from Koshkonong, and probably some little distance westward of that town, eastward to Doniphan, has but a slight advantage over the sections more to the northward and westward. The average date of the last killing frost in spring at Olden and Koshkonong (the latter being 20 miles farther south) is the same for 17 and 10 years, respectively. Freezing temperature has occurred at Olden as late as May, twice in 17 years, and once at Koshkonong in 10 years. It is true that a freeze occurred at a later date at Olden than at Koshkonong, but that can be accounted for by the difference in latitude and elevation. Similar differences at stations farther west may be accounted for in the same manner, including longitude, as the western part of the State is usually colder than the eastern part when averages are considered. In other words, the climatic factors in the region between Koshkonong and Doniphan do not vary more than one would expect for the latitude and topography.

The apparent immunity of orchards in this region, especially in the neighborhood of Koshkonong, from damaging tempera-