

storm occurring during the harvest season, damages hay and grain. An unseasonable rain means loss to producers of raisins. These are illustrations of the influence of unfavorable weather conditions upon crops.

Studies now in progress show the probable frequency of early and late frost, as well as other weather conditions. The farmer can, by taking advantage of the results of these studies, know what his agricultural risk is on any crop in a given locality. The farmer who is guided by the daily weather forecasts saves much. In California and Florida the prediction of a killing frost is followed by the use of heaters in the citrus groves. The cranberry grower of the East floods his marshes under the same conditions. When, during the harvest season, rain is predicted, the wise farmer discontinues cutting grass and grain and places under shelter as much of the crop as he can. Shippers of perishable fruit avoid loss by utilizing the weather forecasts.

It is obvious that weather is a matter of vital concern to the farmer. Man cannot control the weather, but he can, through close observation and through application of knowledge acquired by the meteorologist, so order his work as to prevent loss which would otherwise occur.—*James F. Chamberlain.*

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#### CLIMATIC CONTROLS IN CALIFORNIA.\*

The general climatic conditions of the Pacific Coast, and particularly the climate of California, may be said to be controlled by four great factors:

*First*, the movement of the great continental and oceanic pressure areas—the so-called permanent “highs” and “lows” is an important climatic control. Under this head we include, also, the most active factor in climatic development, namely, the movements of individual pressure areas; since there is now good ground for believing that the paths of the individual disturbances—large-sized whirls and counter-whirls—are largely determined by the general relations of the permanent pressure areas. Over the northern Pacific Ocean in winter, there exists an area of low barometer covering the region between the latitudes of 40°–60° North and longitude 130°–140° East. An area of high pressure overlies the greater part of North America, with extensions southwest to the Tropics and west to the 160th Meridian. The typical wet winters on the California Coast occur when this great North Pacific “low” extends well eastward outlying the continent west of a line drawn from San Francisco to Calgary. At the same time the great continental high area apparently recedes to the southeast. On the other hand, the pressure distribution characteristic of a dry winter on the California Coast is marked by the prevalence of the continental high over the entire country west of the Rocky Mountains.

*Second*, The prevailing easterly drift of the atmosphere in temperate latitudes, causing the well-known winds from the west, is one of the prime factors in modifying the climate of the coast of California. This coast line stretching for ten degrees of latitude is subjected to a steady indraft of air from the west. In this movement, together with the fact that to the west is the great Pacific Ocean, lies the secret of the difference in temperature between the Atlantic and the Pacific Coasts at places of like latitude.

*Third*, Proximity of the ocean, not ocean currents. For some years there has been an impression that the milder climate of the Pacific Coast was due to the

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\*Thesis presented to Dr. Ford A. Carpenter, Instructor in Meteorology, Southern Branch, University of California.

warming influence of the Japanese Current. No reliable data exist to support such a belief and it is quite unlikely that the Japanese Current plays any important part in modifying the climate of the Pacific Coast. The active factors as said before are the prevailing eastward drift of the atmosphere and the proximity of the mass of water, a great conservator of heat. It is probable that if these conditions could be reversed and the general movement of the air from east to west, marked changes in climatic conditions would result and the Pacific Coast might then have a rigorous climate.

The exceedingly diversified topography from a distance of two thousand miles from the coast inland is the fourth climatic control. In California perhaps more than in any other part of the habitable earth a great diversity in climate exists. A short study of the relief map of California throws much light on the cause of the great diversity of climate.—*Alice Jones.*

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### CLIMATES OF THE UNITED STATES.

“*The essential characteristics of United States climates*” are vividly presented by Prof. R. DeC. Ward in the December, 1920, *Scientific Monthly* (pp. 555–568). Instead of being faced with uninteresting climatic tables, the reader learns of the characteristic types of weather in each of the five major climatic provinces of the country. A map and discussion of these climatic subdivisions was first published in the *Bulletin of the American Geographical Society*, in 1915 (vol. 47, pp. 672–680). In the large Eastern province almost any kind of weather may be expected at any time of the year. The Gulf Province is warmer and wetter, but subject to killing frosts. The Plains Province is set off by its uncertain rainfall, most of which comes when most needed for crops, i. e., in spring and early summer. Generally quiet, dry weather, with great ranges of temperature, is characteristic of the Plateau Province. Finally, the Pacific Province is noted for its usual steadiness of weather and for its marked winter rainy season and summer dry season. The most important difference between the northern and southern portions of the climatic provinces, as succinctly shown by small tables, is one of temperature, except that along the Pacific Coast the greatest contrast between north and south is one of rainfall. In that region there is a fairly regular decrease in the duration and amount of rainfall, from north to south, from highland to lowland and from coast to interior.

Professor Ward's broad presentation of the climates of the United States and their human effects make this article of value not only to the general reader, but also to him who wishes to gain a comprehensive view before studying details.—*Charles F. Brooks.*

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### MISCELLANEOUS NOTES.

SUBMITTED BY A. H. PALMER.

Readers of this BULLETIN may remember several notes on “rainmaking” which were published last year. It appears that “rainmakers” hibernate, for nothing was heard of their activities during the past winter. However, with the coming of spring at least one has emerged from temporary inactivity, as is evident from the following dispatch which appeared in the “*San Francisco Chronicle*” recently: