DRAINAGE OF IRRIGATED LANDS*

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SEEPAGE usually results in one of two ways, either from a rising of the ground-water above its original level or from the retention of applied irrigation-water by an impervious stratum at a comparatively short distance from the surface. Seepage caused by a general rising of the ground-water usually involves larger areas, and is more common than that caused by impervious strata. In the former case, the underground-water passages, which are sufficient in capacity for the ordinary flow of underground water, are choked by the added irrigation supply, and a gradual ponding in the soil takes place. In the winter, when the irrigation water is wholly or partly shut off, the ground water surface lowers, only to rise

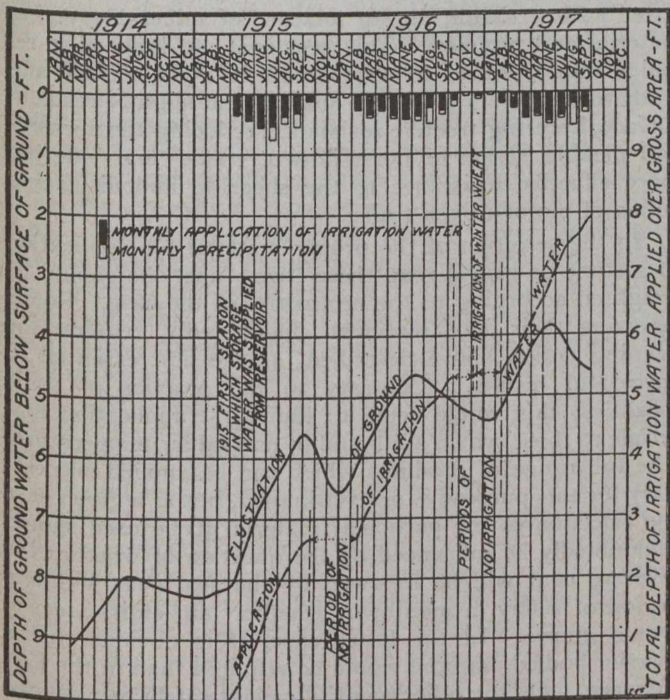

Fig. 1.—Ground-water Fluctuations and Use of Water in Rio Grande Valley

again to a greater elevation during the succeeding irrigation season.

The surface of the ground water is represented by a series of peaks and valleys, which correspond to the seasonal use of water on the land. The peaks increase steadily in height, and finally reach the ground surface at low points. Water stands in these during the irrigation season, only to disappear during the winter. Fig. 1 shows the fluctuation of ground water and the application of irrigation water on 8,500 acres in the Rio Grande valley. The ground-water curve is based on the records of 20 wells in various parts of the tract. The net area irrigated was 5,300 acres, and the average depth of water applied was 4.3 ft., corresponding to 2.7 ft. over the entire 8,500 acres. Where the water stands on the surface, or where the ground-water level is near enough to the surface to be affected by capillary attraction, the resulting evaporation causes the deposition of "alkali" salts.

The flow of underground water, like the flow of surface water, follows the direction of greatest slope, but on account of friction of the soil particles, the movement is slow. If irrigation losses are large, the supply of ground water exceeds the amount handled by natural movement and there is seepage, even on land with a considerable slope.

Deep drains keep the ground-water level at a sufficient depth below the surface to prevent the rise of "alkali". They do not empty the underground reservoir, but simply reduce the peak of the ground-water surface.

A study of Figs. 1, 2 and 3 shows that the loss of a comparatively small quantity of water by deep percolation necessitates the construction of an extensive drainage system. In Fig. 1, note how closely the curve representing the ground water responds to the use of irrigation water. This curve drops rapidly when irrigation stops, showing the effect of the natural underground drainage.

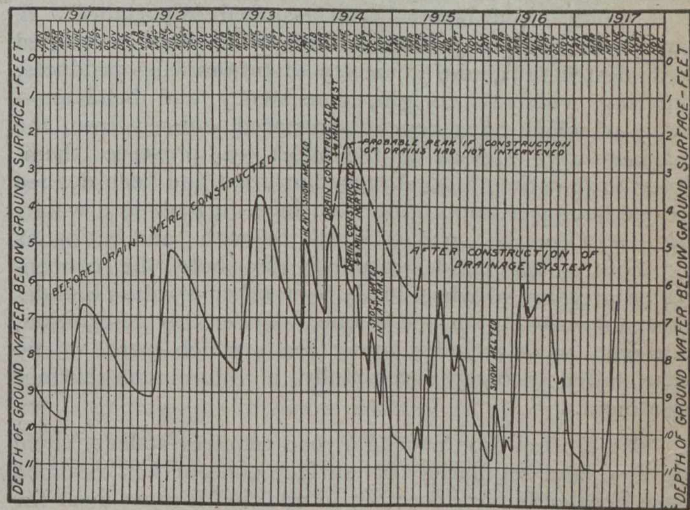

Fig. 2.—Ground-water Fluctuations in Part of Boise Valley, Idaho

The financial loss caused by deep percolation does not stop with the construction of a drainage system. Drains are not a "cure-all" for seepage. After each irrigation a "peak" of ground water remains, the size depending on the care taken by the irrigators. This ground water must spread laterally and enter the drains, if the soils are to be properly aerated and injury from "alkali" prevented. If there is a continual overabundance of water applied this "peak" remains so close to the surface as to make the root space shallow. In addition, much of the plant food is removed by the continual motion of free water in the soil.

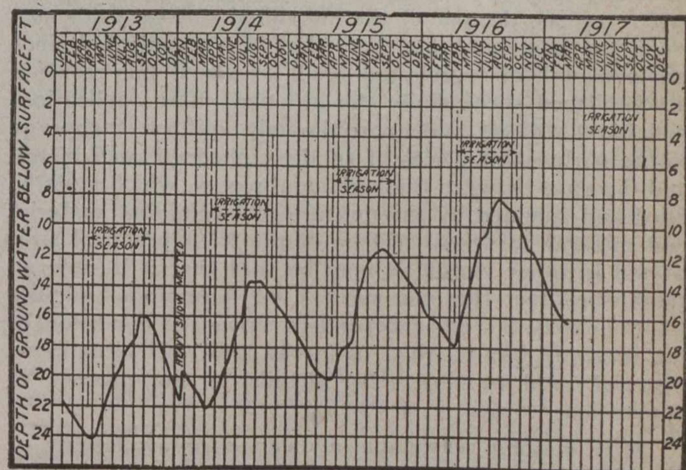

Fig. 3.—Ground Water in Boise Valley, Idaho.

*Abstract from "Reclamation Record."