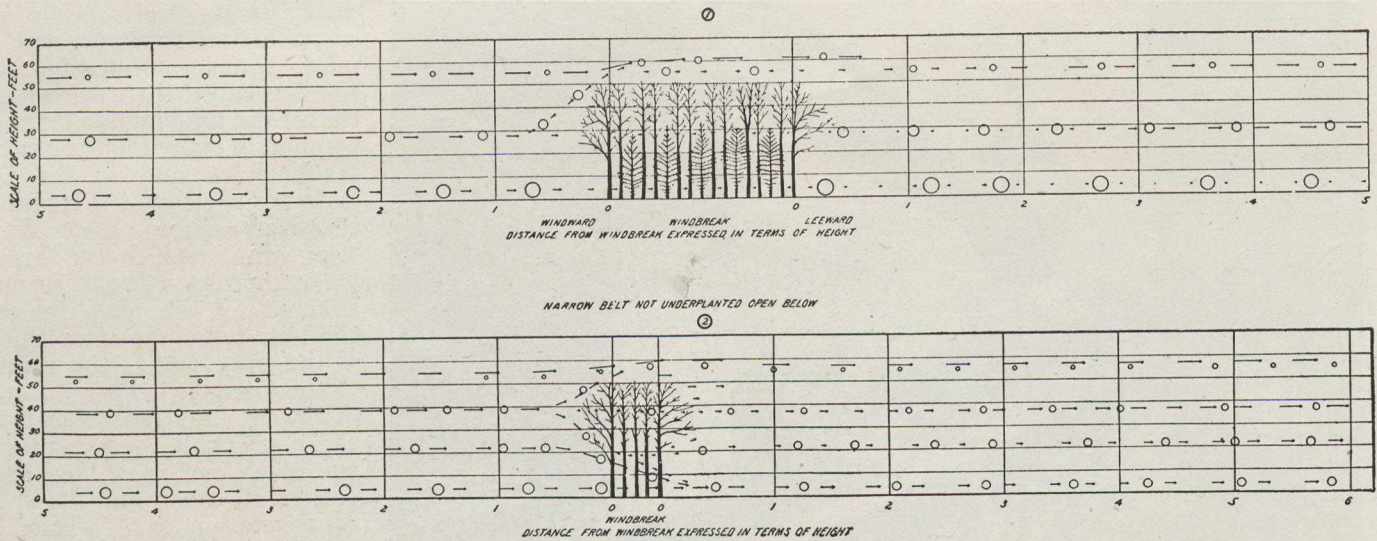


Mature shelter belt underplanted densely



Showing the effect of two kinds of windbreak on air currents...Velocity indicated bylength of arrows...Humidity by diameters of circles.

Breaking the Power of Prairie Winds

By Carlos G. Bates, U.S. Forest Service

The windbreak directly reduces the mechanical force of winds and through this reduction has several other influences. The measurement of velocity of surface air currents has been carried on chiefly in connection with studies of evaporation and is accomplished by the use of the standard anemometer, which expresses the wind velocity in miles per hour. As in the case of all other atmospheric measurements, the anemometer is set up at a height of 4 feet from the ground. One instrument, in a fully-exposed situation gives the normal wind velocity for a stated period, while at the same time other instruments exposed at certain points within the area influenced by the windbreak show comparable velocities. The distances from the windbreak are always even multiples of the height of the windbreak.

Evaporation

The ability of the windbreak to check evaporation must be its source of greatest benefit, since, in the region where windbreaks find their greatest usefulness moisture is almost always insufficient for the best interests of agriculture. To thoroughly understand the influence of a windbreak upon evaporation it should be stated that the evaporation of water from any wet surface and also the transpiration of moisture from the leaves of plants is accelerated by three conditions — heat, dryness of the air, and rapid air circulation. Hence, anything which reduces the movement of the air reduces the rate of evaporation and may effect an appreciable saving of the moisture supply.

Evaporation has been measured in a way which shows about the same effects of windbreak protection as are felt by the plants of a field crop. In other words, the evaporating surface of the instrument responds to the same influences as do the leaves of

plants. The evaporimeter consists of a circular sheet of filter paper resting on a thin glass plate and continually moistened by a supply of water which is fed onto the center of the paper. The moist paper is exposed to sunlight, and the circulation of the air above it is perfectly free, so that it responds readily to changes of temperature and to changes in wind velocity.

In this case, as in measuring wind, the normal evaporation for the period in question has always been obtained by exposing an evaporimeter at a point where it could not be affected by the windbreak. Other evaporimeters were similarly exposed on both sides of the windbreak at distances from the windbreak which were one, two, and five times its height, and, in addition, on the leeward side at ten and twenty

times the tree height. These distances practically cover the entire range of the windbreak's influence upon evaporation. The instruments show the quantity of water evaporated, and the amount evaporated in the open is taken as the normal, or 100 per cent. Amounts evaporated at other points are reduced to percentages of the normal.

Humidity

It has been assumed that the greatest effect of a windbreak upon the humidity of the air over grain fields arises not so much from the possibility of the trees adding to or detracting from the moisture content of the air as from their disturbing influence upon the movement and direction of air currents. To determine how great this effect might be the amount of moisture in the air at several points on both sides of the windbreak and at a height of 4 feet from the ground was determined in a single case by numerous and successive readings of the ordinary cog-psychrometer.



PRAIRIE COTTONWOOD TREES, 45 FEET HIGH.

Photograph taken near Raymond, Alberta. The trees are 18 years old, irrigated, and were planted by Herbert Cook in 1902 to shelter his home. The seedlings were obtained from the Dominion Forestry Branch, at Indian Head, Sask.