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Warm-Season Rainfall in Texas

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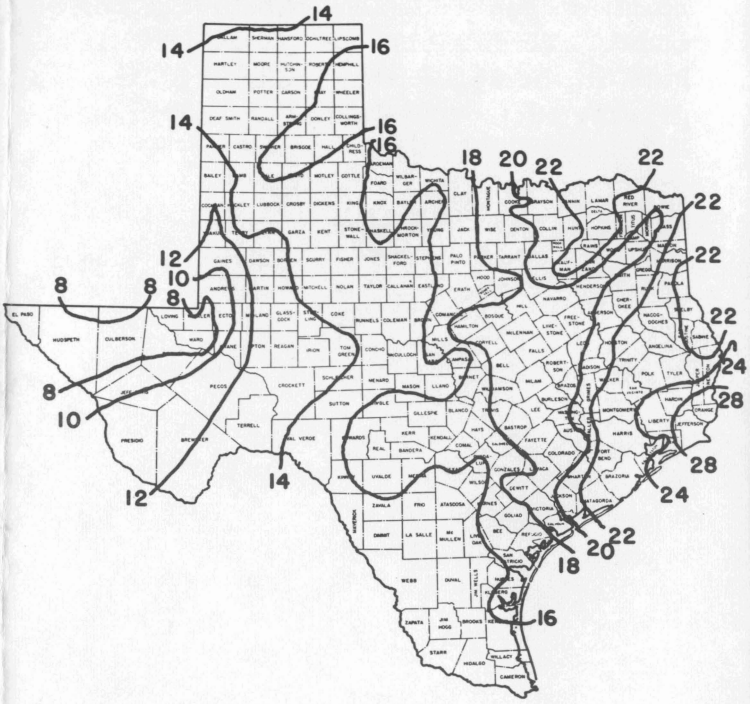

The rainfall map shows the isohyetal lines of the average summer rainfall in Texas. In East Texas, rainfall is usually sufficient for producing commonly grown crops. In some areas of the State, it is sufficient for producing crops during certain seasons; and in the west and south, irrigation is necessary for all types of crop production.

The effectiveness of summer rainfall on crop production results chiefly from frequency, intensity, duration and seasonal distribution. Much of Texas' summer rainfall occurs in high intensity torrential thunder showers; consequently, much is lost in runoff.

INFILTRATION RATE

The downward movement of water entering the surface soil layer is infiltration, and the rate is described as the maximum amount of water that enters under specified conditions in a given time, usually measured in inches per hour. Each soil type has a different infiltration rate as well as range of rates, depending upon its physical properties. The infiltration rate depends upon the texture, structure, organic matter, porosity and antecedent moisture.

Terms commonly used for classifying infiltration rate in the surface layer are: very slow for fine-textured soils with no apparent aggregation, with platy structural units or of a structure with barely visible blocky aggregation in the surface layer; slow in moderately fine-textured soils with poor structural aggregation of platy or blocky classification; moderate in medium-textured soils which usually possess aggregation in varying degrees; and rapid in moderately coarse or coarse-textured soils which usually have single grain or individual particle type structure.

Actual infiltration rates usually are determined in the field on an undisturbed soil, using a regular infiltration measuring device. Average infiltration rates for soil textures are: clays 1/4-1/2 inches, clay loams 1/2-2 inches, sandy loams 2-3 inches and coarse sands 7-9 inches per hour. Obviously, runoff will be high from thunderstorms on the fine-textured soils.

PERMEABILITY

Permeability is the ease with which gases, liquids or plant roots penetrate a mass or layer of soil. Because different soil horizons or layers vary in permeability, the horizon having the most critical or limited permeability always should be clearly identified.

Laboratory tests determine with extreme precision the different permeability classes; however, the terms generally remain the same for classifying the infiltration rate--very slow in soils with claypans, hardpans and heavy clay subsoils, where structural units especially are not evident; slow in soils with fine to moderately fine-textured subsoils with some fine sub-angular blocks or granules; moderate in soils that are fine to medium-textured with well-developed structural units having larger and more numerous pores; and rapid in soils with sandy, loamy sand or gravelly sand layers or subsoil, where the structure is usually single grained or weakly granular.

If a soil is saturated when the rain begins, runoff likely will be greater than where the soil is barely moist. The same is true for a soil with a very tight clay texture because the water will not readily penetrate the soil.

Water entering the soil is held in two ways: in the pore space or capillaries sometimes called the interstices; and by adsorption on the solid surface of the clay and organic matter particles. The water exists in thin films of irregular size, shape and thickness. Sometimes the films are only a few molecules thick and are held by a tremendous cohesive force. This explains why many times crops may wilt and curl even in a moist soil. Plants at this stage have used the available soil moisture, the amount between field capacity and the permanent wilting point.

MOISTURE

Average moisture holding capacities for soils of the following textures are clays 3.5-3.9, clay loams 3.0-3.4, silt loams 2.7-3.1, loams 2.5-2.9, sandy loams 1.9-2.3 and sands 1.0-1.4 inches per foot of soil profile.

Moisture available to plants under average conditions for the soil textures are clays 2.0-2.2, clay loams 1.9-2.1, silt loams 1.7-1.9, loams 1.6-1.8, sandy loams 1.3-1.5 and sands 0.8-1.0 inches per foot of soil profile.

Certainly, some moisture exists in the soil after the permanent wilting point is reached, as the above figures show. This moisture, however, is held in the soil with a cohesive force greater than that exerted by the plant.

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