Field Office Guide to Climatic Data

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Introduction [TOC]

The Natural Resources Conservation Service is charged with management of not only soil, but all five SWAPA resources (soil, water, air, plants, animals), and human considerations. SWAPA management requires an understanding of the resources, as well as interactions between resources. Many concerns about the resource can be addressed through climate information and specific climatic data.

Climate is an important factor driving the agriculture of a given region (along with soils, water available for irrigation, societal influences, economics, others). Under many situations, climate is THE determining factor which defines which crops can be grown in an area. For instance, although the soils and economics of North Dakota may support growing cotton, the climate there (specifically temperature and precipitation) would not allow cotton to grow and mature.

This publication concerning climatic data is oriented to the NRCS role in American agriculture and natural resource conservation. It describes the NRCS National Water & Climate Center (NWCC) and its network of liaisons in each NRCS state office.

How to Use this Guide [TOC]

This guide is divided into 7 sections. Section 1 contains detailed information about climatic data elements, measurement methods, and problems associated with collecting climatic data. Sections 2, 3, and 4 provide material to help understand data collection systems. Section 5, Climate Terminology, contains definitions of climatic terms. Section 6 explains how climatic information can be obtained. Climatic data needs associated with a particular conservation practice are listed in Section 7.

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1 Climatic Data Element Descriptions, Measurement Methods, and Errors Associated with it's Collection. [TOC]

The following description of climatic data elements is a condensation of the material contained in the National Weather Service Observing Handbook No.2, Cooperative Station Observations, the Weather Station Handbook an Interagency Guide for Wildland Managers, and the American Meteorological Society Glossary of Meteorolog

Statistical analysis of climatic data generates descriptive information which reflects the average atmospheric conditions at a location, as well as generating probabilities that extreme events will occur. Any statistical analysis of climatic data, due mainly to the limited number of samples available, must follow the rules for statistical analysis. An important rule governing small sample analysis requires a minimum of 30 samples. Thi does not mean that climatic data with less than 30 years of data can not be analyzed, but that some adjustment be made to estimate what a 30 sample set would produce.

AIR TEMPERATURE - Temperature is a measure of the hotness or coldness of air. It is measured on some definitive temperature scale. Two scales are commonly used. The Fahrenheit and Centigrade temperature scales establish the freezing of water at 32/0 degrees respectively and boiling point at 212/100 degrees respectively. The Fahrenheit scale is used most frequently in the US and Centigrade throughout the rest of the world. Air temperature is usually measured with either a liquid-in-glass maximum and minimum thermometer mounted in a vented, wooden box or with an electronic sensor.

It is important that thermometers be shaded from sunlight to avoid an erroneously high measured temperature. Instrument shelters are designed to rectify this problem. For more information on instrument shelters, see the Weather Station Handbook - an Interagency Guide for Wildland Managers.

EVAPORATION - Evaporation is the physical process by which a liquid is transformed to a gaseous state. Evaporation is influenced by solar radiation, air temperature, vapor pressure, wind, and possibly atmospheric pressure. Evaporation varies with latitude, altitude, season, time of day, and sky condition. Accurate evaporation readings requires careful maintenance of an evaporation pan which contains water. The water depth is measured daily and adjusted for any precipitation which may occur.

PRECIPITATION - Precipitation refers to all forms of water, liquid or solid, that fall from the atmosphere and reach the ground. Precipitation includes, but is not limited to, rain, drizzle, snow, hail, graupel, sleet, and ice crystals. It is one of the most basic data elements collected by any climate station. Dew, frost and rime are excluded, since they are a result of water vapor in air condensing or freezing onto a surface.

The standard U.S. precipitation gage has an eight inch diameter mouth and height of about 30 inches. Non-recording gages simply collect precipitation; amount of precipitation must be measured by an observer. Recording gages have instrumentation which records the time, duration, and intensity of precipitation. Most recording gages store information on a paper strip, which is generally changed weekly by an observer. Precipitation intensity and duration, useful information for many NRCS design activities, can be derived from information gathered by precipitation gages.

The biggest factor in precipitation measurement error is wind. Strong winds during precipitation events can cause considerable differences between measured and actual precipitation. Measurement errors can also resu from small amounts of dew, frost, and rime accidentally included in the total measured precipitation. Even wit careful placement, all gages underestimate the real precipitation, particularly with snowfall.

NEW SNOW - New snow is the incremental amount of snow that has fallen since the last snow depth observation. Delineating between new snow and old snow presents a challenge. A snow board (generally a sheet of plywood) can provide an artificial surface at the top of the existing snow. Snow boards are laid on top of old snow when there is any possibility of new snow falling. After each observation of new snow, the board i cleaned and placed in a new location. Board placement and measurement location are the greatest source of error in determining new snow.

SNOW DEPTH - Snow depth is the actual depth of snow on the ground at the time of measurement. Snow depth is usually measured daily and determined to the nearest whole inch with a calibrated stick, such as that used with the 8-inch non-recording rain gage, or a ruler or yardstick. Snow should be measured in several locations and averaged to avoid errors induced by drifted snow.

SNOW WATER EQUIVALENT - The water equivalent of snow is the depth of water that would be obtained by melting the snow cover. Water equivalent of snow is continuously measured (weighed) by recording gages which are winterized with an antifreeze solution. For non-recording gages, the snow catch collected by the