A Century of Meteorological Observations at Fort Valley Experimental Forest: A Cooperative Observer Program Success Story

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Abstract—*Meteorological observations at Fort Valley Experimental Forest began with its establishment as early silvicultural research made heavy use of meteorological data. The Fort Valley weather data represent the longest climatological record for northern Arizona with records dating back to 1909. Importance of long term meteorological records and access to the weather record are described.*

Beginnings

Collection and use of meteorological data has always been an integral part of Forest Service research. The charge for Experiment Stations to keep meteorological records was spelled out in Zon (1908):

> *"Meteorological observations should be made at the Forest Experiment Stations, not only for the purpose of obtaining data which will show the influence of the forest on various factors of climate, but in order to furnish the data necessary for a proper understanding of all of the experiments in which the climatic factor enters into the results."*

Following this guidance, meteorological observations at Coconino Experiment Station (now Fort Valley Experimental Forest, FVEF) were among the first records kept by staff. Partnership between the U.S. Weather Service (then Weather Bureau) and the U.S. Forest Service through the Cooperative Observer Program (COOP) has continued from 1909 to the present.

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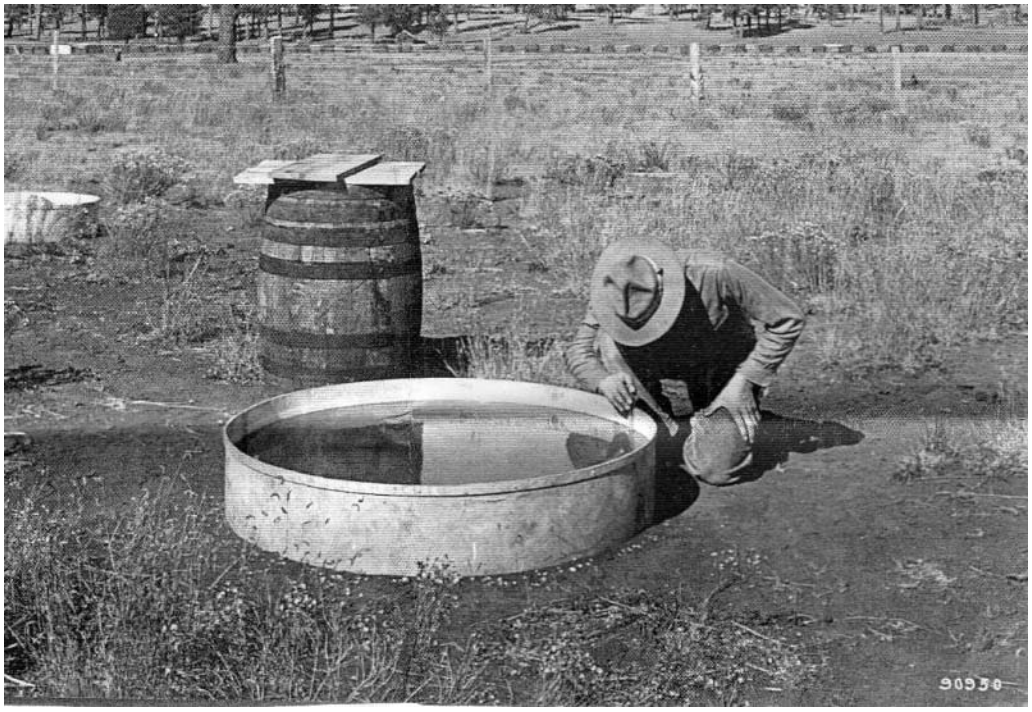
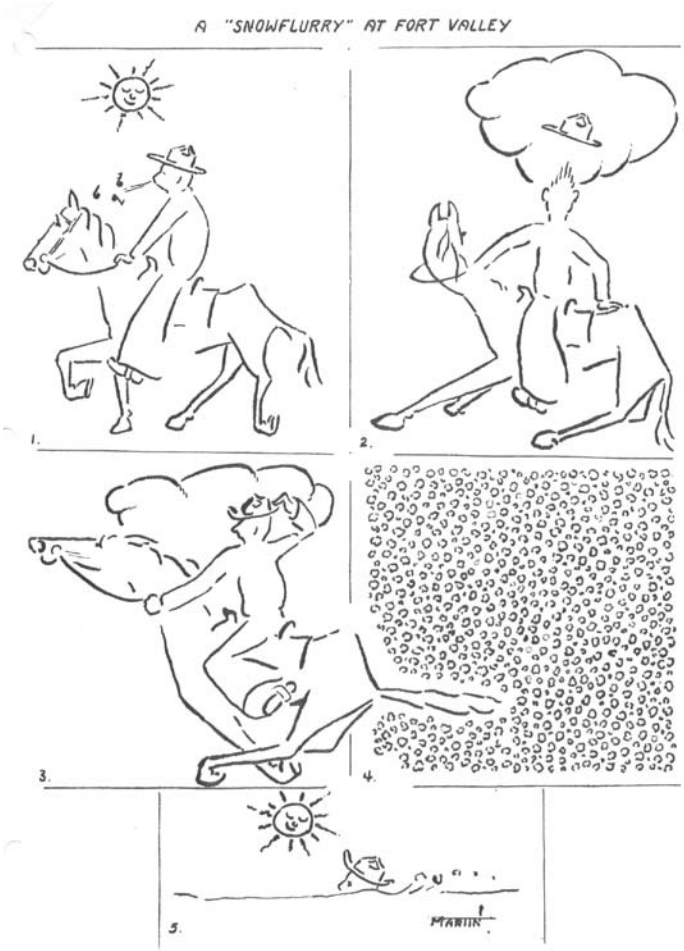


G. A. Pearson measuring water level in evaporation pan. Photo A. G. Varela, 1912. USFS photo # 90950



FVEF staff member Edward C. Martin drew this cartoon describing Fort Valley's fluctuating weather. He began work at Fort Valley in the early 1930s and retired in 1970. This cartoon is from the FVEF archives.

Early Research

Answering questions about ponderosa pine regeneration in the Southwest (or lack thereof) was the impetus for the creation of the FVEF. Early research was tightly intertwined with meteorological observations as illustrated by these early publications:

Mattoon, W.R. 1909. Measurements of the effects of forest cover upon the conservation on snow waters. Forest Quarterly. 7(3): 245-248.

Pearson, G.A. 1913. A meteorological study of parks and timbered areas in the western yellow-pine forest of Arizona. Monthly Weather Review. 41: 1615-1629.

Jaenicke, A.J., Foerster, M.H. 1915. The influence of a western yellow pine forest on the accumulation and melting of snow. The Monthly Weather Review. 43: 115-126.

Pearson, G.A. 1918. The relation between spring precipitation and height growth of western yellow-pine saplings in Arizona. Journal of Forestry. 16: 677-689.

Parameters Measured

Various meteorological parameters have been measured at Fort Valley including rainfall, snowfall, air and soil temperature, humidity, evaporation and wind. Near-continuous air temperature and precipitation records have been maintained since 1909. FVEF has the longest climatological record in northern Arizona.

In 1946 a snow course was established by the U.S. Department of Agriculture's Soil Conservation Service (now Natural Resources Conservation Service) as part of the Cooperative Snow Survey and Water Supply Forecasting program. This has resulted in a data record exceeding 60 years. Snow survey measurement data collected at the Fort Valley snow course are used to describe current snowpack conditions and to help predict snowmelt runoff. The goal of the Snow Survey program is to provide accurate and timely water resources information to help water managers and users make wise and informed decisions about the use of limited seasonal water supplies.

Modernization

The Fort Valley weather station was automated in 1994. A data logger was installed along with a heated tipping bucket rain gauge and temperature sensor, permitting these data to be retrieved remotely via phone line. This facilitated the continuation of the weather record since staff members were no longer living on site. Each half hour the most recent data is uploaded to the RMRS Flagstaff Lab web server that permits public access to very recent (provisional) data. These data can be accessed via the web from www.rmrs.nau.edu/fortvalley/. Following checks to assure quality, the data and metadata are available from the RMRS Data Archive (http://www.fs.fed.us/rm/data_archive/).

Arizona snow survey. 1965 NRCS photograph.

FVEF weather station as it is now. March 21, 2008.

In June of 2008 the Natural Resource Conservation Service installed snow telemetry (SNOTEL) equipment to automate collection of snow data near the existing manual snow course. This exciting development will increase the frequency of data collection (hourly) and make these data more rapidly available to the managers, researchers and the public via the NRCS SNOTEL web site (http://www.wcc.nrcs.usda.gov/snow/).

Significance

Long term meteorological records are of great value in many arenas of research. This is well illustrated by one of the more pervasive issues thus far in the 21st century—climate change. Much credit is due to those that foresaw the importance of meteorological observations, those that initiated the record keeping, and to the many people that helped keep the data flowing over the past century. While future land management issues and research directions are unknown it is safe to suggest that meteorological records will play a key role in many important future studies and that long term records, such as those from the Fort Valley weather station, will be particularly useful.

Reference

Zon, Raphael. 1908. Plan for creating Forest Experiment Stations. Internal Forest Service Memo. NARA-CP RG95 PI-18/Entry115 Box189.