Potential Weather Information for Management of Potatoes

Gerrit Hoogenboom
AgWeatherNet
Washington State University
Prosser, Washington 99350
Gerrit.Hoogenboom@wsu.edu
www.weather.wsu.edu

Traditionally the US Federal Government has been responsible for providing weather information to the citizens of the USA. Most people are familiar with the local weather forecasts that are issued by the National Weather Service (NWS; www.weather.gov), an agency of the National Oceanic and Atmospheric Administration (NOAA; www.noaa.gov). A second role of NWS and NOAA is to provide weather data through local monitoring stations. The more advanced and automated sites are normally located at airports of major cities to support the aviation industry, such as those located in Seattle-Tacoma, Wenatchee, Pasco and Yakima. In addition, NWS operates a network of Cooperative Observer Stations. Traditionally these sites were operated by volunteers who recorded the maximum and minimum thermometer and rainfall using traditional devices, including a liquid thermometer for temperature and a dipstick for rainfall. These volunteers were very dedicated and committed, as readings had to be taken at a fixed time each day, rain or shine and independent of holidays or weekends. There are many stations that have records that go back for at least a century. For Prosser, Washington, we have found paper records that go back as far as July, 1925. However, we found similar paper records for October, 2010. It seems that during the past 85 years not much progress had been made in recording local weather data for Prosser.

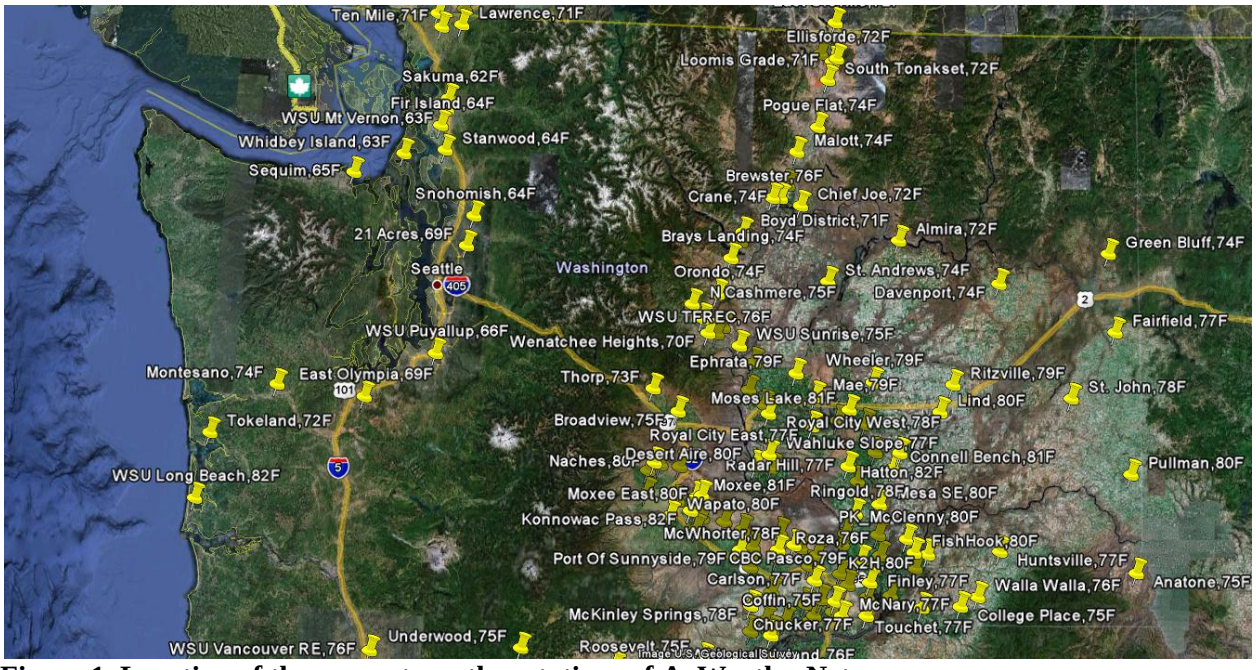

Figure 1. Location of the current weather stations of AgWeatherNet.

Many of the decisions that are made by potato growers are directly or indirectly affected by either past weather conditions, current conditions, or future conditions and forecasts. Although the NWS provides a wealth of weather information, it does not always address current agricultural issues. As a result, many Land-Grant Universities have developed automated weather station networks to specifically support local agriculture. Examples include the University of Nebraska, the University of Georgia that runs one of the largest weather networks in the southeastern USA (www.Georgiaweather.net) and Oklahoma University and Oklahoma State University, which operate one of the largest networks in the USA (www.mesonet.org). Washington State University (WSU) initiated the Public Agricultural Weather System (PAWS) in 1988. This initiative received support from many growers and producers in the Columbia Basin. Over the years the system has gone through many changes in instrumentation, communication and sensing technologies as well as management. In 2008, the network was upgraded to a state-of-the-art network and the network currently comprises 135 automated stations. The name of the network was changed from PAWS to AgWeatherNet several years ago. The location of the current weather stations can be seen in Figure 1.

Figure 2. Automated weather station at the Irrigated Agriculture Research and Extension Center (IAREC) in Prosser, Washington.

In addition to AgWeatherNet, there are many other weather monitoring networks in the Pacific Northwest. These networks are managed by various federal and state agencies as well as private companies. Installing a weather station is relatively easy, but maintaining a station that provides reliable and high quality data is a challenge. AgWeatherNet is in a position to maintain a network of automated stations that is well-maintained through direct financial support by WSU. A scheme has been developed for rotation and calibration of each sensor using the calibration facilities that are currently being developed at the Irrigated Agriculture Research and Extension Center (IAREC) in Prosser, Washington. There are also plans to hire a meteorologist who will be responsible for the daily quality assessment and quality control procedures. The goal of AgWeatherNet is to provide high quality data that are of benefit to growers, producers and others interested in local weather information.

Each weather station is a stand-alone unit that is powered by battery and solar panel. A weather station monitors air temperature, relative humidity, wind speed and wind direction, solar radiation, leaf wetness and soil temperature a depth of 8 inches continuously. The weather data

that are monitored are summarized every 15 minutes. Easy access to local weather data is as important as providing accurate data. PAWS and AgWeatherNet have moved from local radio telemetry communications to using cellular-based data telemetry and the internet for transmission of data between each weather station and local computer servers. AgWeatherNet currently has one data server located at the Tree Fruit Research and Extension Center (TFREC) in Wenatchee and one data server located at IAREC in Prosser. The data from each station are pulled every 15 minutes, sent to a local database in Prosser and pushed to a web server on the main campus of WSU in Pullman. Through the web site www.weather.wsu.edu users can retrieve current weather information, a summary of yesterday's weather data and many other customized data reports (Figure 3).

One of the strengths of AgWeatherNet is not only the dissemination of accurate weather data, but also weather-based tools and decision aids. Models for potato early and late blight have been implemented. There is also a simple tool for irrigation management. This information can not only be retrieved from the AgWeatherNet web site (www.weather.wsu.edu) using a regular personal computer, but also using a handheld or portable device (www.weather.wsu.edu/mobile). There is also an option to set an alert system that sends a text message to your cell phone based on preset threshold values for temperature and other weather variables (www.weather.wsu.edu/awn.php?favorite=show).

Communication and information technologies are rapidly developing. In parallel, scientific models and associated decision aids are also rapidly developing. Growers and producers are expected to make more timely and precise decisions in order to reduce production costs, while maintaining and improving product quality. AgWeatherNet is planning to emphasize the development and implementation of a range of models to support the local agricultural industry. Initially we are planning to develop both simple and more complex phenological models that can predict growth and development over time using local weather data from AgWeatherNet as well as crop and variety specific information. This will require using historical data bases on crop development as well as collecting detailed data where needed to help develop these models. Coupling current weather information, past weather data, weather forecasts and climate outlooks with these crop models will allow growers to have a better indication of the current status of a tree or crop and to make more informed management decisions. Ultimately the goal of AgWeatherNet is to not only provide timely and reliable data, but also to provide tools and decision aids which are relevant and can be easily accessed and applied.

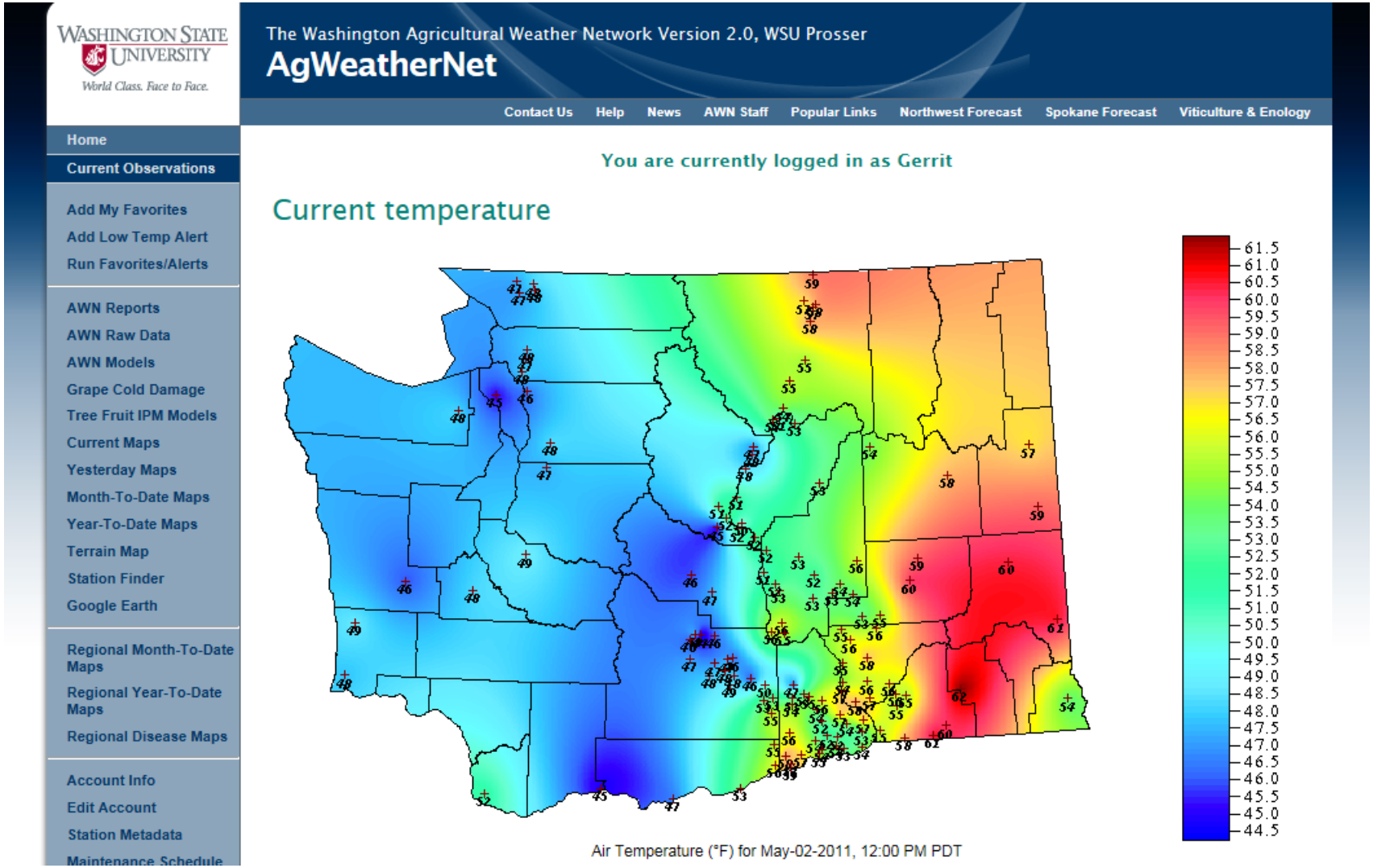

Figure 3. AgWeatherNet web site.