The Inland Northwest Informer
Information For Storm Spotters, Cooperative Observers And Everyone
A Publication Of WFO Pendleton, Oregon
Spring-Summer 2011 - Volume 8

January 2011 Flooding in Kittitas County

By Jon Mittelstadt, Science and Operations Officer and Marilyn Lohmann, Service Hydrologist

Synopsis

Rain falling on melting snow caused rapid runoff and flooding during the period from January 15 to 20, 2011. Minor flooding occurred in a number of locations in the NWS Pendleton forecast area (southeast WA and northeast OR) but Kittitas County, Washington, received the most damage.

Warm Temperatures and Snowmelt

The groundwork for flooding was established during the first half of the month, starting on the 5th of January, after a series of weather systems increased the mountain snowpack. Starting on January 14,, a southerly flow of warm air increased temperatures in the Washington Cascade Mountains. Temperatures were 10 to 15 degrees Fahrenheit above normal from January 14 to 18. Overnight low temperatures remained near or above freezing over the same period. (The Yakima, WA airport tied a record high temperature of 60 degrees for the day of January 16). These warm conditions created a significant melting of the mountain snowpack. For example, the chart below displays the snow water at the Sasse Ridge SNOTEL, located 14 miles north-northwest of Cle Elum, WA at an elevation of 4,340 feet. (SNOTEL, or SNOw TELmetry, stations are managed by the Natural Resources Conservation Service to measure mountain snowpack.) The navy blue line on the chart (figure 1) shows the snow water for the 2011 water year. The blue line spikes in the middle of January (located on the graph between the tick marks labeled 12/30 and 1/29). This spike represents the rapid increase in snowpack water during the first half of January, followed by the rapid melting that began January 14.

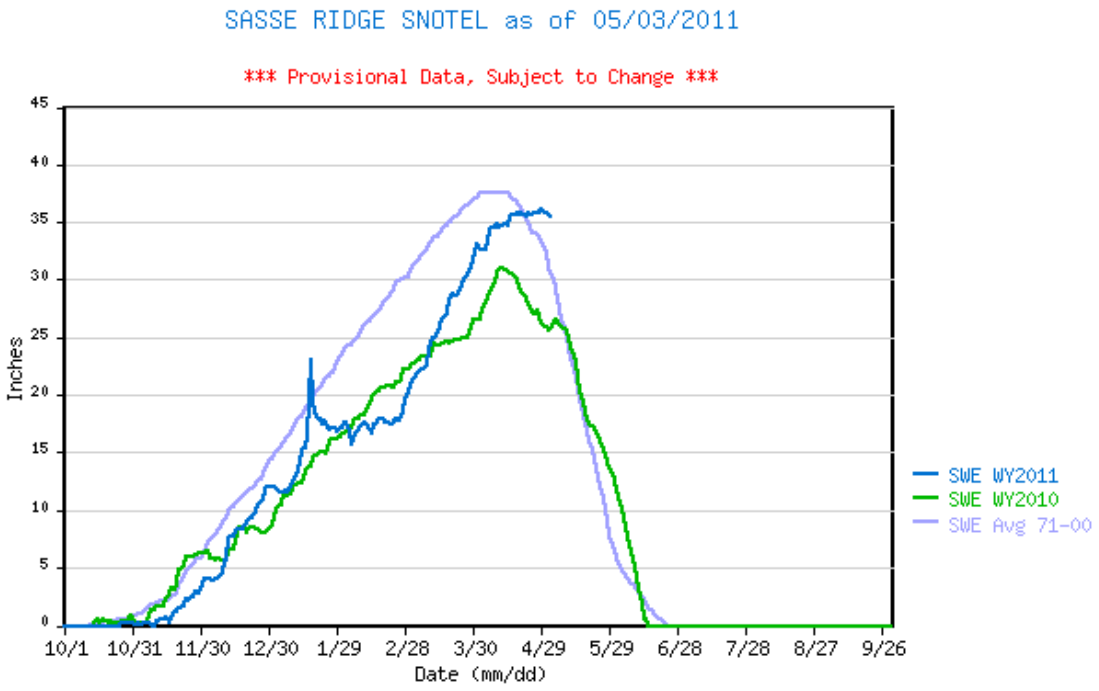

Figure 1: Snow Water Equivalent (SWE) measurements at Sasse Ridge, WA for water year 2011 (navy blue line), water year 2010 (green line) and the 1971-2000 average (lavender line).

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Heavy Rain

Between January 14 and 16, surges of warm, moist air from the Pacific Ocean produced periods of heavy rain. For example, the infrared satellite image shown below, from 7:30 pm PST on January 15, 2011, shows cloud top temperatures over the Pacific Northwest. The green shading stretching from the Pacific Ocean and crossing Kittitas County, WA indicates the position of an atmospheric river of moisture which brought heavy precipitation to the Washington Cascade Mountains. Snow levels rose above 5000 feet overnight on the morning of the 16th. Easton, WA received nearly 3.75 inches of rain from January 14 to 16. Cle Elum, WA received 1.85 inches of rain in 24 hours on January 16.

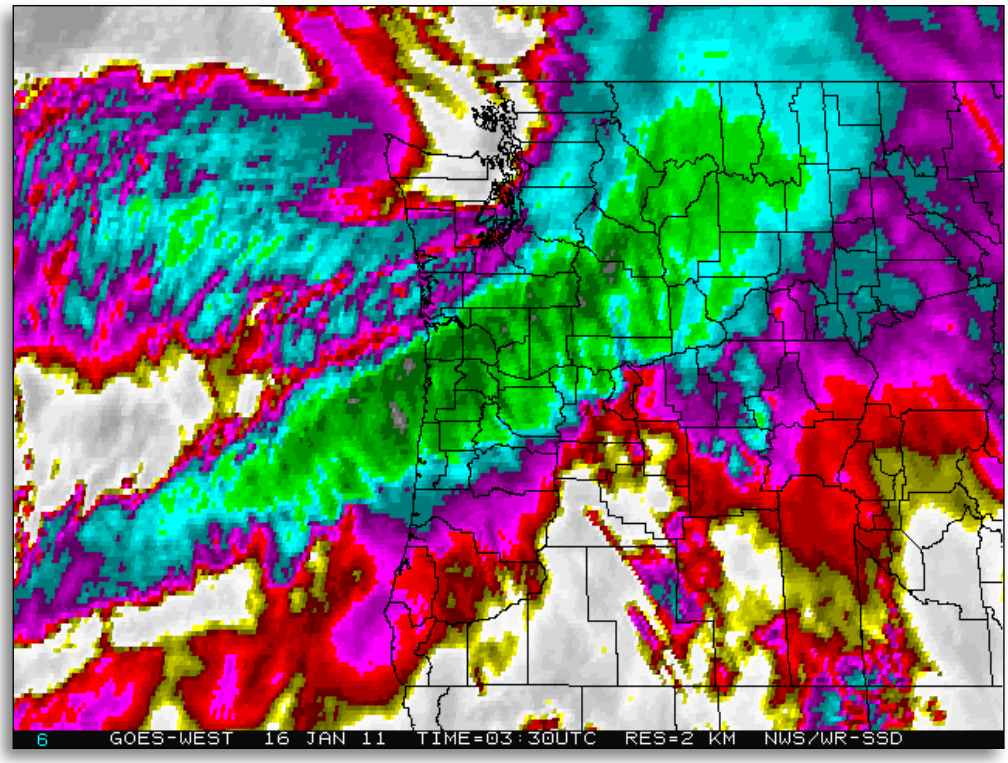


Figure 2: Infrared satellite image indicated cloud-top temperatures: dark gray-->light gray-->yellow ->red--> blue->green show the transition from warm to cold. The green temperatures indicate cloud tops colder than -70 degrees Celsius.

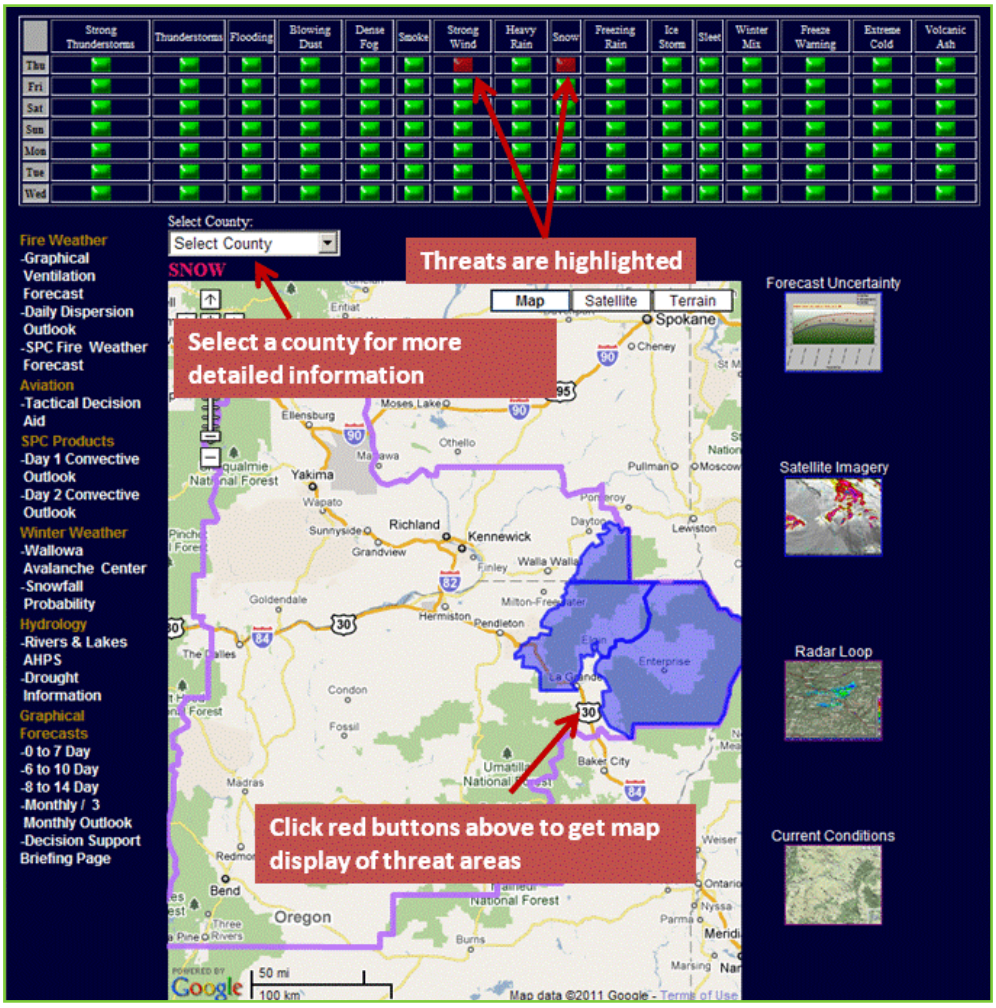
Flood waters surround a home along Dolarway Road in west Ellensburg, on Monday, January 17, 2011.

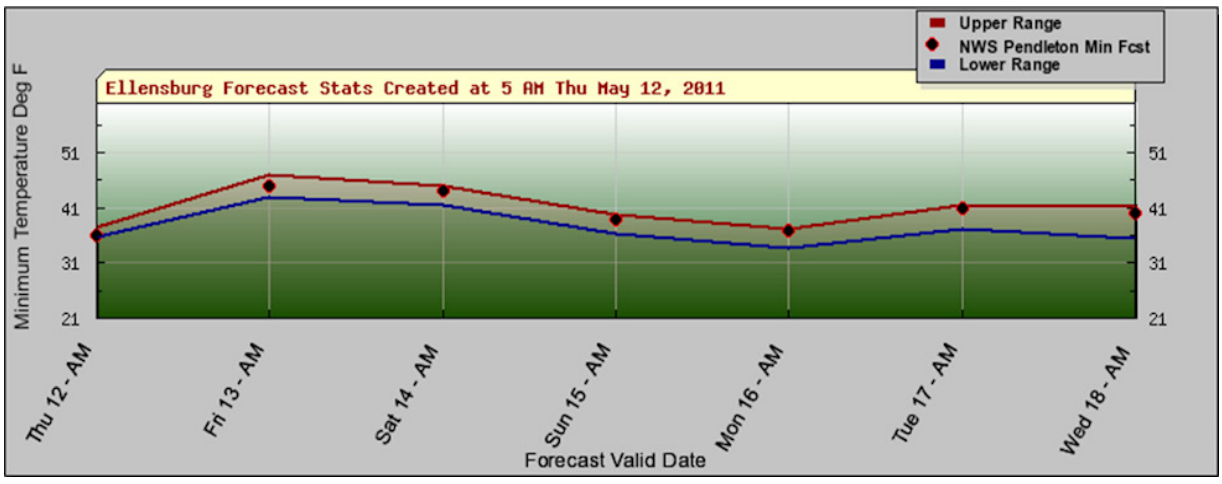
Photo by Brian Myrick/Ellensburg Daily Record

WFO Pendleton's Decision Support Webpage

By Mike Vescio, Meteorologist-In-Charge

WFO Pendleton's website features a Decision Support webpage that is a comprehensive source of weather information (see figure). Across the top of the page are the hazards for the next seven days. If an item is colored red that means a hazard exists somewhere in the forecast area for the time period specified. To find out where, click on the red button and the region of concern will highlight on the map. You can also drill down to the county level by selecting specific counties from the drop down menu above the map. On the left hand side of the page are useful links to web sites such as the Storm Prediction Center convective outlooks which should be a part of any weather briefing. On the right side of the page are links to Satellite, radar and observational data as well as a relatively new feature: forecast uncertainty data. Our office has created forecast plumes out to 7 days for maximum and minimum temperature for several stations in our forecast area. These diagrams represent the envelope of possible temperatures based on our average error for a given forecast. The diagram below provides an example of these forecasts. The points represent the actual forecast and the plume represents the range of possible values. As you can see the Decision Support page is loaded with information and we certainly hope you visit the site as part of your daily routine.





Minimum temperature forecasts for days 1 to 7 issued by the NWS office in Pendleton, OR (black points with red circles). The red and blue lines represent the error of NWS forecasts over the last 30 days for the given location. The black points can be considered the most likely forecast; the shading between the red and blue lines shows an estimate of the range of possible temperatures.

Water Year Precipitation
October 2010 - March 2011

By Marilyn Lohmann, Service Hydrologist

Station	Amount In Inches	Percent of Normal
Bend	10.80	141%
Condon	10.41	116%
Dufur	8.90	92%
Heppner	9.73	115%
John Day City	8.32	121%
Joseph	9.19	122%
LaGrande	12.10	120%
Madras 2N	7.46	97%
Meacham	29.67	107%
Milton-Freewater	10.93	111%
Moro	8.72	111%
Pelton Dam	7.42	101%
Pendleton, WFO	11.12	138%
Pilot Rock	12.06	148%
Prineville	9.49	149%
Redmond Airport	6.45	132%
Seneca	11.82	155%
The Dalles	10.23	88%
Wallowa	12.21	123%
Wickiup Dam	18.61	116%
Clel Elum	20.19	113%
Dayton	14.63	114%
Ellensburg	6.04	98%
Hanford	4.81	104%
Ice Harbor Dam	8.64	120%
McNary Dam	7.36	136%
Mill Creek Dam	15.36	121%
Mt Adams RS	44.93	126%
Prosser	6.63	128%
Sunnyside	5.70	120%
Whitman Mission	12.15	135%
Yakima Airport	5.97	106%

October 2010 was wetter than normal with November 2010 cool and drier than normal. December was much wetter than normal. January saw flooding at mid month, due to moderate rain and warm temperatures, but ended up surprising drier than normal. February was drier and cooler than normal and March was much wetter and cooler than normal. So for the first half of the water year, overall conditions are wetter than normal.

Did You Know?

On June 11, 1968...a severe thunderstorm produced golf ball sized hail and a tornado over Wallowa County. With a path between 8 and 10 miles long and nearly 2 miles wide, the tornado was one the strongest tonadoes to ever occurr in the pacific northwest. It destroyed approximately 1800 acres of prime timber.

On July 3, 1998...nearly stationary thunderstorms produced heavy rain along and near Manastash Ridge. An automated rain gauge reported 2.99 inches of rain. A flash flood washed out portions of Canyon Road between Yakima and Ellensburg, Washington. 200 people were stranded by landslides.

On July 9, 1995...a severe thunderstorm developed near Redmond, Oregon, and traveled nearly 200 miles before dissipating. This thunderstorm produced baseball sized hail from Condon to Hermiston. It also spawned flash floods, damaging winds and even a brief tornado elsewhere along its path, causing tens of millions of dollars in damage to crops, structures, and property.

Climate Outlook Interpretation

How to read CPC climate products

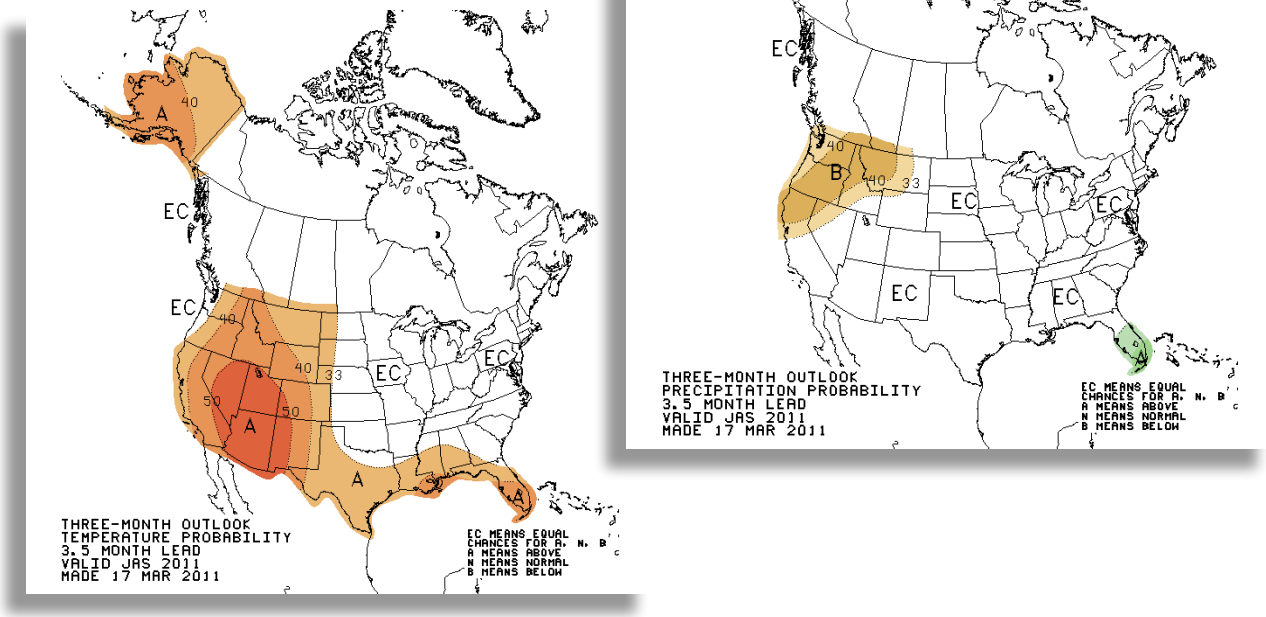
By Diana Hayden , Meteorologist

Have you looked at the Climate Prediction Center's 3-month outlook and wondered what the forecaster used to make the forecast? Have you wondered what the colors and lines mean? Now is your chance to find out how the 3-month outlook is created and how to read it.

There are many different forecast models and statistical tools that go into each forecast put out by the Climate Prediction Center (CPC). One of the models uses several different runs of a dynamic model of the ocean and atmosphere to come up with a mean forecast of all the runs (an ensemble mean). Each of the runs in the model was also influenced by using model runs of past conditions. Another tool that goes into the forecast is the Optimal Climate Normals. This tool uses the difference between the most recent 10-year mean of temperature or the 15-year mean of precipitation for a given location, the time of year, and the 30-year climatology period (1971-2000 in this case). An analysis which predicts the evolution of patterns of temperature and precipitation based on the patterns of the global sea-surface temperatures, the 700 mb heights and the United States surface temperatures and precipitation from the past year is also used. Averages of observations during El Nino, La Nina, and ENSO neutral years are also used to provide a guidance for effects of El Nino and La Nina on the current forecast. If you are interested in learning more about these and other tools, you can refer to the CPC webpage at:

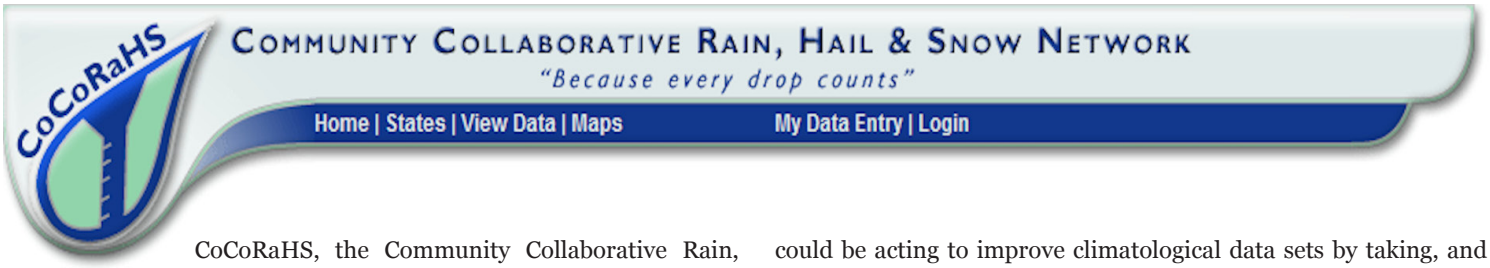
http://www.cpc.ncep.noaa.gov/products/predictions/long_range/tools.html

Once the forecast is produced, the maps can be created. Using the 30 observation years that make up the climate normals (for these maps 1971-2000), the coldest or driest 10 years are defined as the Below category, the warmest or wettest 10 years is defined as the Above category, and the remaining 10 years in between are defined as the normal category. Using the forecast, the forecaster determines which of the extreme categories is the most likely to occur, and they then assign probabilities higher than 33.3% to that category. In most situations, the Normal category will remain 33.3%, therefore to equal 100%, the opposite extreme category will be decreased accordingly. Situations where the Normal category change are when the favored category of Above or Below reach 70% or higher. If for example, the forecaster decides that there is an 80% chance of Above normal conditions, the Below normal category will then be fixed at 3.3% and the probability of the Normal category will be adjusted down so that the total will be 100% (16.7% in this case). In regions that the forecaster has no forecast tools favoring the chance of either Above or Below normal, the chance of these two categories is set at 33.3% and labeled EC, or equal chances. The contours are then drawn at 10% intervals, and the shading helps to indicate different levels of probabilities above 33.3%.



CoCoRaHS Update!

By Rachel Trimarco, Meteorologist



CoCoRaHS, the Community Collaborative Rain, Hail, and Snow Network, has been active in Washington and Oregon for much of the past year. To date, there are over 200 active volunteer precipitation observers in the Inland Northwest (WA and OR on the east side of the Cascades). However, we are always looking for more volunteers. We would like to achieve the national goal of 1 observer per square mile in urban areas, and 1 observer per 36 square miles in rural locations. If you have ever been interested in the weather, this is the best time of year to become involved with CoCoRaHS. Summer is fast approaching, and your rain and hail reports are incredibly important.

What is CoCoRaHS? It is a unique, non-profit, community-based network of volunteers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow). Automated surface observations are everywhere these days, and far outnumber the amount of manual reports being taken. In a very real way, you could be acting to improve climatological data sets by taking, and reporting, your rain and snow observations!Why is CoCoRaHS important? Precipitation is essential for life. As many of us know, it can vary greatly with topography, storm type and season. It really is true that it can pour on one side of the street and be dry on the other. Snowfall may pile up in one neighborhood and only dust another. Meteorologists, engineers, hydrologists, entomologists, insurance experts, and building contractors are all very interested in precipitation. And for some, like the many farmers of our region, it is their very livelihood.

How to become a volunteer? You can become a volunteer by signing up via our Web site: www.cocorahs.org. Online training materials are available, as well as links to purchase the official 4" rain gauges. You may also inquire about upcoming local training sessions in your area by contacting your local coordinators at Rachel.Trimarco@noaa.gov, or Diana.Hayden@noaa.gov.

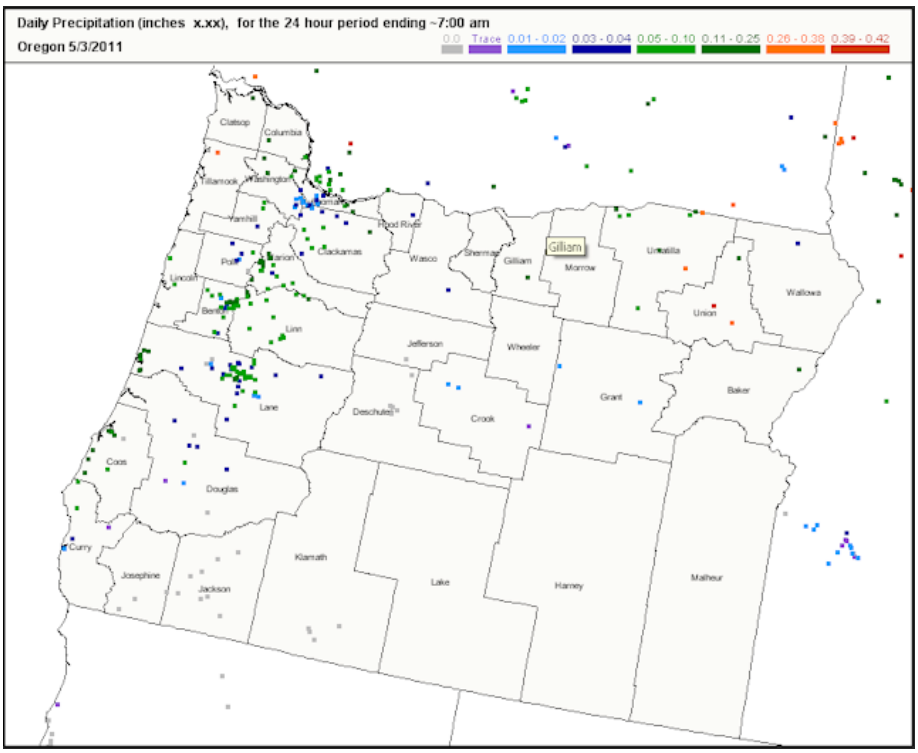


Photo Album

Spring thunderstorm over the city of Pendleton, April 2011. Photo by R. Cloutier.

Late season snow on the Blue Mountains of northeast Oregon, April 2011. Photo by R. Cloutier.

A developing Cumulonimbus over eastern Grant County, June 2010 Photo by A. Adams.