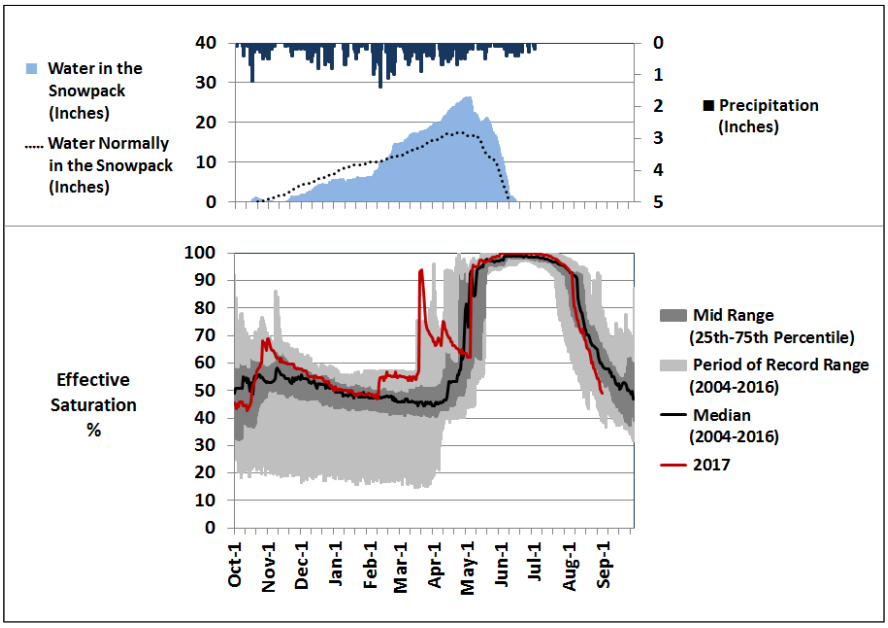
Northeast Oregon Mountain Soil Moisture September 1st, 2017 (5 sites)

Despite an above normal snowpack that lasted 1 to 2 weeks longer than normal, rapid snowmelt followed by rapid drying of soils resulted in slightly lower than normal spring soil moisture levels. After the snowpack melted, soils received very little water inputs from precipitation and dried quickly. Tipton SNOTEL has been removed from this report due to sensor failure.

Mt Howard, 7910' elevation

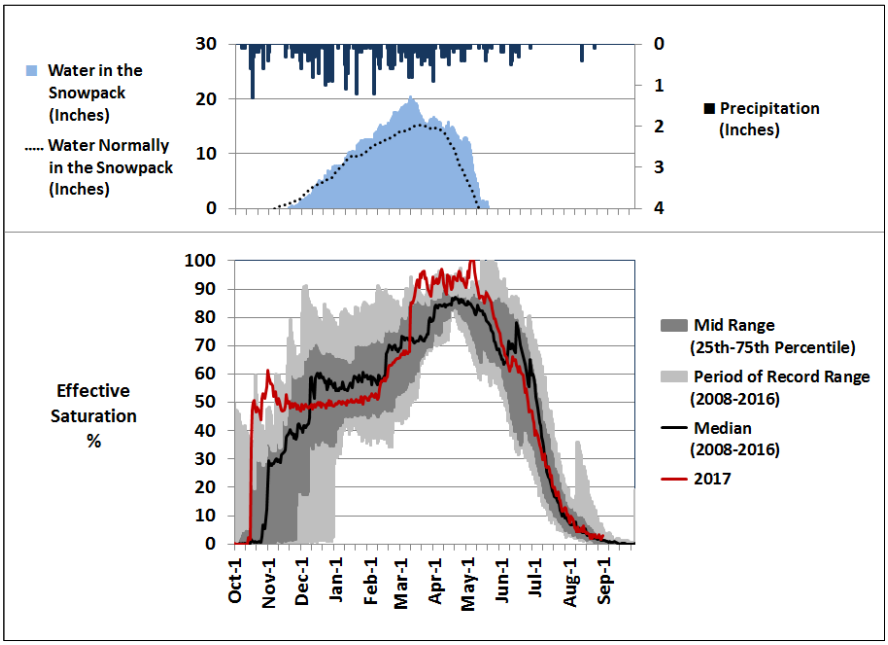
- As of September 1st, the soil moisture is 49% effectively saturated, when normally it is 59%.
- Snowpack melted out on June 15th this year, about a week later than normal.



Site Characteristics: Mt. Howard SNOTEL site sits on soils formed in volcanic ash over colluvium from argillite. The soil series is Angelpeak which consists of deep and very deep, well drained soils on mountains. The site has a slope of 10 percent. Mean annual precipitation is approximately 44 inches, with roughly 45% falling as snow. Vegetation is subalpine fir, lodgepole pine and western larch with an understory of elk sedge and grouse blueberry. Soil moisture probes have been installed here since 2004, at depths of 2, 4, 8 and 40 inches. The silt equation is currently being applied to all probes.

Bourne, 5850'elevation

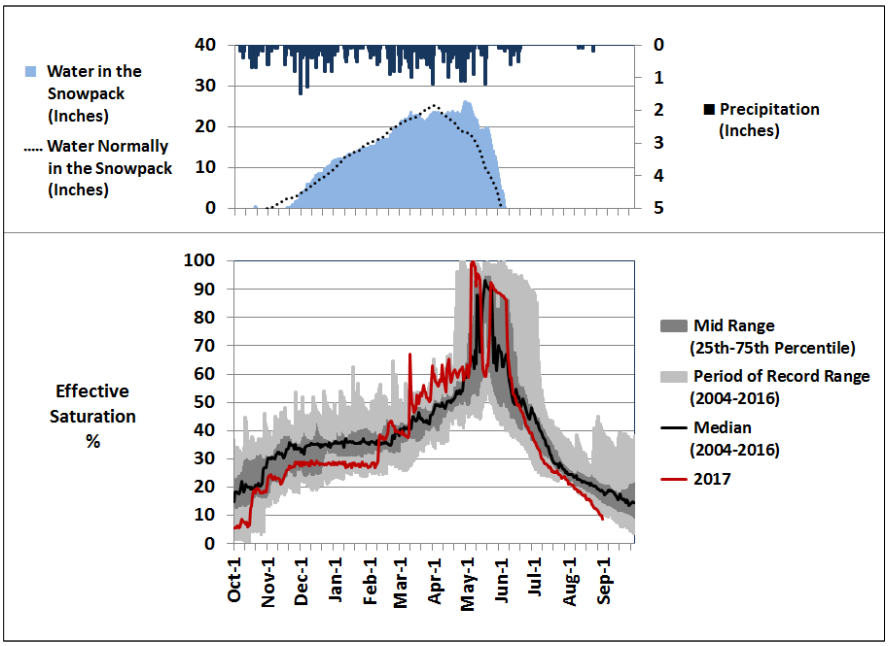
- As of September 1st, the soil moisture is 3.1% effectively saturated, which is normal for this time of year.
- Snowpack melted out on May 20th this year, a week later than normal.



Site Characteristics: Bourne SNOTEL site sits on volcanic soils formed from ash overlying colluvium and residuum from andesitic basalt and basalt. The soil series is Monumentrock, which consists of deep, well drained soils. The site has a slope of 25 percent. Mean annual precipitation is approximately 33 inches, with roughly 50% falling as snow. Vegetation is subalpine fir, lodgepole pine, western larch, grand fir, Douglas fir, grouse huckleberry, bearberry, buffalo berry, willow, sickletop lousewort, heartleaf arnica, pearly everlasting, grasses and sedges. Soil moisture probes have been installed here since 2008, at depths of 2, 4, 8 and 40 inches. The silt equation is currently being applied to all probes.

Moss Springs, 5760' elevation

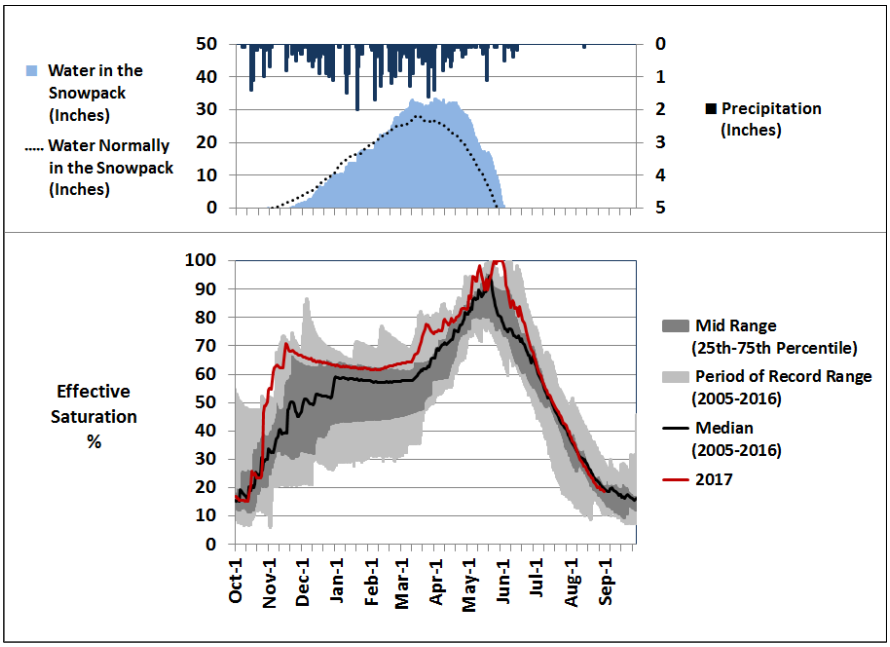
- As of September 1st, the soil moisture is 8.8% effectively saturated, when normally it is 18%.
- Snowpack melted out on June 5th this year, which is about normal for this site.



Site Characteristics: Moss Springs SNOTEL site sits on volcanic soils formed from ash over igneous-basalt. The soil series is Mountemily, which consists of very deep, well drained soils on ridgetops, side slopes and shoulders of mountains. The site has a slope of 10 percent. Mean annual precipitation is approximately 51 inches, with roughly 50% falling as snow. Vegetation is lodgepole pine, subalpine fir, western larch, Engleman spruce, huckleberry, twinflower, Oregon boxwood, prince's pine, sidebells pyrola, herbaceous plants, grasses and sedges. Soil moisture probes have been installed here since 2004, at depths of 2, 4, 20 and 40 inches. The silt equation is currently being applied to all probes.

Schneider Meadows, 5400' elevation

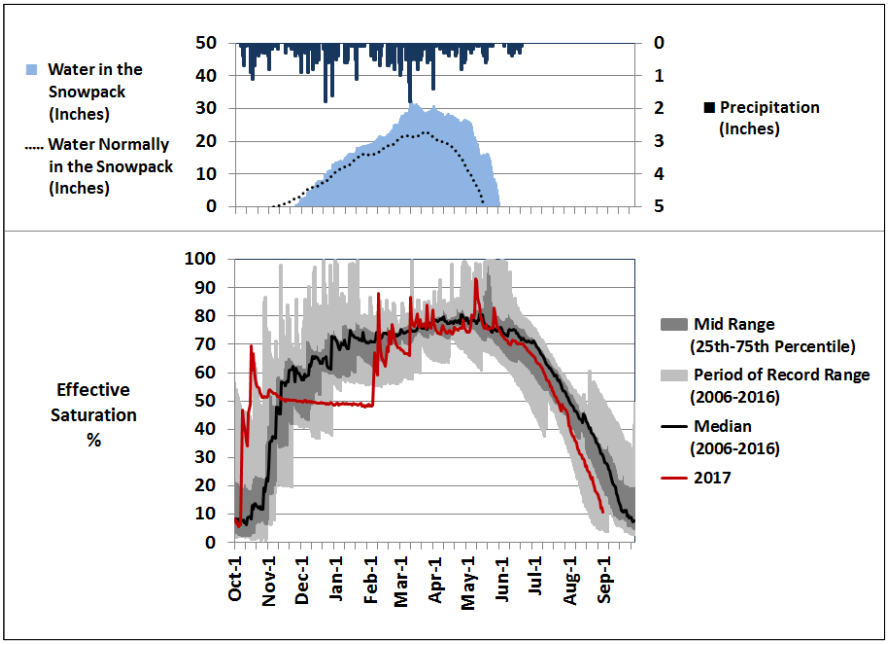
- As of September 1st, the soil moisture is 19% effectively saturated which is normal for this time of year.
- Snowpack melted out on June 2nd this year, which is also about normal for this site.



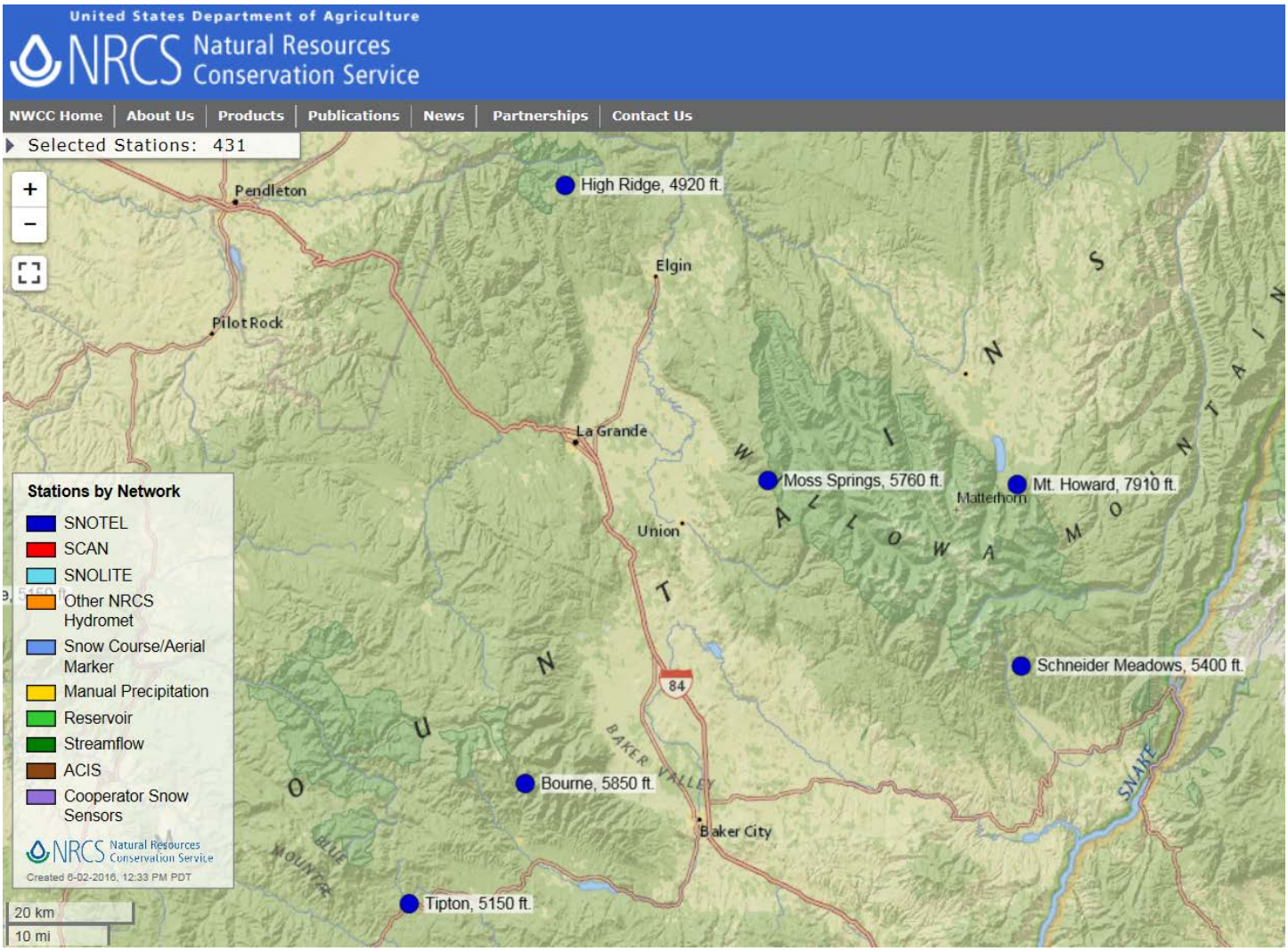
Site Characteristics: Schneider SNOTEL site sits on volcanic soils formed from tephra derived from basic-ash and/or alluvium. The soil series is Tovame which consists of very deep, somewhat poorly drained soils, formed in alluvium from mixed rocks on terraces on mountain valley floors. The site has a slope of 1 percent. Mean annual precipitation is approximately 48 inches, with roughly 60% falling as snow. Vegetation is lodgepole pine, quaking aspen, sagebrush, herbaceous plants, grasses and sedges. Soil moisture probes have been installed here since 2005, at depths of 2, 20 and 40 inches. The silt equation is currently being applied to all probes.

High Ridge, 4920' elevation

- As of September 1st, the soil moisture is 11% effectively saturated when normally it is 31%.
- Snowpack melted out on May 30th, which is about two weeks later than normal.



Site Characteristics: High Ridge SNOTEL site sits on volcanic soils formed from colluvium derived from ash over colluvium derived from rock. The soil series is Tamara, consisting of very deep, well drained soils formed in a mantle of ash overlying material derived from a mixture of loess and colluvium and residuum from basalt. The site has a slope of 10 percent. Mean annual precipitation is approximately 50 inches, with roughly 47% falling as snow. Vegetation is grand fir, spruce, Douglas fir, western larch, ponderosa pine, lodgepole pine, twinflower, big huckleberry, herbaceous plants, grasses and sedges. Soil moisture probes have been installed here since 2006, at depths of 4, 8 and 20 inches. The silt equation is currently being applied to all probes.



Percent Effective Saturation (S_e) is a soil's moisture level, scaled between its saturated water content and its residual water content:

$S_e = (\Theta - \Theta_r)/(\Theta_s - \Theta_r)$

Where: S_e is the effective soil saturation
Θ is water content read by a probe
Θ_r is the residual water content (the minimum water content a probe consistently reaches during dry periods)
Θ_s is the saturated water content (the maximum water content a probe consistently reaches during wet periods)

Example: if a probe consistently records 0.40 volumetric water content during peak soil moisture conditions and 0 during the driest time of the year, 0.40 is considered 100% effective saturation for that soil.

Percent effective saturation for a profile is calculated using the weighted mean of soil moisture read by sensors' at various depths (usually 2, 4, 8, 20 and 40"). Each horizon of a profile is assigned a daily soil moisture value by the soil moisture sensor within that portion of the profile. If no soil moisture sensors intersects a soil horizon, the soil moisture in that depth is assigned to the top or bottom sensor depending on its relative proximity to those sensors.

Interpreting Soil Moisture Plots

The soil moisture plots display effective saturation by percent which is calculated using daily SNOTEL data. They show how the current year's soil moisture data compares to historical data at a site. The current water year's soil moisture line (red) can be compared to normal soil moisture (median) line (black), as well as the historic range for the site. This gives users important context about the current year and historic variability of soil moisture in the profile.

To give the reader greater insight into what surface water inputs the soil moisture probes are reacting to, the graph above the soil moisture plot show snow water content in light blue and the hyetograph (increments of precipitation) in dark blue.

The grey shaded areas represent different percentiles of the historical range of the soil's effective saturation for each day. The light grey shading indicates the lows and highs in the data record (minimum to the 25th percentile and the 75th percentile to maximum). The dark grey shading indicates the interquartile range between the 25th to 75th percentiles, while the median is the 50th percentile. A percentile is the value of the effective saturation below which the given percent of historical years fall. For instance, the 75th percentile line indicates that the effective saturation has been below this line for 75 percent of the years of record.