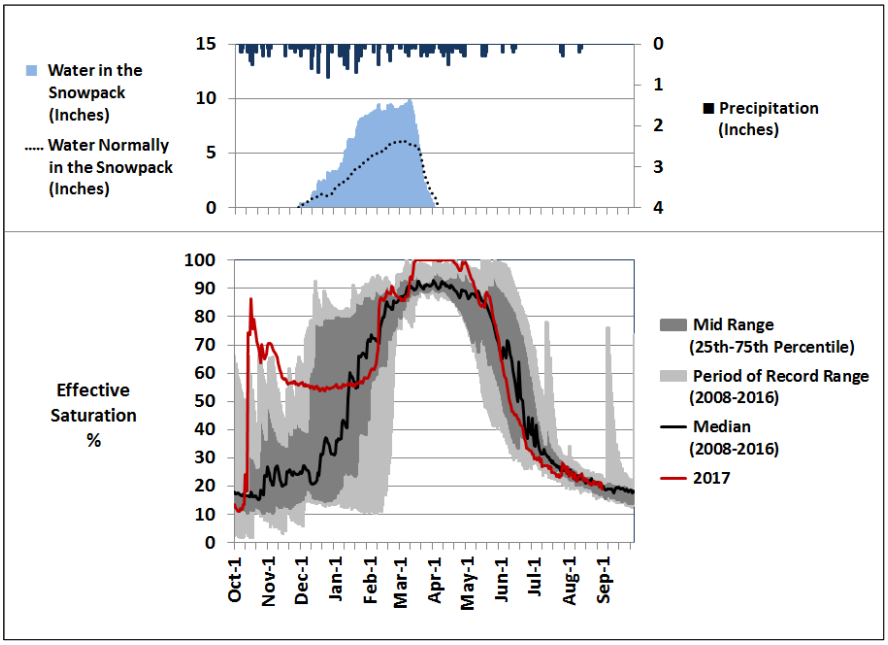
Malheur Basin Mountain Soil Moisture September 1st, 2017 (2 sites)

Despite above normal amounts of snow this year, rapid melt led to relatively normal timing of melt out. Overall, soil moisture in this region remained near or above normal saturation levels for longer than usual this winter and spring, especially in the shallow soil profile at Rock Springs SNOTEL. After the snowpack melted, soils received very little water inputs from precipitation and dried quickly.

Rock Springs, 5290' elevation

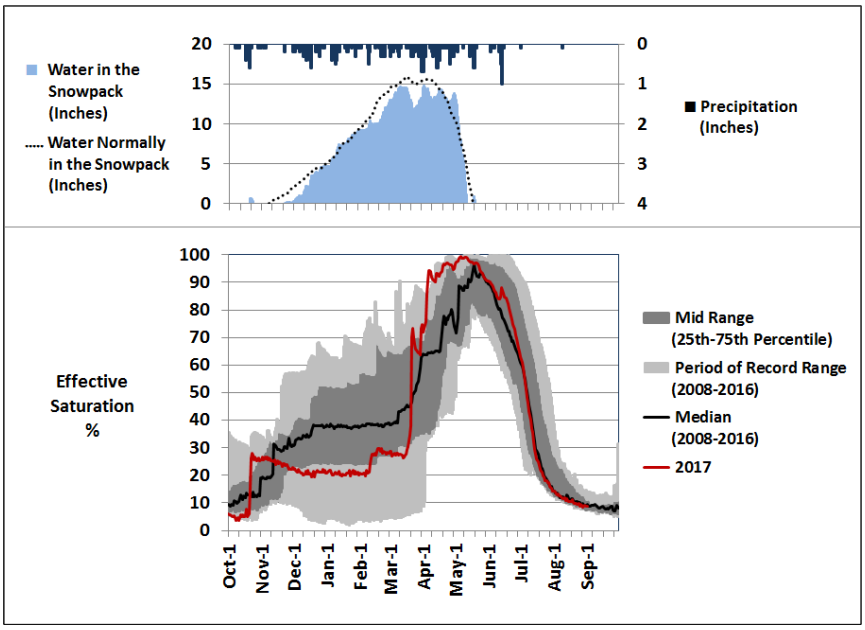
- As of September 1st, the soil moisture is 19% effectively saturated, which is normal for this time of year.
- Snowpack melted out on March 31st, which is also normal for this site.



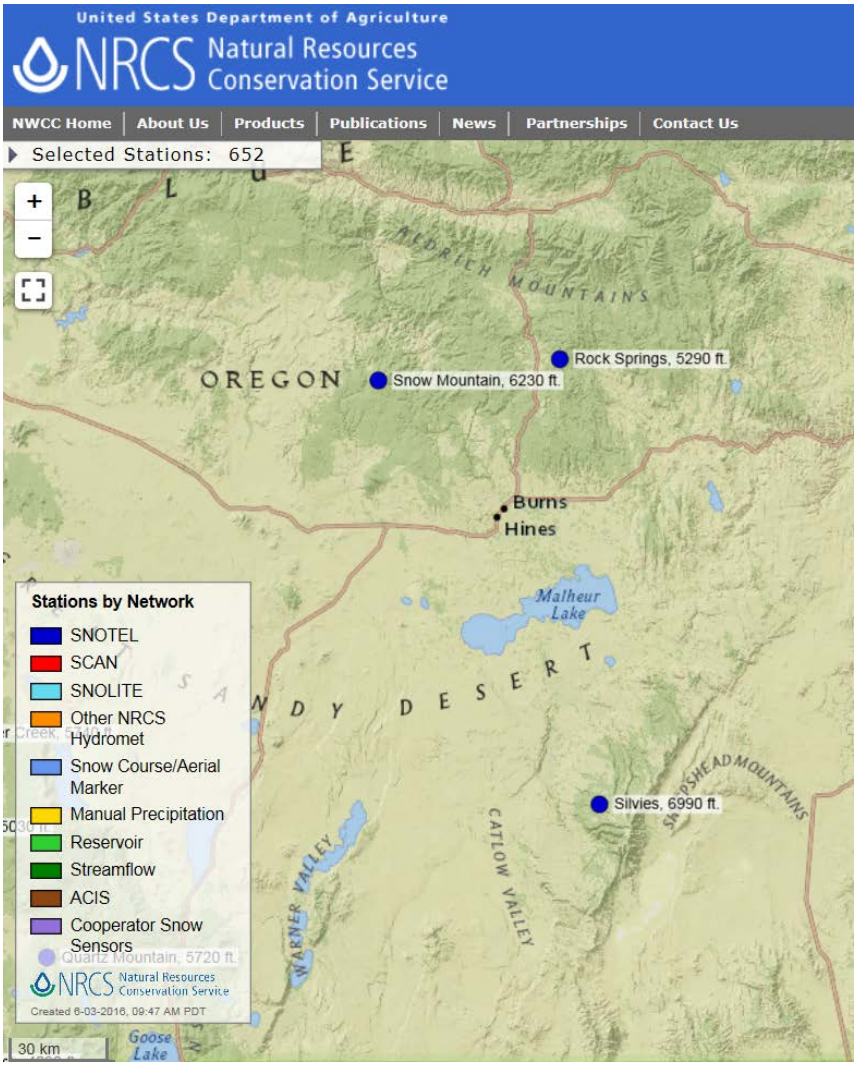
Site Characteristics: Rock Springs SNOTEL site sits on volcanic soils formed from volcanic ash and/or loess and/or clayey residuum weathered from andesite. The soil series is Dupratt, which consists of moderately deep, well drained soils that formed in basaltic colluvium and residuum with ash and loess in the surface layers. Dupratt soils are on plateaus and benches and on south slopes. The site has a slope of 7 percent. Mean annual precipitation is approximately 18 inches, with roughly 38% falling as snow. Vegetation is Ponderosa pine, snowberry and elk sedge. Soil moisture probes have been installed here since 2008, at depths of 2, 4 and 8 inches. The silt equation is currently being applied to all probes.

Silvies, 6990' elevation

- As of September 1st, the soil moisture is 8.8% effectively saturated, which is normal for this time of year.
- Snowpack here melted out on May 12th, which is also about normal for this site.



Site Characteristics: Silvies SNOTEL site sits on the Hackwood soil series which consists of very deep, well drained soils that formed in alluvium and colluvium derived from quartzite, conglomerate, and igneous rocks with a component of loess. The site has a slope of 2 percent. Mean annual precipitation is approximately 31 inches, with roughly 58% falling as snow. Vegetation is forest canopy of quaking aspen with a sparse understory of mountain brome and tall bluegrass. Soil moisture probes have been installed here since 2008, at depths of 2, 8, 20 and 40 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.