

### 3/1/2017 Hole in Mountain SNOTEL – Update

**Summary:** Snow accumulation at the new Hole in Mountain SNOTEL location is much greater than the original location due to drifting. The snow water medians from the original Hole-in-Mountain SNOTEL location do not represent accumulation at the new site, so these snow medians will no longer be used in calculating basin snow percentages. At this time averages for precipitation and soil moisture will continue to be used in those basin percentages.

*Snow surveyor Logan Jensen contemplates deep snow at the new Hole in Mountain SNOTEL 3/2/17*



**Full Explanation:** Hole-in-Mountain SNOTEL was rebuilt in a new location in October 2016 after being destroyed by an avalanche in December 2015, a news release attached below gives more information. The Hole-in-Mountain basin is prone to strong wind. The new location is in a topographic hole where the wind deposits snows. The old location was exposed to the wind and snow was scoured from the site. Unfortunately, it is either one or the other in this high mountain cirque. Snow tube samples this winter at both the old and new locations confirms that the new site accumulates much more snow. See table below.

Date	Snow Depth (inches)		Snow Water Content (inches)	
	Old Site	New Site	Old Site	New Site
1/4/2017	45	64	11.0	15.80
1/26/2017	70	114	23.0	34.00
3/2/2017	73	140	38.7	70.30

*Snow tube measurements made at old and new Hole in Mountain SNOTEL locations, winter 2017*

A location that gets more snow was preferred during site selection. From that point of view the new location is better. That said, the old normals (medians) for snow no longer represent the accumulation pattern at the new location. Applying the medians from the old site to the new site was inflating basin snow percentages. The snow medians were therefore removed and basin percentages are now calculated using other nearby sites without Hole in Mountain. The table below lists the sites used to calculate Clover Valley and Franklin River basin snowpack. Hole in Mountain SNOTEL snow water and depth will still be visible, but since the median has been removed this data will no longer be used in [basin calculations](#) or [update reports](#) for snow percentages.

Clover Valley & Franklin River Basin	Network	Elevation (ft)	Location
			East or West Side of Ruby - Humboldt Crest
Robinson Lake - Aerial Marker	SC	9200	East
Lamoille #5	SC	8814	West
Corral Canyon	SNOTEL	8440	West
Dorsey Basin	SNOTEL	7870	West
Green Mountain	SNOTEL	8180	West
Hole-in-Mountain (removed)	SNOTEL	8175	West
Pole Canyon	SNOTEL	7760	East
Pole Canyon #2	SC	7700	East
Lamoille #3	SNOTEL	8025	West

*Sites used in Clover Valley and Franklin River Basin Snow Percentages (SC = snow course)*

Of these sites only Robinson Lake Aerial Marker, Pole Canyon #2 Snow Course and Pole Canyon SNOTEL are east of the Humboldt/Ruby crest. Pole Canyon SNOTEL was installed in 2013, so is too new to have meaningful normals. The remaining sites are west of the crest and outside the basin. These west-side sites were added to basin calculations in 2015 prior to the avalanche to increase the number of sites used in calculations. Adding nearby sites, across a divide is commonly done in other areas of the country. Before these sites were added to the Clover Valley and Franklin River basin group a statistical analysis was done between the original Hole in Mountain SNOTEL and the other sites. The analysis showed a strong relationship. This was expected as snowpack across any region tends to be very relational, in other words if the snowpack percentage is high on one side of a mountain range, the other side of the range typically has a similarly high percentage. This doesn't mean the exact amount of snow water at each location is the same, as the leeward side of the range generally has less water because of the rain shadow effect. Due to this the sites on the leeward side typically have median values that are also lower. Since both numbers shift the same way, the percent of median is similar on both sides of a mountain range.

Moving forward snow surveyors will continue to make measurements at both new and old sites, until we feel confident in creating a new median that represents the new location. At this point the precipitation and soil moisture averages appear to produce basin averages in line with surrounding areas, therefore we will keep these averages and include Hole in Mountain in basin calculations for these data types.

For questions please contact Jeff Anderson at 775-875-8500 extension 152 or [jeff.anderson@nv.usda.gov](mailto:jeff.anderson@nv.usda.gov)



**For Immediate Release**

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**Hole in Mountain SNOTEL Rebuilt in New Location**

**Reno, Nevada – Dec. 13, 2016** – Hole in Mountain SNOTEL, south of Wells, Nevada in the East Humboldt Mountains, was rebuilt in a new location and brought back online on October 20, 2016. The weather station had not reported data since it was destroyed by an avalanche on December 23, 2015. This was the second avalanche to hit the SNOTEL. The first avalanche was in February 1986, after which the site was rebuilt in the original location. This time, the station was moved about 450 feet south and located behind a small ridge to protect the site from future slides.

Hole in Mountain SNOTEL is one of over 850 such weather stations operated by the USDA Natural Resources Conservation Service (NRCS). SNOTEL stands for “snow telemetry”. SNOTEL stations monitor snowpack, precipitation and other climate variables across the mountainous regions of the western United States. The SNOTEL network is used to make water supply forecasts.

Water users who depend on Hole in Mountain SNOTEL should be aware that the normals for snowpack and precipitation from the original site will continue to be displayed in the [NRCS Update Reports](#) for the winter of 2017. Doing so will allow water users to compare data from the new location to the old location, and to other nearby SNOTEL sites. Typically, percentages for nearby sites are similar in a given area. By comparing percentages it is possible to gain an understanding of how similar the new location is to the old one. If Hole in Mountain’s percentages depart from nearby sites, this would indicate that the new location has different characteristics than the original location.

As of mid-December it appears the new location is accumulating more snow than the original site. The December 13, 2016 update report (below) shows that the snowpack is 215% of median while most nearby sites with similar elevation are between 98 and 153% of median. The new location is in a topographic depression surrounded by aspen trees. It appears snow is drifting into that depression, resulting in a higher percentage than nearby sites. The water year to date precipitation percentage for Hole in Mountain is slightly less than nearby SNOTEL sites. This is in part due to installation after the start of the water year. The water year to date precipitation in the update report does not include early October precipitation which totaled 1.7 to 3.1 inches at nearby SNOTELs through October 19<sup>th</sup>. Also, precipitation gages are less apt to collect drifting snow than snow pillows; this is due to the gage opening being well above the snow surface.

As this winter progresses, snow surveyors will make snow tube measurements at both the old and new sites for further comparison. Our hope is that these measurements will allow us to develop a relationship between the two locations and adjust the normals for 2018.

Water users should keep these things in mind when using Hole in Mountain data to make decisions. For questions or further explanation please contact Jeff Anderson at (775) 857-8500 ext. 152.

<b>Nevada SNOTEL Snow/Precipitation Update Report</b>							
Based on Mountain Data from NRCS SNOTEL Sites							
**Provisional data, subject to revision**							
Data based on the first reading of the day (typically 00:00) for Tuesday, December 13, 2016							
Basin Site Name	Elev (ft)	Snow Water Equivalent			Water Year-to-Date Precipitation		
		Current (in)	Median (in)	Pct of Median	Current (in)	Average (in)	Pct of Average
<b>CLOVER VALLEY &amp; FRANKLIN RIVER</b>							
Corral Canyon	8440	3.8	3.5	109	8.8	6.2	142
Dorsey Basin	7870	4.9	3.2	153	9.5	6.9	138
Green Mountain	8180	6.5	4.4	148	9.2	7.0	131
Hole-in-Mountain	7900	8.6	4.0	215	10.5	8.6	122
Pole Canyon	7700	4.8	N/A	-	10.4	N/A	-
Lamoille #3	8025	3.9	4.0	98	8.8	6.9	128
<b>Basin Index (%)</b>		<b>145</b>			<b>131</b>		

December 13, 2015 Snow and Precipitation Update Report.

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Photo 1: Hole in Mountain SNOTEL in its new location. The site is tucked behind a small ridge about 450ft south of the original location. This new location will keep future avalanches from impacting the site. Photo taken October 2016.



Photo 2: Damaged observed at Hole in Mountain SNOTEL after avalanche. The SNOTEL shelter, which houses the site's electronics, was swept 200 feet downhill of its foundation. Photo taken January 2016.



Photo 3: Damaged observed at Hole in Mountain SNOTEL after melt-out. The avalanche bent over the brown precipitation gage and instrument tower. The snow pillow which weighs the snowpack is the white object under the tower. Photo taken June 2016.