

Big Horn County	Bald Mountain SNOTEL	Elevation 9380'		
Date	High	Low	Snow Depth	SWE
Sun, June 26	53	39	22.5	54
Sat, June 25	59	43	??	56
Fri, June 24	59	41	??	60
Thu, June 23	66	43	??	62
Wed, June 22	62	41	30.3	65
Tue, June 21	54	36	31.0	69
Mon, June 20	50	36	31.9	72
Sun, June 19	51	38	32.5	74
Sat, June 18	53	34		

Big Horn County	Bone Springs Divide SNOTEL	Elevation 9350'		
Date	High	Low	Snow Depth	SWE
Sun, June 26	56	35	27	11.2
Sat, June 25	57	42	30	12.5
Fri, June 24	58	41	33	14.2
Thu, June 23	61	42	38	15.9
Wed, June 22	59	40	40	17.7
Tue, June 21	51	37	45	19.5
Mon, June 20	46	36	47	20.4
Sun, June 19	47	36	50	21.7
Sat, June 18	50	35		

Big Horn County	Basin – Auto Station	Elevation 3898'
Date	High	Low
Sun, June 26	84	55
Sat, June 25	84	54
Fri, June 24	88	55
Thu, June 23	89	57
Wed, June 22	86	48
Tue, June 21	79	51
Mon, June 20	75	51
Sun, June 19	77	58
Sat, June 18	77	45

Big Horn County	Lovell – Auto Station	Elevation 3830'
Date	High	Low
Sun, June 26	77	53
Sat, June 25	82	54
Fri, June 24	83	57
Thu, June 23	89	57
Wed, June 22	86	52 (estimated)
Tue, June 21	79	52
Mon, June 20	61	50
Sun, June 19	75	58
Sat, June 18	76	47

Big Horn County	Otto – Auto Station	Elevation 4239'	
Date	High	Low	
Sun, June 26	80	54	
Sat, June 25	81	53	
Fri, June 24	87	56	
Thu, June 23	86	57	
Wed, June 22	82	50	
Tue, June 21	79	51	
Mon, June 20	72	50	
Sun, June 19	72	55	
Sat, June 18	73	46	

Big Horn County	Hyatt High RAWS	Elevation 5670'	
Date	High	Low	
Sun, June 26	77	54	
Sat, June 25	79	55	
Fri, June 24	80	55	
Thu, June 23	83	59	
Wed, June 22	79	54	
Tue, June 21	72	49	
Mon, June 20	67	48	
Sun, June 19	69	50	
Sat, June 18	70	46	

Big Horn County	Mill Creek RAWS	Elevation 8898'	
Date	High	Low	
Sun, June 26	62	40	
Sat, June 25	61	43	
Fri, June 24	61	43	
Thu, June 23	67	46	
Wed, June 22	63	39	
Tue, June 21	52	36	
Mon, June 20	49	36	
Sun, June 19	51	37	
Sat, June 18	52	34	

Big Horn County	Shell Creek SNOTEL	Elevation 9580'		
Date	High	Low	Snow Depth	SWE
Sun, June 26	53	32	38	11.8
Sat, June 25	57	36	39	12.6
Fri, June 24	58	39	43	14.0
Thu, June 23	62	39	46	15.5
Wed, June 22	59	37	49	16.9
Tue, June 21	53	33	51	17.9
Mon, June 20	49	33	54	18.8
Sun, June 19	47	35	56	19.6
Sat, June 18	50	30		

Big Horn County	South Big Horn County Airport – Greybull	Elevation 3934'
Date	High	Low
Sun, June 26	76	55
Sat, June 25	83	50
Fri, June 24	81	55
Thu, June 23	90	60
Wed, June 22	87	49
Tue, June 21	81	51
Mon, June 20	74	51
Sun, June 19	65	57
Sat, June 18	76	50

Washakie County	Leigh Creek RAWS	Elevation 8202'
Date	High	Low
Sun, June 26	66	45
Sat, June 25	65	49
Fri, June 24	68	50
Thu, June 23	68	51
Wed, June 22	66	46
Tue, June 21	59	40
Mon, June 20	53	39
Sun, June 19	56	42
Sat, June 18	55	38

Washakie County	Middle Powder SNOTEL (snow melted out by June 11, 2011)	Elevation 7760'
Date	High	Low
Sun, June 26	67	48
Sat, June 25	68	49
Fri, June 24	71	47
Thu, June 23	69	48
Wed, June 22	68	46
Tue, June 21	58	44
Mon, June 20	52	42
Sun, June 19	58	44
Sat, June 18	61	42

Washakie County	Powder River Pass SNOTEL	Elevation 9480'		
Date	High	Low	Snow Depth	SWE
Sun, June 26	56	35	0	0
Sat, June 25	60	39	3	1.1
Fri, June 24	61	40	7	2.2
Thu, June 23	64	41	13	4.0
Wed, June 22	62	37	14	5.7
Tue, June 21	54	34	17	7.4
Mon, June 20	49	35	19	8.4
Sun, June 19	44	37	20	9.1
Sat, June 18	53	31		

Washakie County	Split Rock Creek	Elevation 6554'
Date	High	Low
Sun, June 26	76	51
Sat, June 25	76	55
Fri, June 24	75	51
Thu, June 23	75	55
Wed, June 22	77	51
Tue, June 21	66	45
Mon, June 20	60	43
Sun, June 19	64	46
Sat, June 18	66	44

Washakie County	Worland Municipal Airport	Elevation 4226'
Date	High	Low
Sun, June 26	78	52
Sat, June 25	81	50
Fri, June 24	88	52
Thu, June 23	87	58
Wed, June 22	86	49
Tue, June 21	77	51
Mon, June 20	74	51
Sun, June 19	62	54
Sat, June 18	76	46

Johnson County	Cloud Peak Reservoir SNOTEL	Elevation 9860'		
Date	High	Low	Snow Depth	SWE
Sun, June 26	58	35	1	0.6
Sat, June 25	60	32	4	2.1
Fri, June 24	62	34	11	3.9
Thu, June 23	64	36	15	5.9
Wed, June 22	62	38	20	7.9
Tue, June 21	56	35	25	9.6
Mon, June 20	54	35	27	10.9
Sun, June 19	45	37	30	11.8
Sat, June 18	52	34		

Notes Associated with the Above Tables:

Dates in **black** are those leading up to the onset of flooding; those in **green** after the flooding begins.

SWE (snow water equivalent) is that value at the end of that day. Using Cloud Peak Reservoir SNOTEL, for example, the SWE at the end of the day on Monday, June 20 was 10.9 inches. By the end of the next day, Tuesday, June 21, the SWE was 9.6 inches. Thus, 1.3 inches of SWE was melted from the snow on Tuesday, June 21. Therefore, we can see that 5 inches of SWE was melted from the snow during the period June 21-23 (10.9 at the start of June 21 and 5.9 at the end of June 23).

The Bald Mountain SNOTEL had difficulties with the melting snow (perhaps water accumulation on the measuring device) and some of the SWE data was unreliable.

The June 2011 flooding began during the early morning hours of Friday, June 24, on many of the tributaries of the western Bighorn Mountains. The most extreme flooding occurred on Tensleep, Shell, Horse, Trapper, and Medicine Lodge creeks. The tables given above along with a short summary of temperature and snowmelt data are provided here as a reference for future spring snowmelt runoff flooding. It is important to remember this type of flooding often occurs between early may and mid-June, but like 2011, can occur outside of this window.

There is an old USGS “rule of thumb” that in order for runoff to begin in the mountains temperatures must reach 70-75F for three (3) consecutive days at basin/valley elevations of 5000-6000 ft. All of the basin sites are below 5000 feet in elevation and may not be a good predictor. However, the Hyatt High RAWS which sits at 5670 feet in elevation about 1.75 miles east of Medicine Lodge State Archaeological Site met this criterion. In fact, the third day of 70F+ high temperatures (June 21-23) immediately preceded the onset of the most severe flooding which began around midnight on Friday, June 24.

Another “rule of thumb” has been to look for high temperatures in the upper 50s and lower 60s for at least two (2) consecutive days at 7500-9000 foot elevations in order for snowmelt runoff to begin. All of the SNOTELS in the western Bighorn Mountains are above 9000 feet and each reached the upper 50s temperature threshold on June 22 and 23. There are two RAWS sites, Leigh Creek (8202 ft) and Mill Creek (8898 ft) that are within the 7500-9000 foot range that provide a comparison. Here is a summary of the temperatures and associated snowmelt at the SNOTEL stations. Note the obvious increase in snowmelt of June 22 and 23 compared to the previous two days. The loss of SWE was at least 50% more and in the case of Shell Creek more than 2.5 times more than the previous two days.

Bone Springs Divide SNOTEL – June 22 & 23: Lost 3.6” of SWE (previous two days 2.2”)

Cloud Peak Reservoir SNOTEL – June 22 & 23 (June 21 close): Lost 3.7” of SWE (previous two days 2.2”)

Powder River Pass SNOTEL – June 22 & 23: Lost 3.4” of SWE (previous two days 1.7”)

Shell Creek SNOTEL – June 22 & 23: Lost 4.4” of SWE (previous two days 1.7”)

Leigh Creek RAWS – June 21-23: Highs 59F, 66F, and 68F

Mill Creek RAWS – June 22 & 23: Highs 63F and 67F

Lastly, overnight low temperatures at elevations of 8000-9500 feet at or warmer than 37F can indicate that snowmelt may have been ongoing through the nighttime hours. Many of the SNOTEL and RAWS sites fall into this elevation range. The lowest site, Leigh Creek RAWS (8202 ft), met this criterion for at least several nights prior. The highest site, Cloud Peak Reservoir SNOTEL (9860 ft), was close but only met the 37F threshold one of the nights. In the cases of the Bald Mountain SNOTEL, Bone Springs Divide SNOTEL, Powder River Pass SNOTEL, Shell Creek SNOTEL, and Mill Creek RAWS each met the 37F criterion for the nights of June 21-22 and June 22-23.