



Weather Summary

Olympic National Park – Water Year 2021

The North Coast and Cascades Network (NCCN) Inventory and Monitoring Program monitors climate in order to compare current and historic data to understand long-term trends, to provide data to model future impacts to park facilities and resources, and to provide park staff with information needed to make management decisions. This brief summarizes climate data collected and notable weather events that occurred during water year¹ 2021 in Olympic National Park.

Significant Weather Events

A series of storms in mid-December 2020, drenched the Olympic Peninsula with 12 to 18 inches of precipitation. This was followed by a high intensity rain event on January 1st and 2nd, 2021, that triggered landslides and flooding, including a large debris flow near Lake Crescent that closed and damaged the newly completed Spruce Railroad Trail. In a period of less than 36 hours, 3.96 inches of rain fell in this area.

The combination of these late December storms also brought Lake Crescent to its highest level on record (Figure 1). Highest annual rainfall marks occurred at most weather stations on or near January 2nd. Storm totals from January 1st to 5th were as high as 10 and 12 inches at the Hoh and Quinault rainforests, respectively.

A record-breaking heat wave occurred between June 25th and 30th. All time maximum air temperature records were set at Olympic National Park weather stations throughout this event (Table 1). Highest temperatures were typically on June 28th. Interior, lowland stations recorded the highest values, including Bunch Field in the Quinault with a temperature of 112° F.

There was a surprising contrast between coastal stations, where Kalaloch, a coastal site further south and closer to the ocean, reached less extreme highs (87° F) compared to Ozette, with highs of 105° and 108° F. A similar trend was documented by temperature sensors deployed at coastal intertidal monitoring sites ([NCCN Intertidal monitoring program](#)). During the heat wave, NPS scientists documented unprecedented rates of snow

melt, extensive damage to new tree growth, and health impacts to intertidal invertebrates exposed during extreme low tides on those days.



Figure 1. Thirteen inches of rainfall during the last weeks of December, were followed by the major rainfall event of January 1st to 5th which added seven more inches to precipitation totals. By mid-January, Lake Crescent reached its highest level in 20 years.

Table 1. Maximum air temperatures (°F) measured at weather stations within Olympic National Park during the June heat wave.

Weather Station	June 27	June 28	June 29
Buckinghorse Ridge SNOTEL	83	86	90*
Deer Park Ranger Station	88*	88*	92*
Deer Park Road	93*	97*	87
Elwha Ranger Station COOP	97	101*	100*
Hayes River Guard Station	104*	105*	97*
Hoh Rainforest	103*	108*	76
Kalaloch Ranger Station	83*	87*	67
Ozette Ranger Station	105*	108*	68
Quinault Rainforest	109*	112*	80
Waterhole SNOTEL	80	83	87*

*Asterisks indicate all time high temperatures recorded at each station (also shown in bold).

¹ Water year is defined as the period from October 1 to September 30 of the following year, to encompass a full cycle of precipitation accumulation.

Temperature

Water year 2021 was warmer than normal for most seasons of the year. Fall started quite warm and dry but quickly shifted to an unusual cold period in late October, with cold conditions continuing into November. By contrast, December and January were comparatively warm, with Quillayute Airport 3.3° F above normal in December. The months of February and March were much colder than normal. This was most

apparent at low elevation coastal areas such as Quillayute (2.6° and 1.8° F below normal) (Figure 2).

The mountain interior was similar, with temperatures at Waterhole (Hurricane Ridge) 2.4° and 0.5° F below normal. For the remainder of spring and summer months, air temperatures remained well above normal. The most extreme month was June, where temperatures were 5.3° and 2.7° F above normal at Elwha and Quillayute stations, respectively.

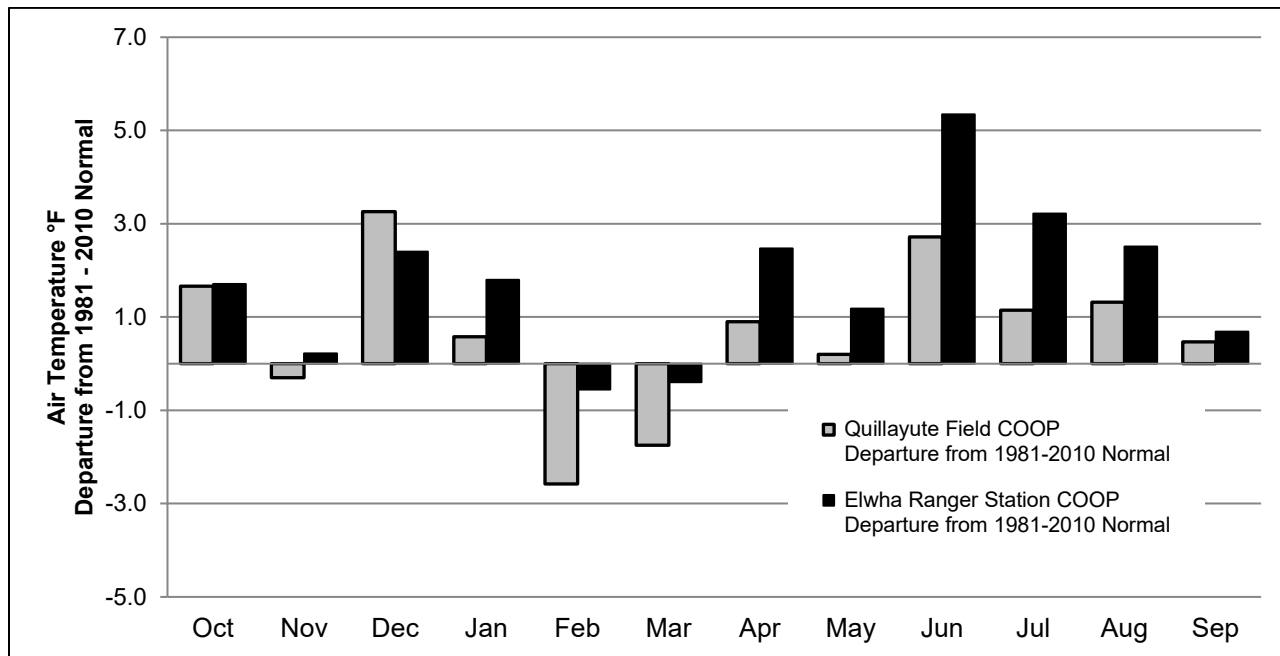


Figure 2. Comparison of average monthly temperature (°F) compared to normal at Quillayute Airport and Elwha Ranger Station in Water Year 2021 against the climatological normal 1981-2010.

Table 2. Average monthly air temperatures (°F) from weather stations within northeast Olympic National Park in Water Year 2021.

Season	Month	Year	Buckinghorse SNOTEL	Deer Park Ranger Station	Deer Park Road	Elwha Ranger Station	Hayes River Guard Station	Waterhole SNOTEL
Fall	October	2020	37.2	39.4	48.5	50.6	43.9	40.9
	November	2020	34.1	29.1	38.7	41.4	35.9	31.6
Winter	December	2020	34.0	29.9	38.9	38.9	32.4	31.0
	January	2021	31.4	26.5	36.6	39.2	–	28.9
	February	2021	27.2	22.3	32.7	37.9	–	25.4
Spring	March	2021	31.0	26.6	36.2	42.3	–	28.8
	April	2021	39.1	34.5	43.9	49.8	–	34.2
	May	2021	42.4	38.8	47.5	54.0	49.5	37.1
Summer	June	2021	53.0	51.1	58.5	62.9	58.8	50.5
	July	2021	58.2	55.5	62.7	65.0	63.8	54.4
	August	2021	57.7	54.1	61.4	65.5	62.7	54.5
Fall	September	2021	49.4	46.6	53.8	58.7	52.8	46.6
Water Year			41.2	37.9	46.6	50.5	50.0	38.7

Table 3. Average monthly air temperature (°F) from west side weather stations within and adjacent to Olympic National Park in Water Year 2021.

Season	Month	Year	Hoh Rainforest	Kalaloch Ranger Station	Ozette Ranger Station	Quillayute Airport COOP	Quinault Rainforest
Fall	October	2020	50.5	52.0	51.9	51.7	50.8
	November	2020	41.6	45.4	44.6	43.9	41.5
Winter	December	2020	40.1	44.5	44.3	43.7	40.0
	January	2021	39.9	43.5	43.0	42.2	39.8
	February	2021	37.9	41.3	40.8	39.5	37.8
Spring	March	2021	40.3	43.1	43.0	42.4	41.0
	April	2021	47.5	47.3	47.7	47.6	48.7
	May	2021	51.1	50.8	51.3	51.5	52.6
Summer	June	2021	60.3	58.0	59.6	58.0	61.9
	July	2021	61.0	57.5	58.3	60.1	62.9
	August	2021	60.8	57.9	59.4	60.9	62.7
Fall	September	2021	56.5	55.5	56.5	57.1	56.9
Water Year		2021	49.0	49.7	50.0	49.9	49.7

Precipitation

Annual precipitation for Water Year 2021 was slightly above average at most weather stations at Olympic National Park. Quillayute Airport received 96.7 inches of annual precipitation, 97% of normal. Elwha Ranger Station received 63.2 inches, 113% of normal (Table 4 and 5). Spatial distribution was normal, with highest precipitation at Quinault and Buckinghorse (125.6" and 125.4") with the lowest quantities recorded in the rain shadowed Deer Park area (36.9"). While annual amounts were near normal, there were stark contrasts between

seasons. Fall and winter months were much wetter than normal. The extreme was the normally dry month of September, which in 2021 was 200 to 300 percent of normal at many stations (Figure 3). In contrast, spring and summer months were extremely dry, with Elwha and Quillayute receiving 46% and 50% normal precipitation, respectively. In addition to small quantities of precipitation, there were also long periods of drought. For instance, at the Quinault rainforest, no precipitation fell between June 17th and August 6th, a period of 50 days.

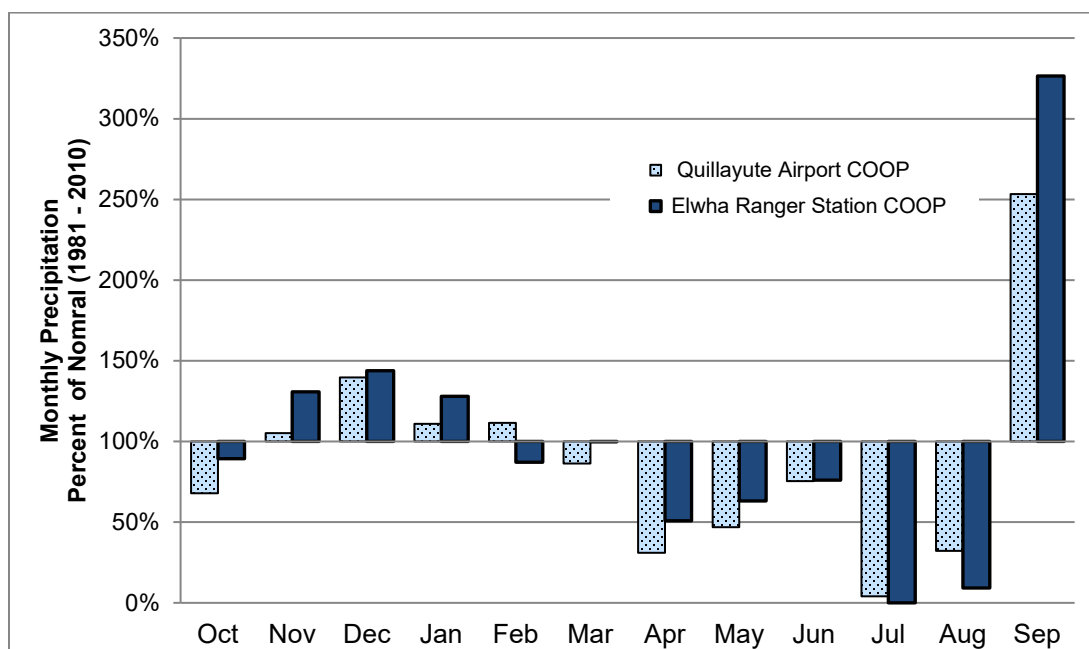


Figure 3. Comparison of monthly total precipitation (inches) as a percent of normal at Quillayute Airport and Elwha Ranger Station in Water Year 2021 against the climatological normal 1981-2010.

Table 4. Total monthly precipitation (inches) from weather stations within northeast Olympic National Park in Water Year 2021.

Season	Month	Year	Buckinghorse SNOTEL	Deer Park Ranger Station	Deer Park Road	Elwha Ranger Station	Hayes River Guard Station	Waterhole SNOTEL
Fall	October	2020	10.6	2.97	2.82	4.66	6.59	4.4
	November	2020	21.7	– ²	7.14	13.57	17.19	11.6
Winter	December	2020	19.8	–	5.29	13.05	13.30 ³	10.7
	January	2021	24.1	–	8.34	11.90	– ⁴	11.2
	February	2021	13.4	–	2.21	4.92	–	8.3
Spring	March	2021	14.3	–	2.24	6.04	–	10.4
	April	2021	1.5	2.38	1.68	1.63	–	2.1
	May	2021	3.2	1.08	0.78	1.34	2.06	1.9
Summer	June	2021	3.8	2.53	2.33	1.01	1.91	2.3
	July	2021	0.3	0.01	0.03	0.00	0.00	0.0
	August	2021	0.3	0.35	0.74	0.11	0.02	0.1
Fall	September	2021	12.4	4.05	3.34	4.93	7.16	5.1 ⁵
Water Year			125.4	–	36.93	63.16	–	68.1

Table 5. Total monthly precipitation (inches) from west side weather stations within and adjacent to Olympic National Park in Water Year 2021.

Season	Month	Year	Hoh Rainforest	Kalaloch Ranger Station	Ozette Ranger Station	Quillayute Airport COOP	Quinault Rainforest
Fall	October	2020	8.86	5.40	5.81	7.13	9.37
	November	2020	17.48	12.43	11.91	16.32	21.63
Winter	December	2020	18.72	16.38	15.37	18.15	20.73
	January	2021	20.14	16.36	12.31	16.21	25.71
	February	2021	15.31	11.13	7.99	11.54	14.14
Spring	March	2021	12.08	8.11	6.74	9.36	12.36
	April	2021	2.68	1.24	1.58	2.43	2.18
	May	2021	4.30	3.49	1.62	2.40	4.29
Summer	June	2021	2.59	1.96	1.26	2.64	4.01
	July	2021	0.05	0.25	0.42	0.08	0.00
	August	2021	0.78	0.86	1.00	0.80	0.55
Fall	September	2021	8.41	8.73	9.47	9.68	10.61
Water Year			111.39	86.34	75.48	96.74	125.57

² Unheated rain gauge. No data collected during winter months.³ Missing 3 days of data. Substituted rainfall totals from Elwha Ranger Station.⁴ Datalogger memory error. Data are missing from January to April⁵ Missing 9 days of data due to a rain gauge failure. Substituted precipitation values from Elwha Ranger Station.

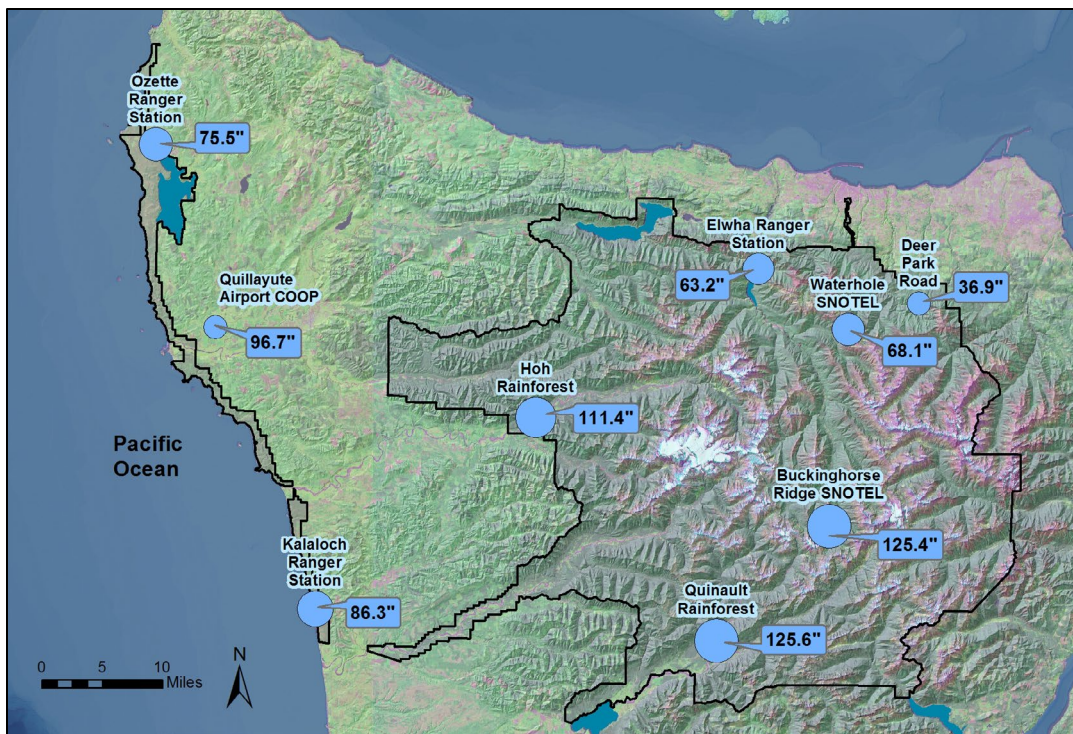


Figure 4. Total precipitation measured at weather stations located within Olympic National Park during Water Year 2021. Blue circles are proportional to the total amount of precipitation measured at each site.

Snowpack

A cold and wet period for much of November created an early and robust mountain snowpack (nearly 200% of normal by December 1st). A warm and wet December limited snowpack growth, and by the end of the month it was once again near normal. Cold conditions for the next three months, however, allowed a substantial snowpack to rebuild. The series of early January storms that pounded the Peninsula, piled snow onto the Olympic Mountains. During the first week of January,

over four feet of additional snow had accumulated, and the snowpack had rebounded to 160% of normal (Figure 5). An above normal snowpack remained in place for the remainder of the winter and spring. It is noteworthy that dry conditions in May, combined with the much warmer than normal months of April and June, led to a rapid decline in the snowpack. Despite the snowpack being 140% of normal on May 1st, the melt out date at the Waterhole (Hurricane Ridge) SNOTEL was within one day of normal (Figure 5).

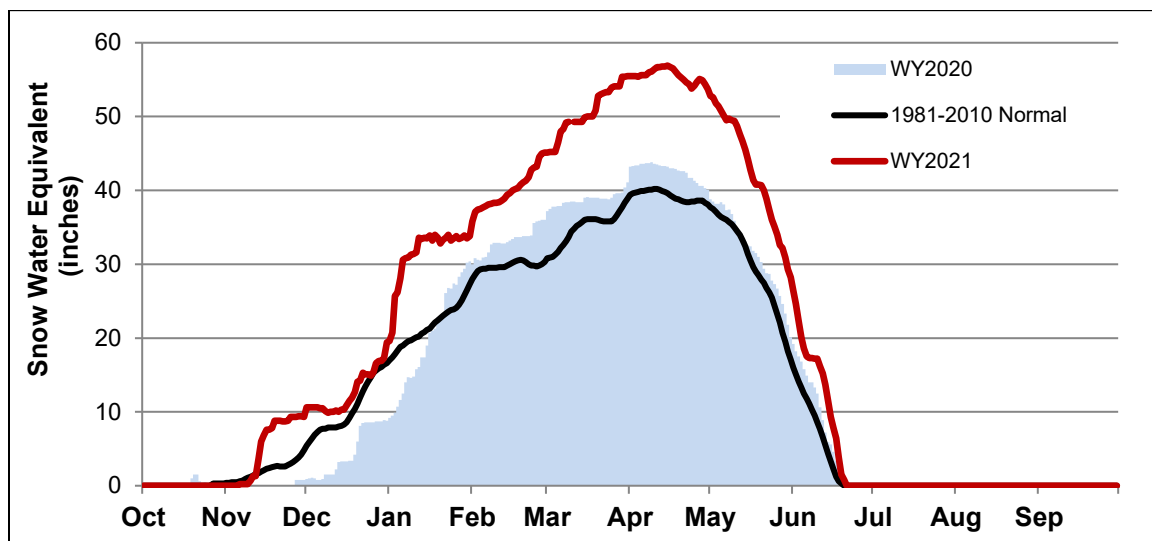


Figure 5. Daily snow water equivalent at the Waterhole SNOTEL, Hurricane Ridge, compared to Water Year 2020 and the Climatological Normal 1981-2010. The graph clearly shows events in mid-November and early January that led to an above normal snowpack in the Olympic Mountains.

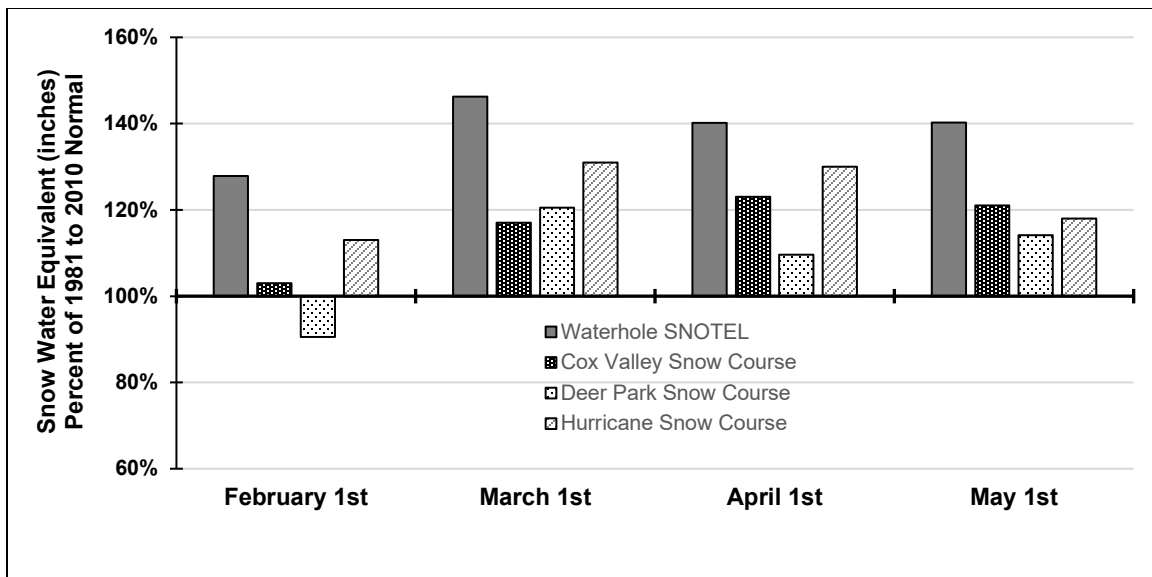


Figure 6. Monthly snow water equivalent at Cox Valley, Deer Park and Hurricane Snow Courses, and the Waterhole SNOTEL, compared to the Climatological Normal 1981 to 2010.

More Information

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