



Office of the Washington State Climatologist

January 5, 2009

Let it Snow!

If there are two words to sum up the month of December across the state of Washington, they would be **cold** and **snowy**. Storm after storm hit the state, and with the temperatures being so frigid, record amounts of snowfall resulted. After a warm and dry start to the month, the first system moved in on the 12th, bringing cold temperatures behind it. Cold, arctic air gripped the state, causing streaks of consecutive days without high temperatures reaching above freezing. Wenatchee had 14 consecutive days with highs below freezing (12/14-12/27) and Stampede Pass, Spokane, and Yakima all had 13 consecutive days with highs below freezing (12/14-12/26). Temperatures on some days in Yakima were down to 21°F below normal and 25°F below normal in Spokane! The last time Wenatchee had 14 days of highs below freezing was in 1980 (1/18-1/31). The 13 day streak of highs below freezing hasn't been seen at Stampede Pass since 1981 (1/24-2/5), at Spokane since 2003/2004 (12/27-1/8), and at Yakima since

In this Issue

Dec. Cold & Snow.....	1
La Niña.....	3
Global Warming?.....	4
Snowpack in the Cascades.....	5
Climate Summary.....	6
Outlook.....	7
CoCoRAHS.....	8
Appendix A.....	8

2005 (12/7-12/19).

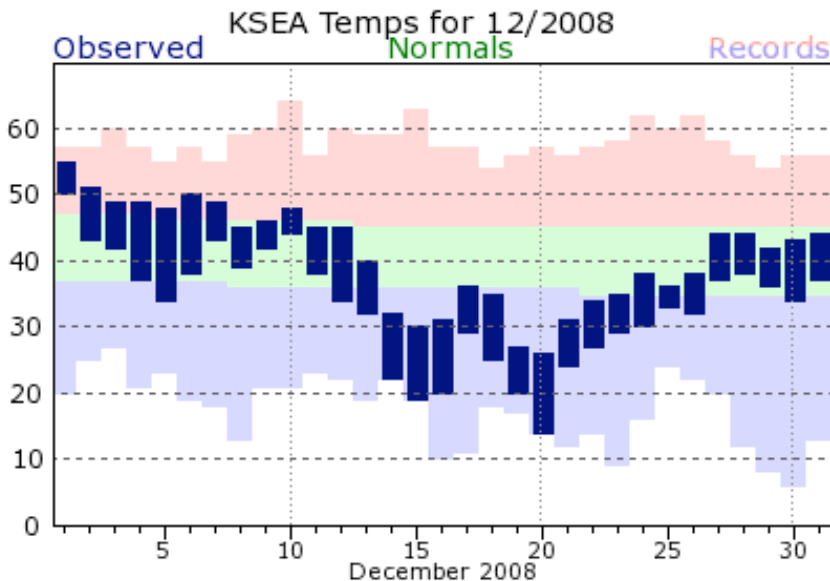


Figure 1 - Temperatures at Sea-Tac for the month of December compared to normals (from NWS).

Temperatures warmed to normal in much of the lowlands of western WA towards the end of the month (see Figure 1) so the low pressure systems that hit the state brought much-needed rain to the lowlands, but eastern WA experienced snow right through the end of the month. Numerous daily and 24-hour records were broken in the second half of the month, and some of those records

can be found in Table 1 and the rest in Appendix A. The temperature records are in °F and the snowfall is in inches. December 2008 is now *both* the snowiest December and the snowiest month on record for Spokane (its 61.5 inches beats out the 42.7 inches in December 1996 and the 56.9 inches in January 1950). Snowfall records have been kept in Spokane since 1893.

Location	Date	Record Description	Record	Prior Record	Prior Year
Chief Joseph Dam	21-Dec	max daily snowfall	8	3	1996
Chief Joseph Dam	16-Dec	low temperature	0	5	1985
Colville	20-Dec	low temperature	-14	-11	1924
Grand Coulee Dam	20-Dec	low high temperature	7	13	1990
Holden Village	15-Dec	low temperature	-4	1	1987
Lacrosse	20-Dec	low high temperature	1	8	1990
Moses Lake	20-Dec	low high temperature	10	17	1984
Olympia AP	19-Dec	low temperature	11	15	1984
Plain	20-Dec	low temperature	-8	-3	1998
Pullman	15-Dec	low temperature	-1	7	2005
Sea-Tac AP	24-Dec	max daily snowfall	2.6	0.8	1965
Sea-Tac AP	14-Dec	low temperature	22	25	1967
Seattle	16-Dec	low temperature	20	24	2005
Spokane AP	24-Dec	max daily snowfall	6.1	5.8	1996
Spokane AP	22-Dec	max daily snowfall	3.8	2.1	1952
Spokane AP	20-Dec	low temperature	-18	-6	1983
Spokane AP	18-Dec	max daily snowfall	10.8	8.3	1951
Spokane AP	17-Dec	max daily snowfall	7	5	1984
Wenatchee	20-Dec	low temperature	-7	-1	1984
Winthrop	20-Dec	low temperature	-21	-16	1924

Table 1 - Records broken during the cold and snowy period in December (from NWS).
Temperatures are in °F and snowfall is in inches.

The impacts of the snow and cold across Washington have been tremendous. Governor Greigore declared a state of emergency on December 24th. In Seattle, ice and snow covered roads closed schools and businesses for days. The impacts of impaired transportation were severe enough that Mayor Nickels recently announced that salt will be used on the roads in the future to help ease the burden of bad driving conditions (Seattle Times 12/31/08). Seattle has not used salt to clear the roads due to the potential impact on the environment, and instead has used sand. The sand was ineffective in this series of storms, as parts of Seattle did not have garbage or recycling pickup for over two weeks, and the metro bus lines operated snow-routes and had closures for 10 days due to the conditions. There was even an incident with two charter buses sliding down an icy hill, resulting in one crashing through a guardrail and hanging over I-5 (Figure 2 - Seattle Times 12/29/08). Fortunately, no one was seriously injured.

The heavy rain that followed the snowfall in western Washington posed a hazard to flat roof-



Figure 2 - Charter bus hanging over I-5 in Seattle on Dec 19th (photo from Seattle Times).

tops. In Olympia, a 2,500 square feet section of roof collapsed at Capital High School on December 25th. School was not in session at that time (Seattle Times 12/26/08).

The pressure of the impassable roads during essential holiday preparation time was too much for some to handle. In Spokane, there was an incident dubbed as “snowplow rage” as a man threatened two snowplow drivers with a gun for making a berm in front of his mother’s driveway. He was subsequently arrested (Spokesman-Review 12/24/08).

La Niña is Coming!

Throughout December, sea surface temperature anomalies in the Pacific Ocean started to resemble a La Niña pattern. A La Niña is not quite declared (-0.5°C sea-surface temperatures (SSTs) anomalies must exist for 3 consecutive months), but it is predicted to emerge through the early part of this year. Figure 3 shows the SSTs in the Niño 3.4 Region in the past year. Similar to last year, this season was expected to be neutral, but SSTs took a nose-dive in December to match the La Niña signal that was already exhibited in the atmosphere. Figure 4 shows the average SST anomalies for most of December throughout the Pacific Ocean. The anomalies are consistent with a La Niña pattern. The Pacific Northwest typically experiences increased lowland snowfall and cold temperatures in the winter during a La Niña, so should a La Niña emerge, more of the same weather experienced in December might be expected.

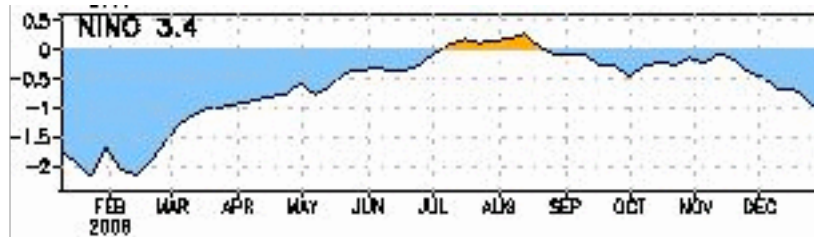


Figure 3 - Time series of Niño 3.4 SST anomalies (from CPC).

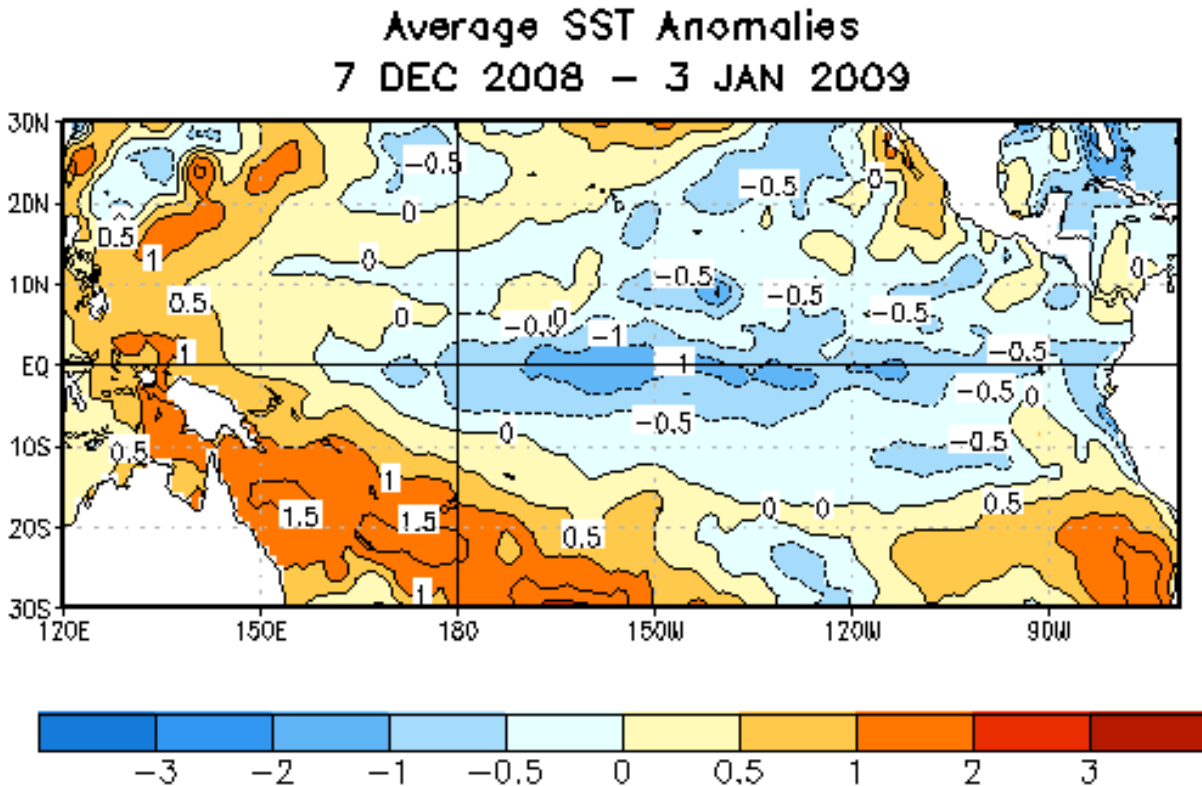


Figure 4 - Average SST anomalies in the Pacific Ocean throughout most of December (from CPC).

Why doesn't this disprove global warming?

With the cold temperatures and snow across Washington this month, and even across the entire northern United States, some people are wondering what this means for global warming. As the old adage goes, climate is what you expect and weather is what you get! Weather is what happens day-to-day; there are always going to be large variations in weather. Climate, however, is defined as at least a 30-year average of weather conditions. Global climate change (or global warming) is a concern for the rise in the average global temperature due to rising greenhouse gases. Scientists discern the role of rising greenhouse gases in climate by looking at variations over large areas and long periods of time. Local extreme events, like our two-week period cold and snow, are exciting but tell us little about climate change. It's a little like the stock market. You don't use a single stock to understand whether, say, a certain tax pol-

icy leads to better long-term growth: you would use a set of broad economic indicators and compare different periods, or different countries. We can't prove a human influence on climate simply from record high temperatures set in one part of the country any more than we can disprove human influence on climate from record low temperatures or heavy snowfall. For example, record high temperatures (in the 60s and the 70s) were recorded on December 26th in parts of Kansas while we were experiencing cold and heavy snow. Daily or weekly ups and downs in the weather are just... weather.

Snowpack in the Cascades

After a dismal start to the snowpack season in the Washington Cascades in November and December, the snowpack is finally near-normal in the south and central Cascades after the snowfall in the second half of December. The north Cascades still has about 50% of normal, and this situation will be monitored. Figure 5 shows the percent of average snow water content in Washington and the west from the NRCS.

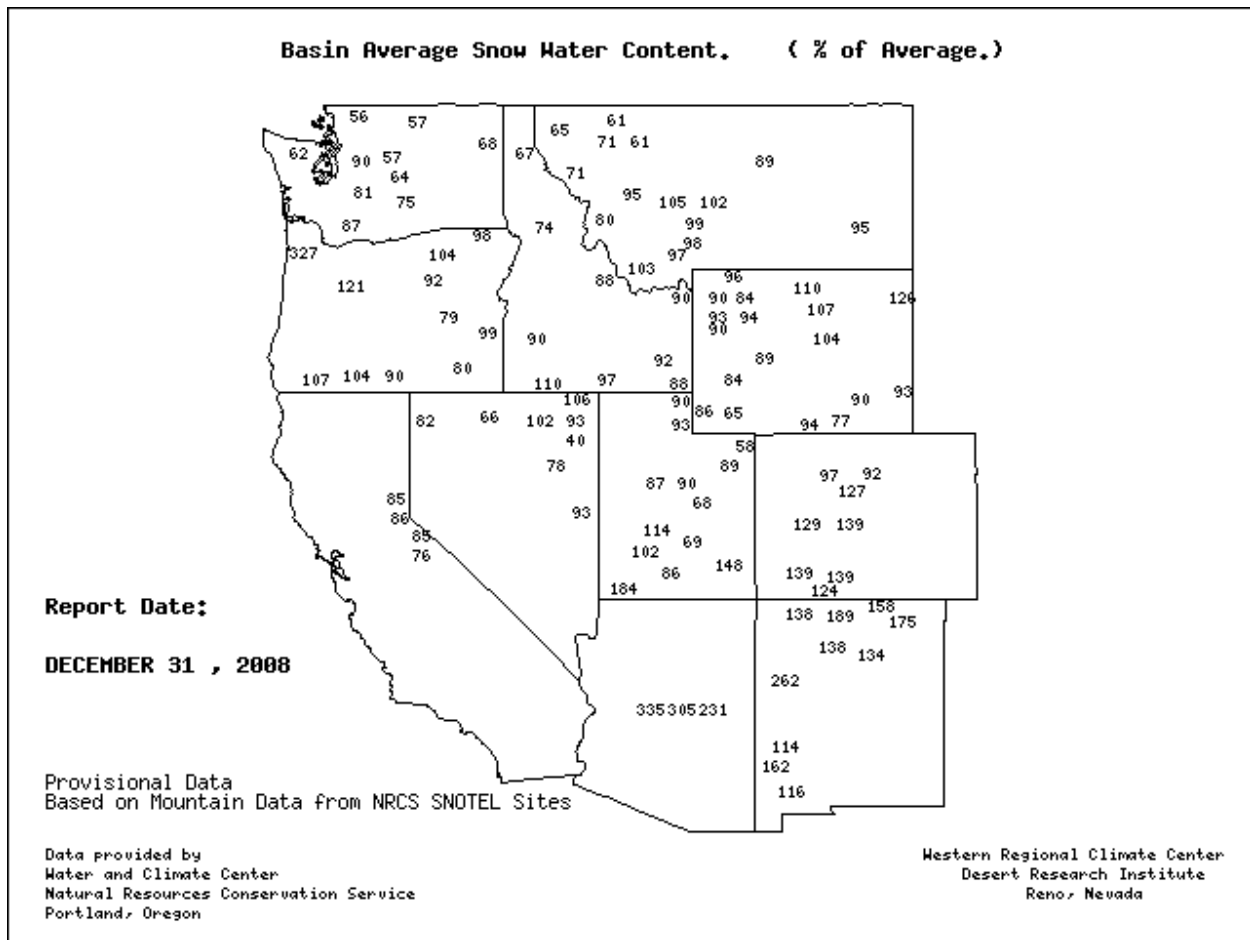
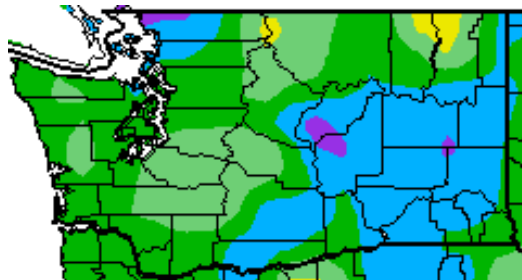


Figure 5 - Percent of average snow water content in the West (from the NRCS).

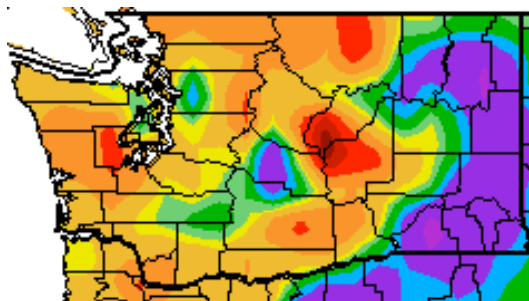
Climate Summary

The first and second half of December were like night and day. The first half was warm and dry, while the second half was cold with normal to above normal precipitation across the state. When examining the month as a whole, the cold temperatures win the battle, as most of the state experienced below normal temperatures for the month. Western WA was below normal by about 2-4°F while parts of eastern WA were below normal by 4-6°F. The images pictured below are from the HPRCC with the normal baseline from 1971-2000.

Precipitation for the month of December is a different story! Despite the snow, precipitation was still below normal for parts of the western coast and the Olympics, around Puget Sound, the northern Cascades, and in parts of central WA (Douglas and Grant counties). Parts in eastern WA, however, were above normal by 150-200%! Above normal precipitation also occurred at one location in Kittitas county.



Temperature (°F)



Precipitation (%)



(December temperature (°F) departure from normal (top) and December precipitation % of normal (bottom).

Source: High Plains Regional Climate Center (<http://www.hprcc.unl.edu>).

	Temperature (F)			Precipitation (inches)			Snowfall (inches)		
	Avg	Norm	Departure from Normal	Total	Norm	% of Norm	Total	Norm	% of Norm
Olympia	35.2	38.0	-2.8	4.72	7.89	59.8	M	M	M
Seattle	38.0	40.7	-2.7	4.58	5.45	84.0	9.8	M	M
Sea-Tac	36.9	40.7	-3.8	4.10	5.62	72.9	13.9	2.5	556
Pasco	26.8	34.6	-7.8	0.86	1.18	72.9	M	M	M
Spokane	21.9	27.2	-5.3	3.94	2.25	175.1	61.5	13.7	448.9
Omak	21.7	25.0	-3.3	0.84	1.82	46.2	M	M	M
Yakima	23.8	28.8	-5.0	0.83	1.38	60.1	11.4	M	M

Table 2 - December Climate Summaries from locations in Western Washington and Eastern Washington (highlighted in orange) from NWS (climate normal baseline is 1971-2000). M denotes missing data.

Consistent with the images above, the monthly summaries (Table 2) show that temperatures were cooler than normal statewide, precipitation was mixed, and that snowfall was higher than normal. Spokane's record snowfall during the month of December was a huge 448.9% higher than the average December snowfall, and Sea-Tac saw 556% of average.

Outlook

The seasonal climate forecast by the NOAA Climate Prediction Center for the beginning of 2009 (January-February-March) calls for at least a 60% chance of below normal temperatures for the entire state of Washington. For precipitation, there is an equal chance of below or above normal amounts for the entire state. For late winter-early spring (February-March-April), the outlook calls for at least a 60% chance of below normal temperatures for most of Washington, and at least a 55% chance of below normal temperatures for southeastern Washington. The FMA outlook calls for an equal chance of below or above normal precipitation.

The ENSO is still neutral as described above, but is resembling atmospheric and oceanic characteristics of a La Niña. ENSO is expected to be classified as a La Niña soon, and will last through the early part of the year

(<http://www.cpc.noaa.gov/products/precip/CWlink/MJO/enso.shtml>). A La Niña is associ-

ated with below normal temperatures in the Pacific Northwest, and the shift to these conditions has undoubtedly influenced the 3-month outlook.



(January-February-March outlook for temperature (left) and precipitation (right) from the CPC).

CoCoRAHS



Thank you, CoCoRAHS observers! Your participation has been essential during the snowy month of December. Do you have any questions regarding snowfall measurements? Do you know someone who is interested in becoming a daily weather observer? See cocorahs.org or contact us at wash.cocorahs@gmail.com.

Appendix A

Location	Date	Time Period	Record Description	Record	Prior Record	Prior Year
Boundary Dam	13-Dec	24 hr ending 9a	max 24 hr snowfall	11.5	6	1982
Boundary Dam	16-Dec	24 hr ending 8a	low high temperature	20	20	1967
Boundary Dam	16-Dec	24 hr ending 8a	low temperature	-4	3	1967
Chelan	16-Dec	24 hr ending 8a	low high temperature	14	19	1967
Chelan	15-Dec	daily	low temperature	10	12	2000
Chelan	14-Dec	daily	low high temperature	18	18	1985
Chief Joseph Dam	20-Dec	daily	low high temperature	9	12	1990
Chief Joseph Dam	16-Dec	daily	low high temperature	17	18	2000
Chief Joseph Dam	15-Dec	daily	low temperature	-3	-1	1955
Chief Joseph Dam	14-Dec	24 hr ending 11p	low temperature	-1	-1	1955
Chief Joseph Dam	14-Dec	24 hr ending 11p	max 24 hr snowfall	4.5	4.5	1981

Colville	21-Dec	24 hr ending 6p	low temperature	-22	-14	1983
Dayton	18-Dec	24 hr ending 8a	max 24 hr snowfall	11	3.5	1978
Grand Coulee Dam	20-Dec	daily	low temperature	-4	-4	1983
Grand Coulee Dam	15-Dec	daily	low high temperature	14	15	1955
Holden Village	20-Dec	daily	low high temperature	10	12	1990
Holden Village	16-Dec	24 hr ending 8a	low high temperature	10	16	1944
Holden Village	14-Dec	daily	low high temperature	14	15	1955
Kellogg	19-Dec	24 hr ending 8a	max 24 hr snowfall	5	4	1971
Lacrosse	25-Dec	24 hr ending 6p	max 24 hr snowfall	3.5	2	1996
Lacrosse	20-Dec	daily	low temperature	-23	-17	1949
Lacrosse	19-Dec	24 hr ending 6p	low temperature	-14	-10	1984
Lacrosse	18-Dec	24 hr ending 7p	max 24 hr snowfall	8	1.8	1978
Northport	30-Dec	24 hr ending 6a	max 24 hr snowfall	6	4.5	1993
Omak	20-Dec	daily	low high temperature	8	11	1951
Omak	20-Dec	daily	low temperature	-3	-3	1951
Plain	20-Dec	daily	low high temperature	8	11	1984
Plain	17-Dec	24 hr ending 6p	max 24 hr snowfall	9	7	1972
Plain	15-Dec	daily	low high temperature	14	22	2005
Pomeroy	16-Dec	24 hr ending 8a	low high temperature	11	18	2005
Pomeroy	16-Dec	24 hr ending 8a	low temperature	-9	-8	1964
Pomeroy	14-Dec	daily	low high temperature	15	19	1945
Pullman	14-Dec	daily	low high temperature	15	20	1972
Quillayute AP	18-Dec	daily	low temperature	20	21	2005
Quillayute AP	16-Dec	daily	low temperature	19	21	2005
Quillayute AP	13-Dec	daily	max daily snowfall	trace	trace	1988
Quincy	20-Dec	daily	low high temperature	11	12	1990
Quincy	19-Dec	24 hr ending 4p	low high temperature	17	17	1992
Quincy	15-Dec	daily	low high temperature	16	19	1955

Ritzville	25-Dec	24 hr ending 6a	max 24 hr snowfall	3.7	2.8	1996
Ritzville	21-Dec	24 hr ending 6a	low temperature	-9	-9	1990
Ritzville	20-Dec	daily	low temperature	-6	-3	1990
Sandpoint	17-Dec	24 hr ending 8a	low high temperature	7	8	1922
Sea-Tac AP	21-Dec	daily	max daily snowfall	3	2.6	1967
Sea-Tac AP	20-Dec	daily	low temperature	14	14	1990
Sea-Tac AP	20-Dec	daily	max daily snowfall	3	1.7	1951
Sea-Tac AP	14-Dec	daily	max daily snowfall	0.7	0.1	1971
Sea-Tac AP	15-Dec	daily	low temperature	19	20	1964
Sea-Tac AP	14-Dec	daily	max daily snowfall	0.6	0.1	1971
Seattle	14-Dec	daily	low temperature	25	28	2000
Seattle	15-Dec	daily	low temperature	23	27	1991
Spokane AP	29-Dec	daily	max daily snowfall	8.3	8.3	1984
Spokane AP	20-Dec	daily	low high temperature	5	6	1990
Spokane AP	18-Dec	24 hr ending 10a	max 24 hr snowfall	19.4	13	1950
Wenatchee	26-Dec	daily	low temperature	5	5	1990
Wenatchee	22-Dec	24 hr ending 8a	low temperature	-1	0	1983
Wenatchee	22-Dec	24 hr ending 8a	max 24 hr snowfall	7	3	1987
Wenatchee	22-Dec	24 hr ending 8a	low high temperature	9	13	1984
Wenatchee	16-Dec	24 hr ending 8a	low high temperature	17	20	1948
Wenatchee Water	29-Dec	24 hr ending 8a	low high temperature	19	19	1948
Wenatchee Water	20-Dec	daily	low high temperature	16	20	1992
Wenatchee Water	20-Dec	daily	low temperature	0	4	1984