

A Synopsis of the December 1-4, 2007 Storm Events



An aerial view of the flooded I-5 overpass looking south Flooding in Chehalis. (Associated Press)

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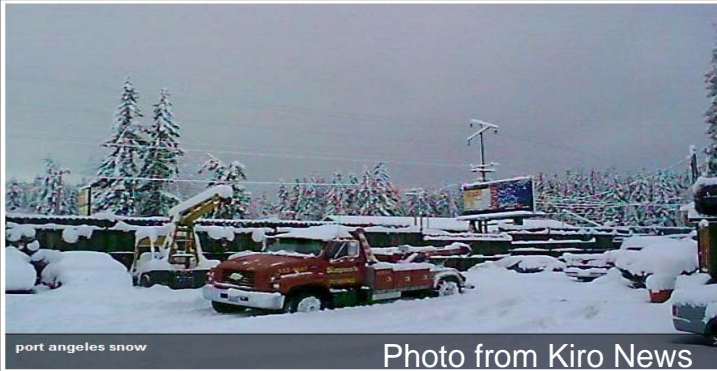


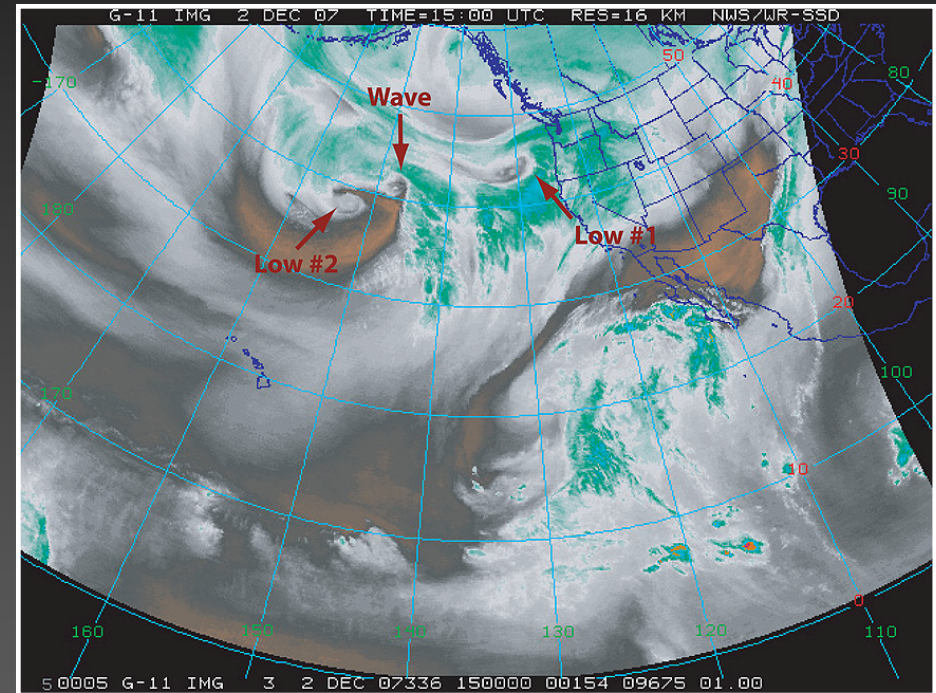
Photo from Kiro News



Photo by Stephen Pierce from OCS link

The Snow
The Wind
The Rain

The Three Storms of Early December 2007



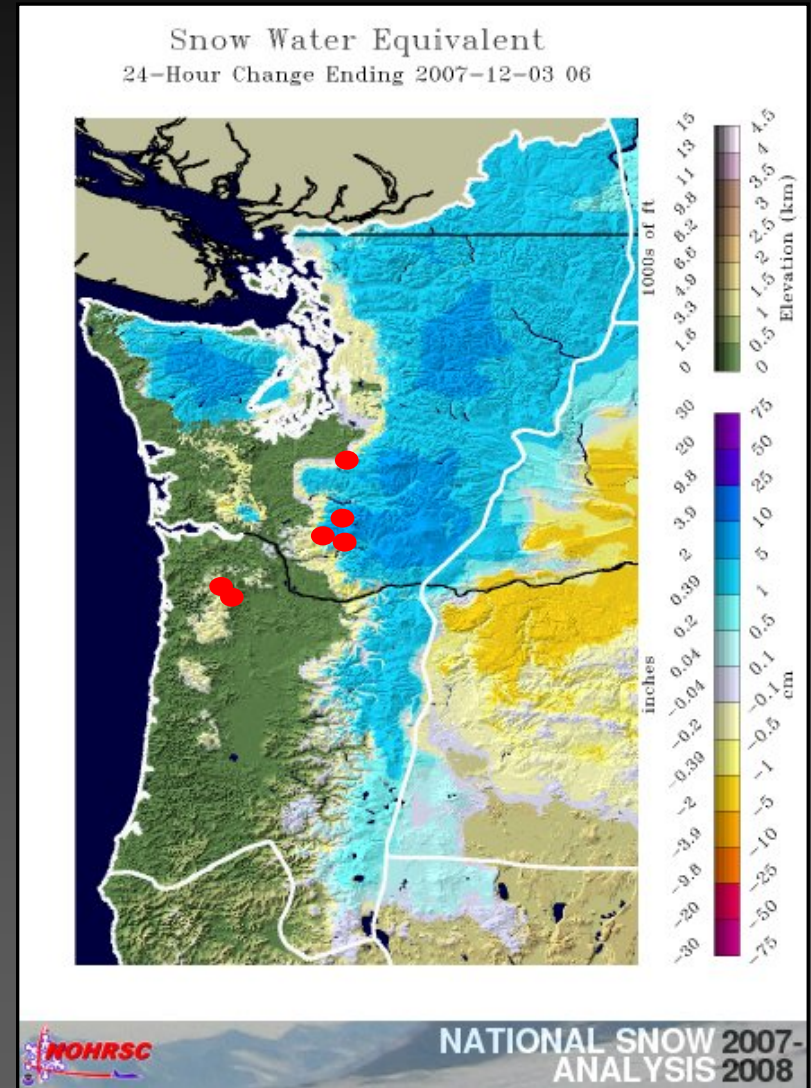
Storm 1: The Snow

Snowfall

The first storm produced heavy snow in the mountains and lighter low elevation snow throughout the region due to the arctic air over the area. While only up to 1" of snow fell around Seattle, several higher elevation areas of the Cascades received over a foot of snow. This heavy snow resulted in deadly avalanches in the Washington Cascade Mountains.

Snowmelt

The warm temperatures early in the storm caused much of the new snow to melt. However, because the new snow did not contain high amounts of water (low snow water equivalent) and because there was not a significant low elevation snowpack, snowmelt amounts were minimal (1-3") for areas below 4,000 ft compared to the high rainfall.



● Snotel sites used to estimate snowmelt in flood area

Storm 2: The Wind

PUBLIC INFORMATION STATEMENT
NATIONAL WEATHER SERVICE PORTLAND OR
1245 PM PST MON DEC 3 2007

..A STRONG PACIFIC SYSTEM CONTINUES TO ROCK THE COASTAL REGION THIS AFTERNOON...

On December 2, a low pressure system moved over the area resulting in extremely high winds along the Coast from Newport to Hoquiam. It is the first time the NWS issued a warning for hurricane-forces winds. Wind gusts of over 80 mph were observed along much of the coast with record set at Naselle Ridge with a peak wind gust of 147 mph.

LOCATION	PEAK WIND GUST
...WASHINGTON COAST...	
CAPE DISAPPOINTMENT.....	104 MPH
KLIPSAN (Long Beach).....	102 MPH
DESTRUCTION ISLAND.....	93 MPH
...OREGON COAST...	
BAY CITY (NEAR TILLAMOOK).....	129 MPH
CAPE MEARES (ELEV. 1500 FT).....	114 MPH
ROCKAWAY BEACH.....	104 MPH
TILLAMOOK BAY TIDE GAGE.....	100 MPH
ASTORIA (WEST SLOPE).....	86 MPH
CLATSOP SPIT	86 MPH
REPORTING ASTORIA AIRPORT....	85 MPH
LINCOLN CITY	125 MPH
YAQUINA HWY 101 BR	88 MPH
LINCOLN CITY (OTHER REPORT)..	85 MPH
NEWPORT AIRPORT.....	83 MPH

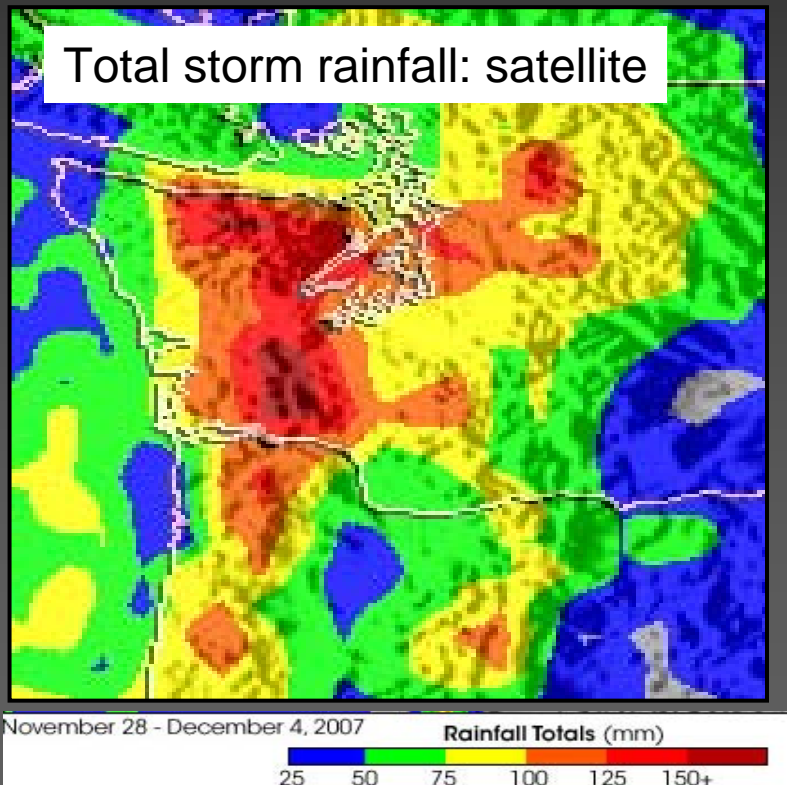
Figure 1. Clatsop Spit Station Wind Speed (mph)



The wind storm had not only high wind gusts, but also had a long duration, increasing the potential for damage. This chart shows high wind speeds for Clatsop Spit in Oregon that lasted from Dec 2nd through the 4th.

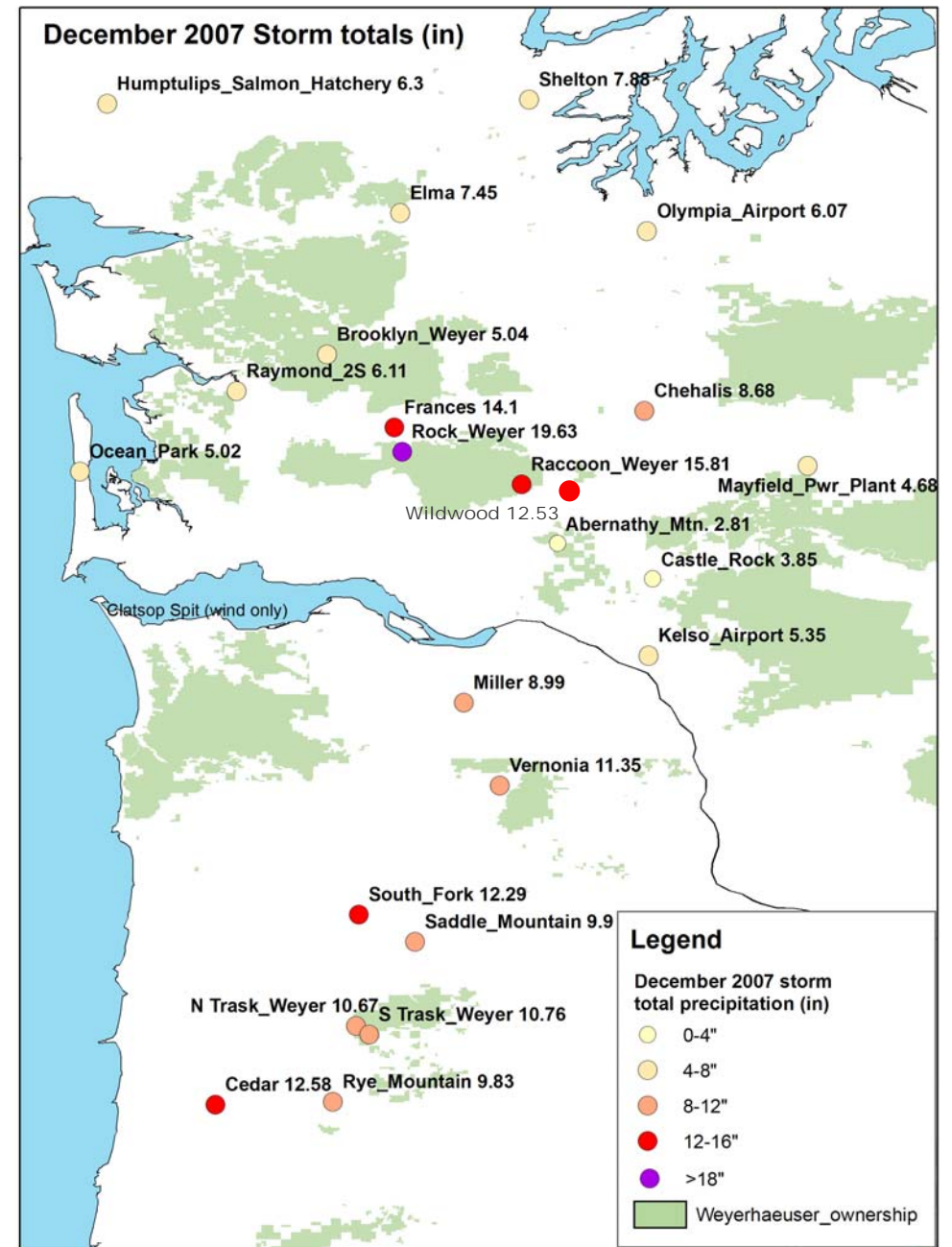
Storm 3: The Rain

The most significant of the three storms arrived December 3rd with near record high temperatures and a moist tropical air which led to record rainfall in many areas of southwestern Washington and northwestern Oregon (Wolf Read, OWSC).



This image shows rainfall totals as recorded by the Multi-satellite Precipitation Analysis (MPA) at NASA Goddard Space Flight Center.

Total storm rainfall (observed)

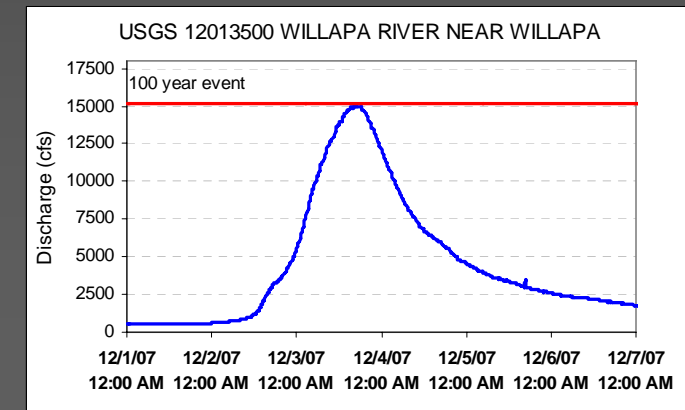
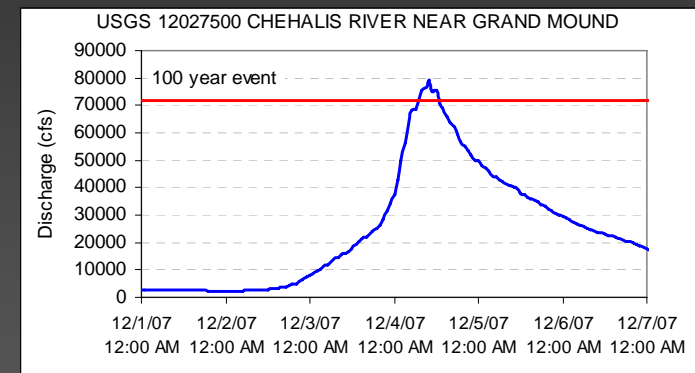
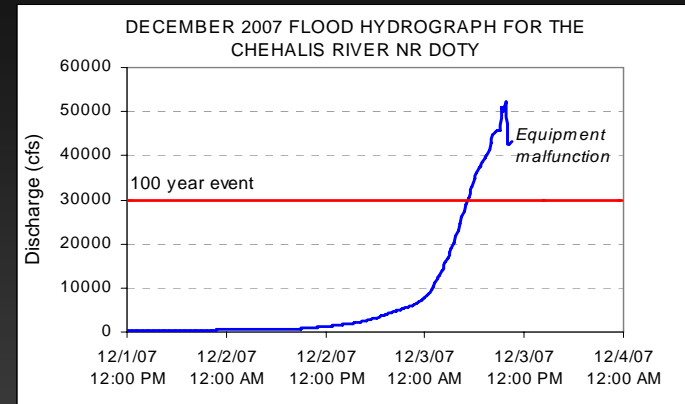
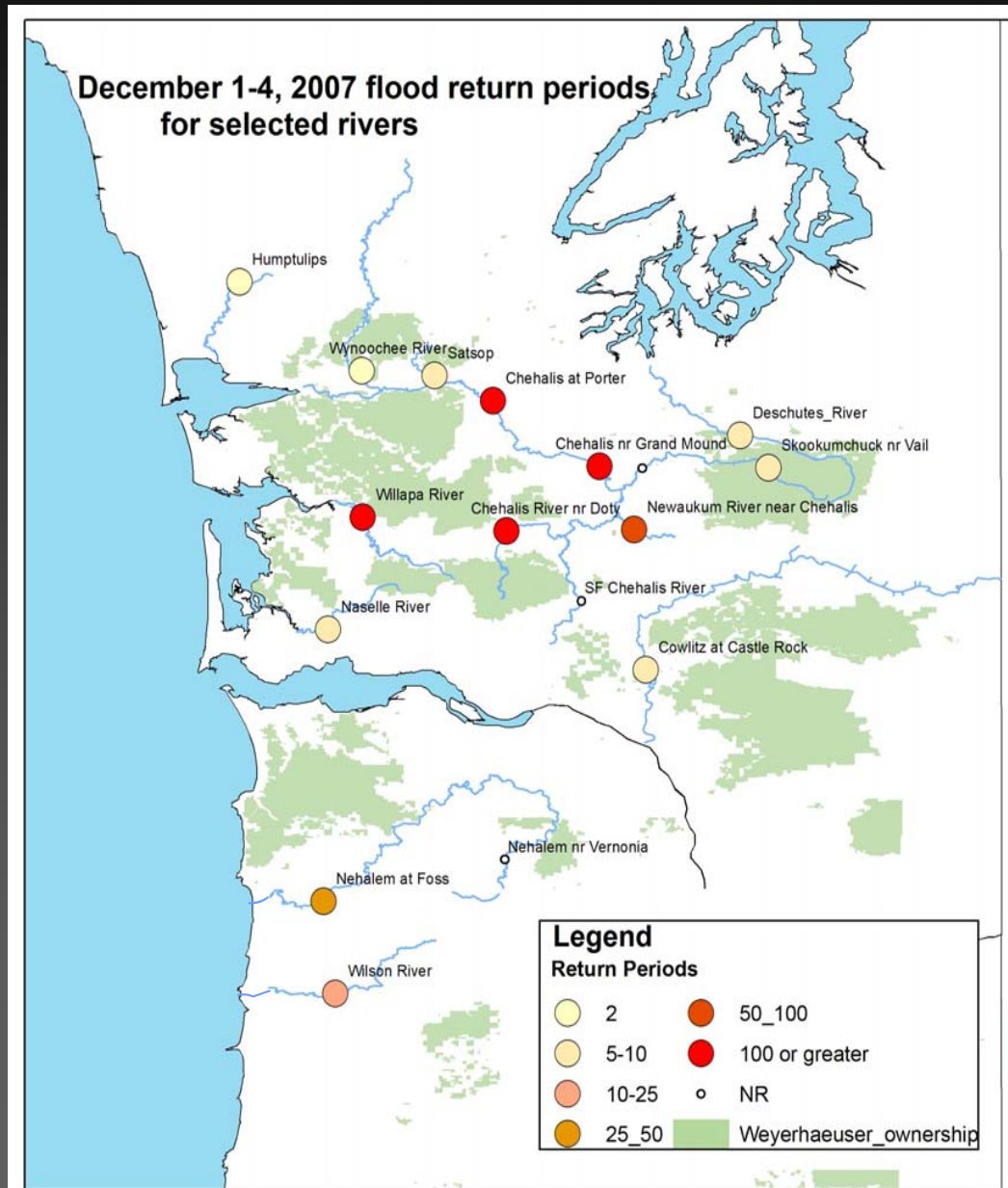


The Rain: Maximum 24 hour precipitation

In some areas, 24-hour maximum storm intensities exceeded 100 year 24-hr amounts as estimated by NOAA. For example, the Chehalis maximum 24-hour storm precipitation of 5.38" exceeded the 100-year 24-hour amount of 3.74". In Vernonia, OR the 24-hour rainfall intensity was 8.31", exceeding the 100-year intensity by almost 2.5".

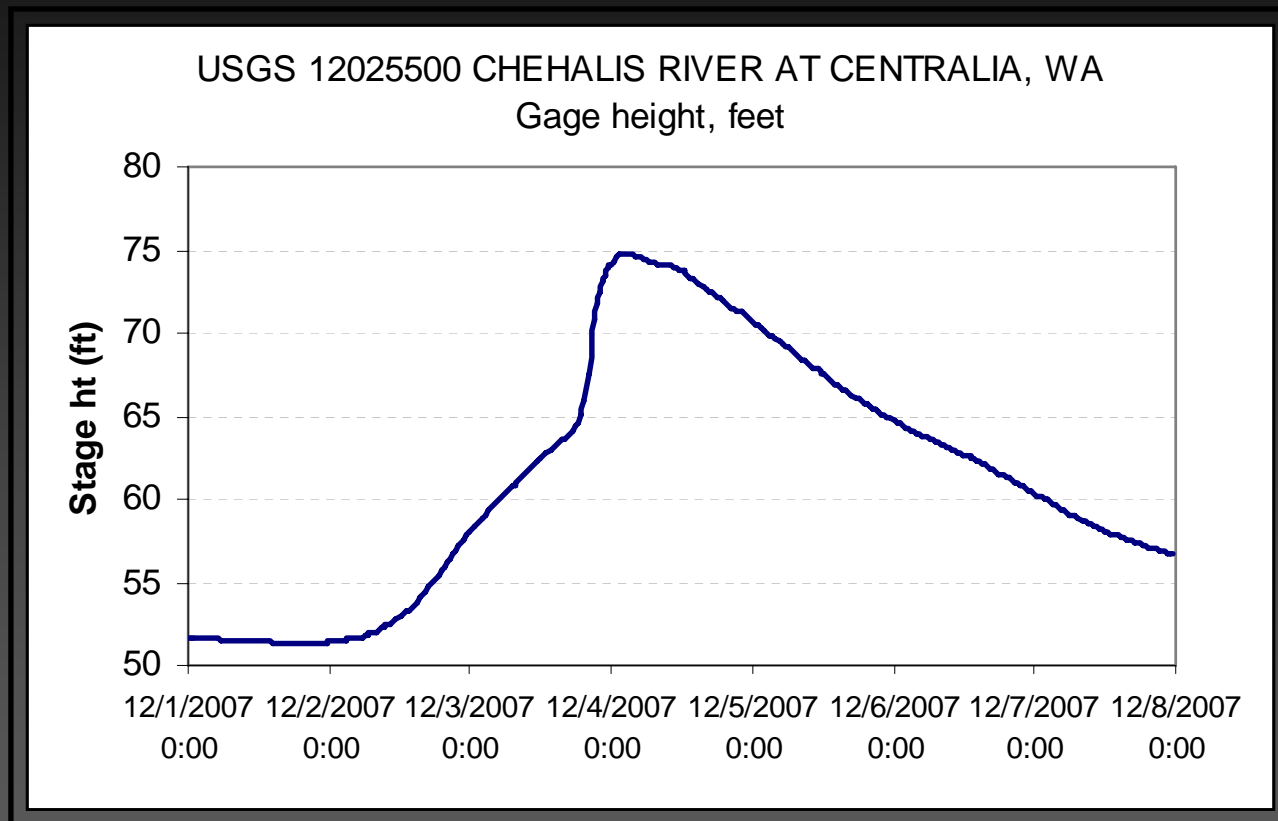
Rank	Site_Name	Elevation (ft)	State	Dec. 2007 storm 24- hour max. precip. (in)	NOAA 100- year 24 hr precip. amount (in)
1	Rock Cr Weyerhaeuser	1424	WA	14.35	7.50
2	Raccoon Weyerhaeuser	1086	WA	13.85	7.59
3	Frances	230	WA	9.70	7.84
4	South Fork	2257	OR	9.49	9.86
5	Wildwood	370	WA	9.29	6.75
6	Cedar	2220	OR	9.18	11.21
7	Vernonia	755	OR	8.31	4.92
8	Rye Mountain	2000	OR	7.29	10.07
9	Shelton	269	WA	6.42	8.50
10	Miller (RAWS)	1031	OR	6.40	6.00
11	Chehalis (RAWS)	262	WA	5.38	3.74
12	Elma	70	WA	4.77	6.25
13	Humptulips salmon hatchery	140	WA	4.71	8.62
14	Rochester	151	WA	3.83	6.39
15	Olympia Airport	203	WA	3.80	6.10

Storm 3 continued: The Floods



NOTE: This is all provisional data and should be used with caution until approved by the USGS

Storm 3: Flood surge in Centralia

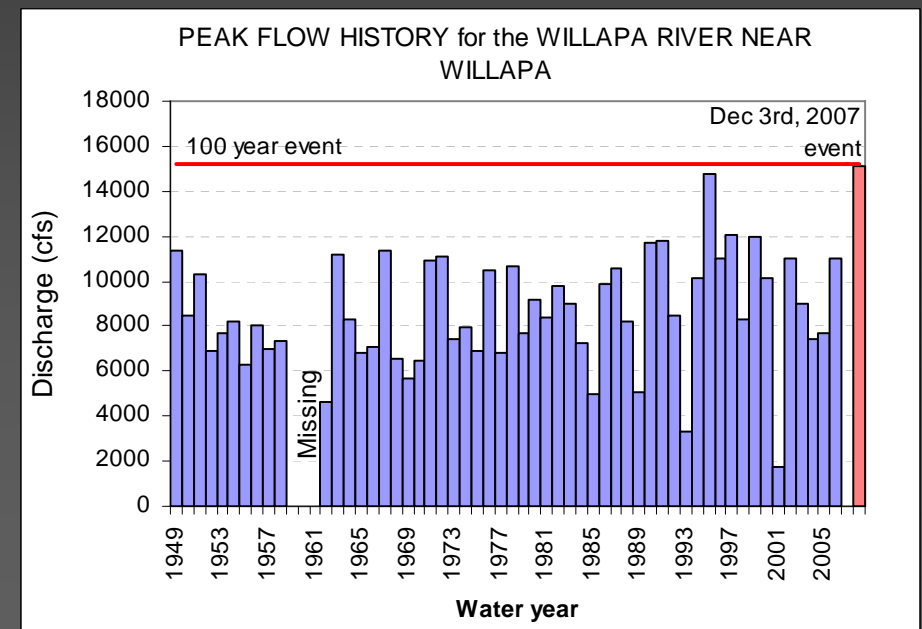
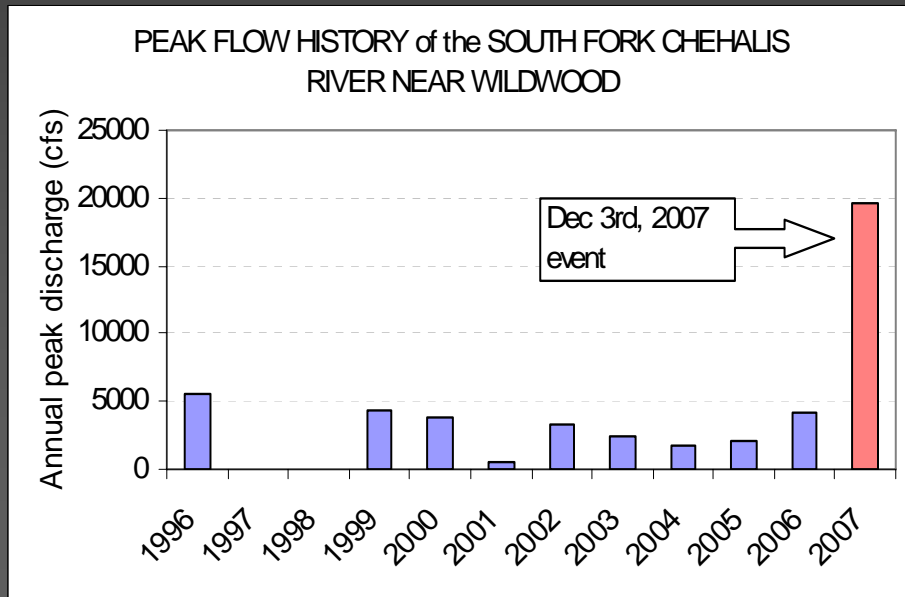
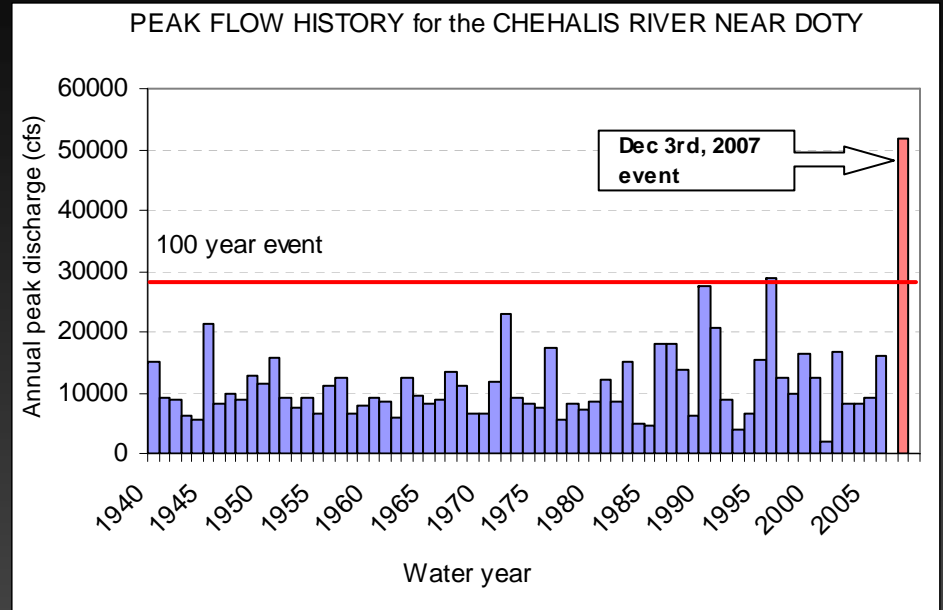


The Chehalis River at Centralia had an extreme rise in stage beginning around 7 PM on the 3rd indicating the potential effect of the flood wave from the upper Chehalis in the Doty area according to Larry Schick of the ACOE.

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Storm 3: The Floods

These charts show the December 2007 peak flows compared to historic flows for selected gages where the recent event appears to be the flood of record. The Chehalis River basin had 5 new records set as a result of the storm.



NOTE: Dec 2007 is provisional data and should be used with caution until approved by the USGS

Summary

A series of extreme magnitude events:

- The first ever hurricane-force wind warning issued by NWS. Maximum recorded wind gust of 147 mph. It was also a long-duration wind event.
- Record rainfall: climate stations in the north Oregon coast and in SW Washington had high rainfall with several stations breaking records. The highest storm totals were recorded in SW WA. In addition, several stations there had 24 hour rainfall well in excess of the 100 year 24 hr amount.
- Ten rivers exceeded their flood of records. In the Chehalis River basin 5 all-time high records were broken. As Larry Schick meteorologist with the Army Corps of Engineers said referring to the Chehalis River at Doty, *"This is an extraordinarily rare event. A huge event. Double the previous record."*