

Probable Maximum Precipitation (PMP)

George H. Taylor

February, 2006

What is PMP?

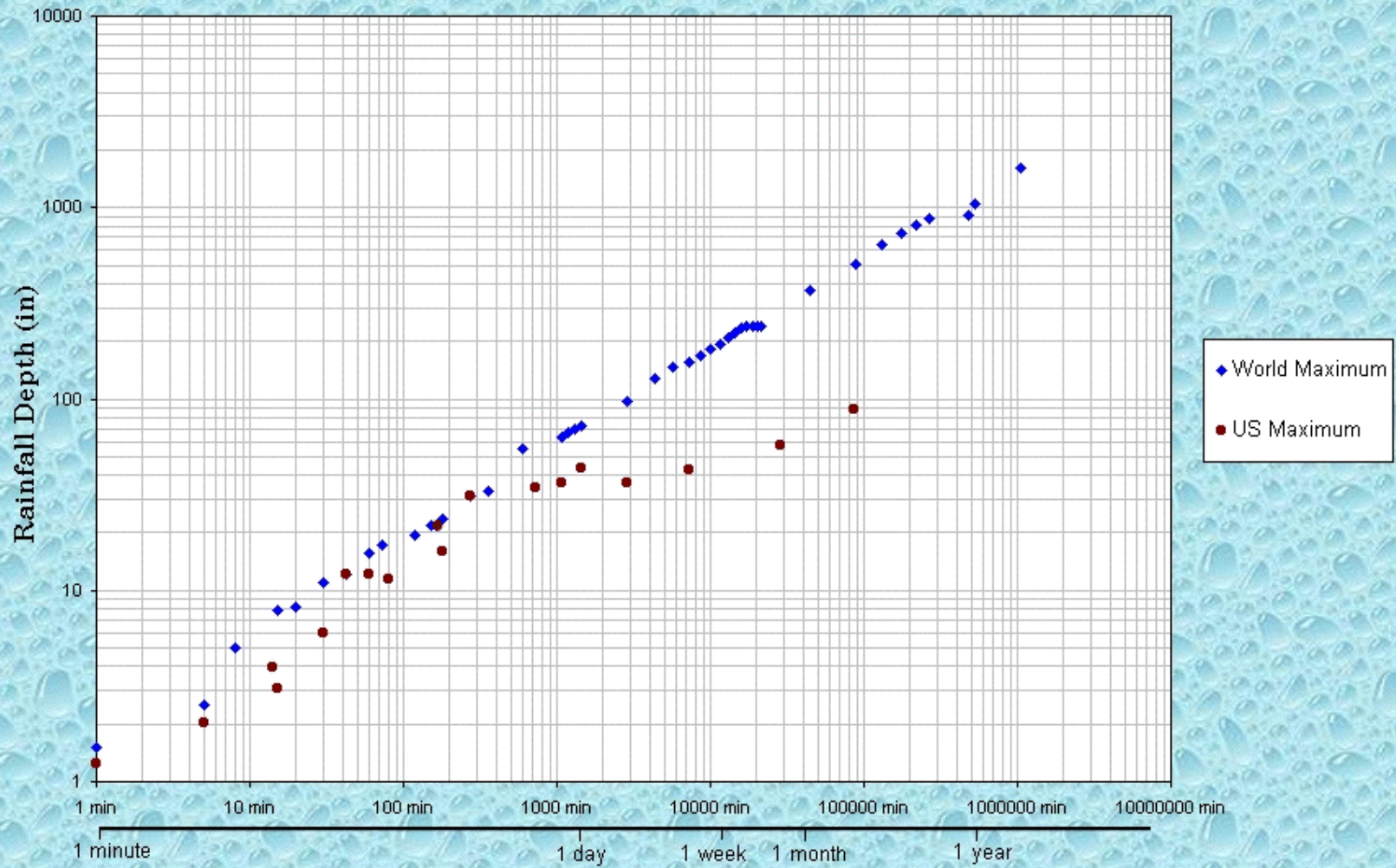
PMP is defined by NWS as "theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular geographical location at a certain time of the year."

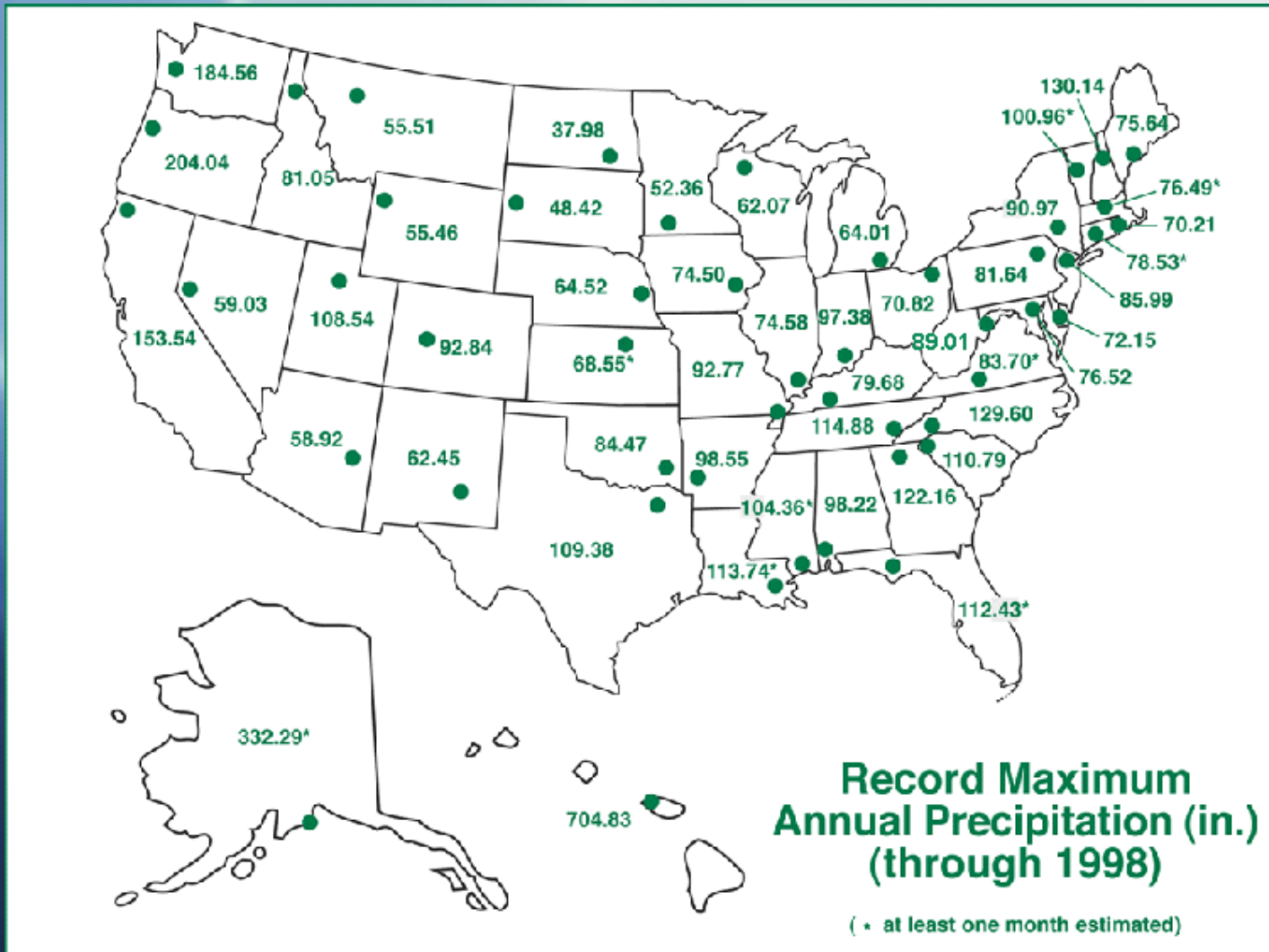
This is slightly different from the previous definition (American Meteorological Society 1959), which was used in HMR 36. The HMR 36 definition stressed that the estimate was for a particular drainage area. The current definition is more generalized, and emphasizes the control the atmosphere has over a broad geographic region.

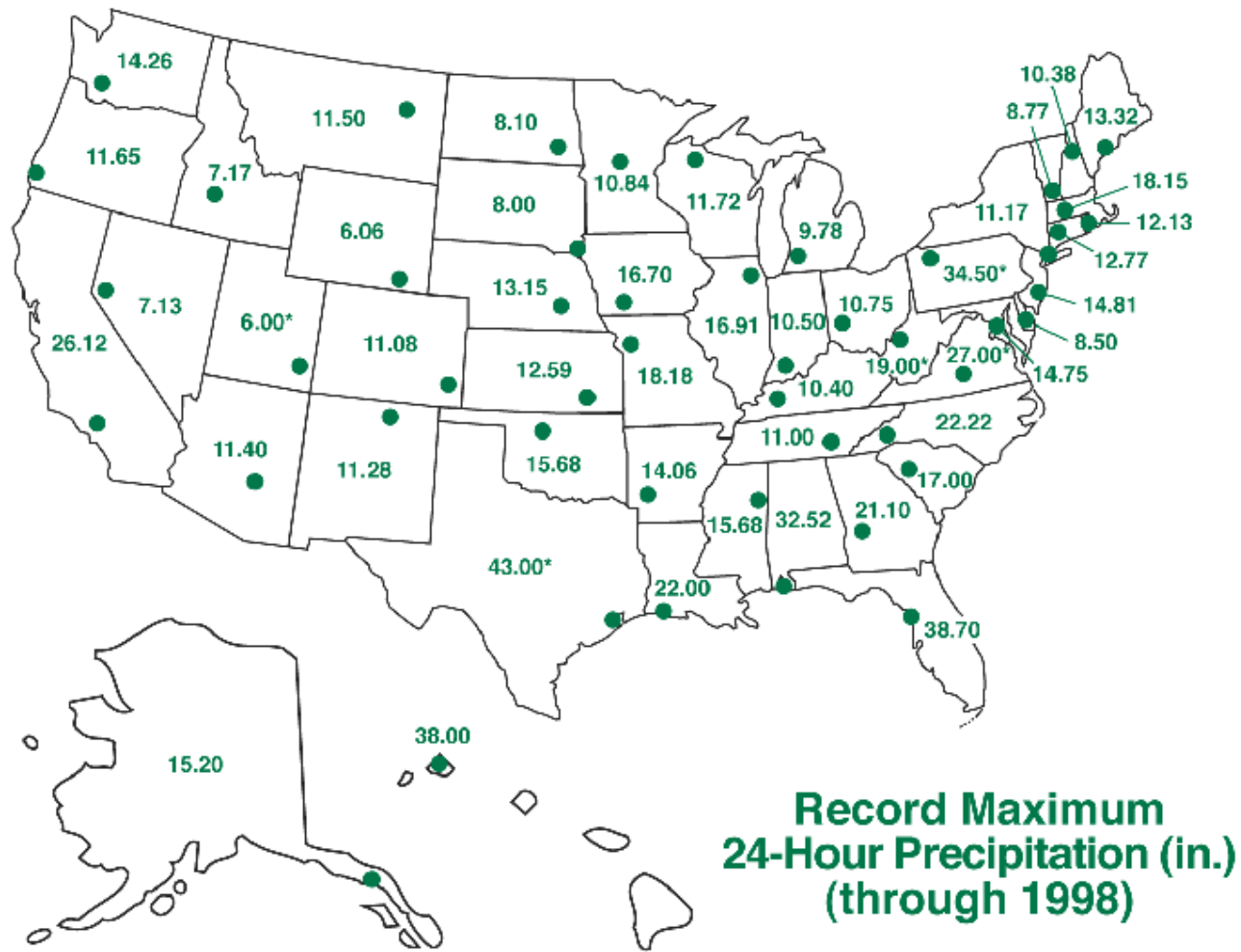
What is PMF?

The Probable Maximum Flood (PMF) is the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area.

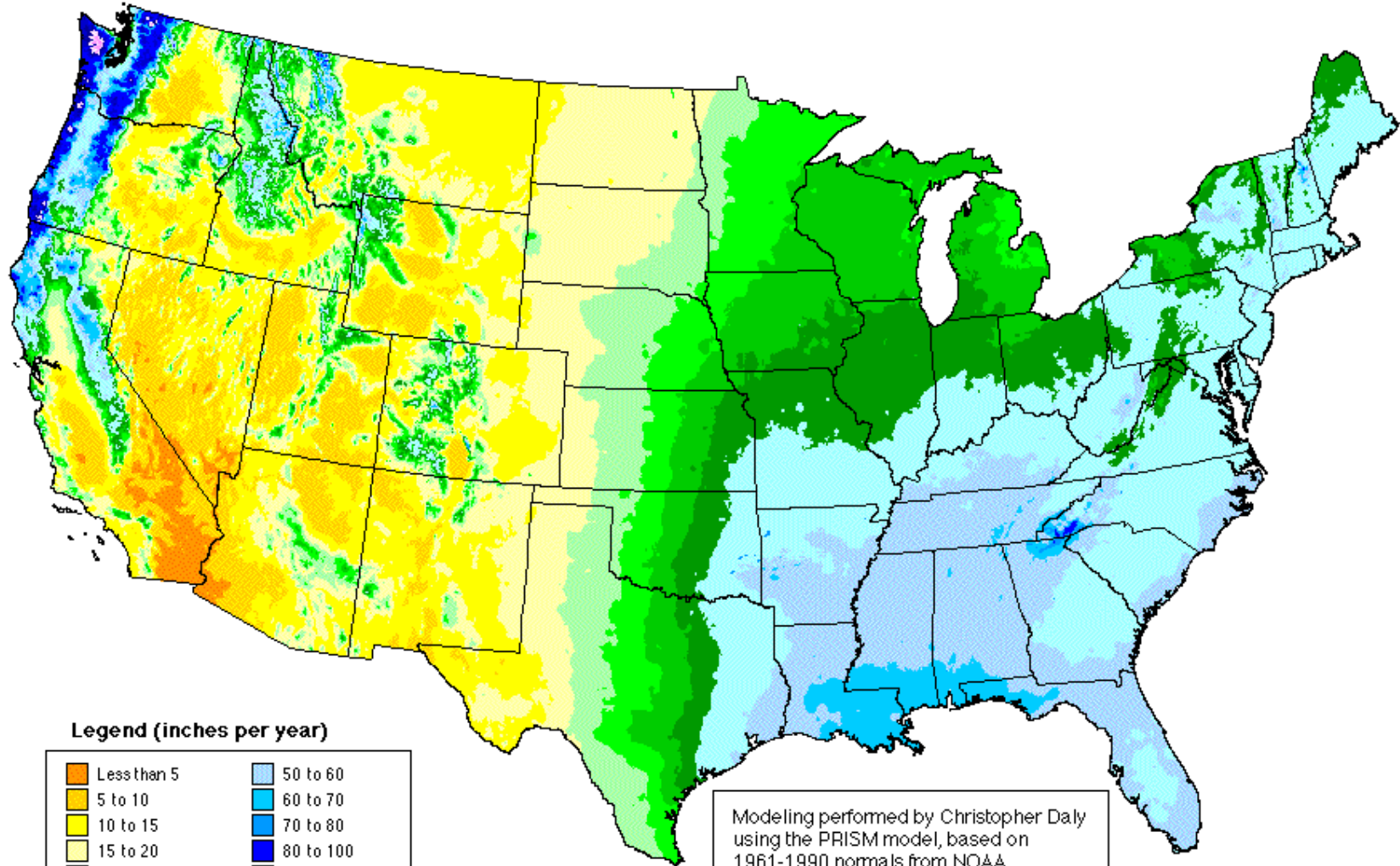
Maximum observed point rainfall as a function of duration







Annual Precipitation, United States, 1961-1990



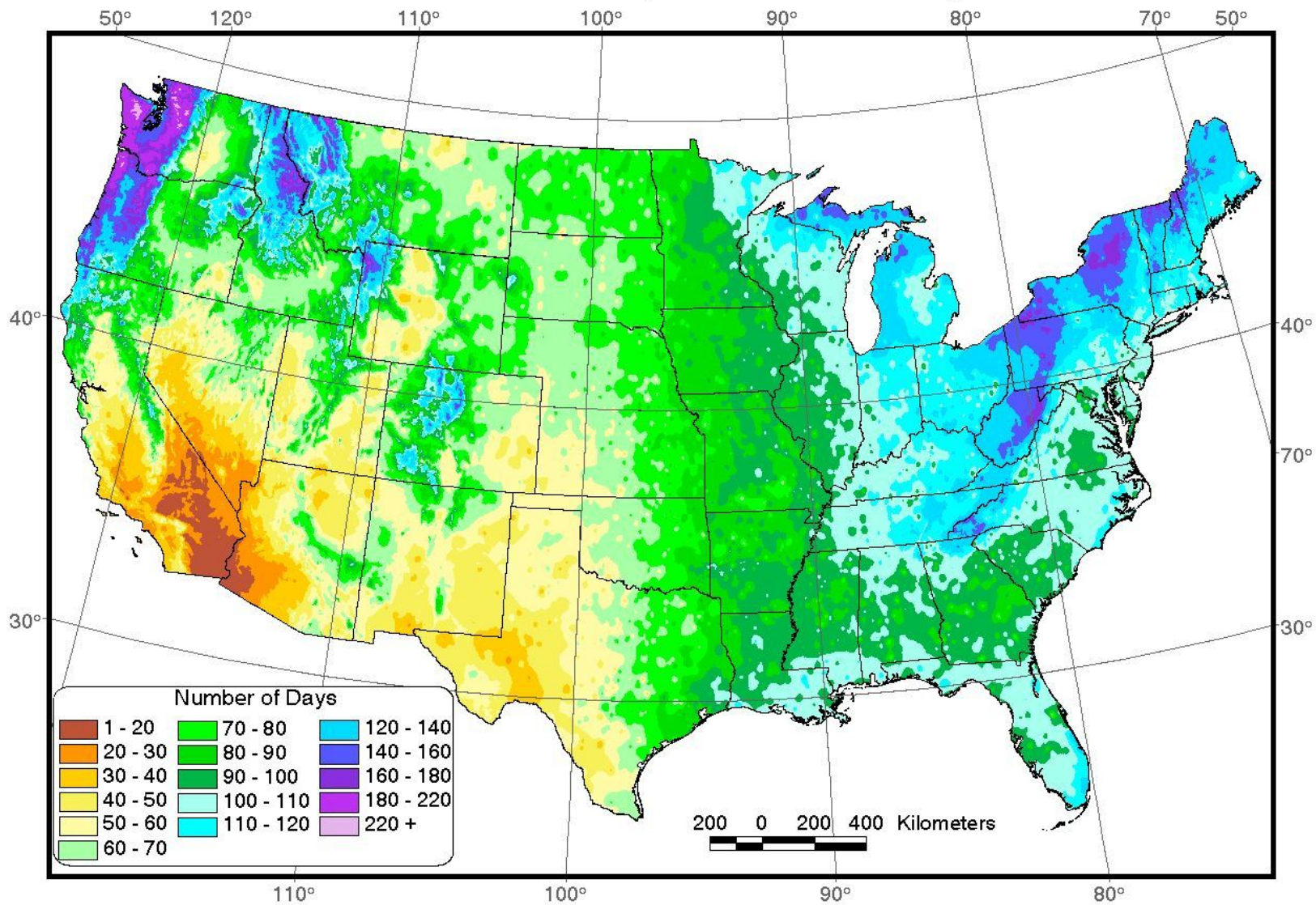
Legend (inches per year)

Less than 5	50 to 60
5 to 10	60 to 70
10 to 15	70 to 80
15 to 20	80 to 100
20 to 25	100 to 120
25 to 30	120 to 140
30 to 35	140 to 180
35 to 40	More than 180
40 to 50	

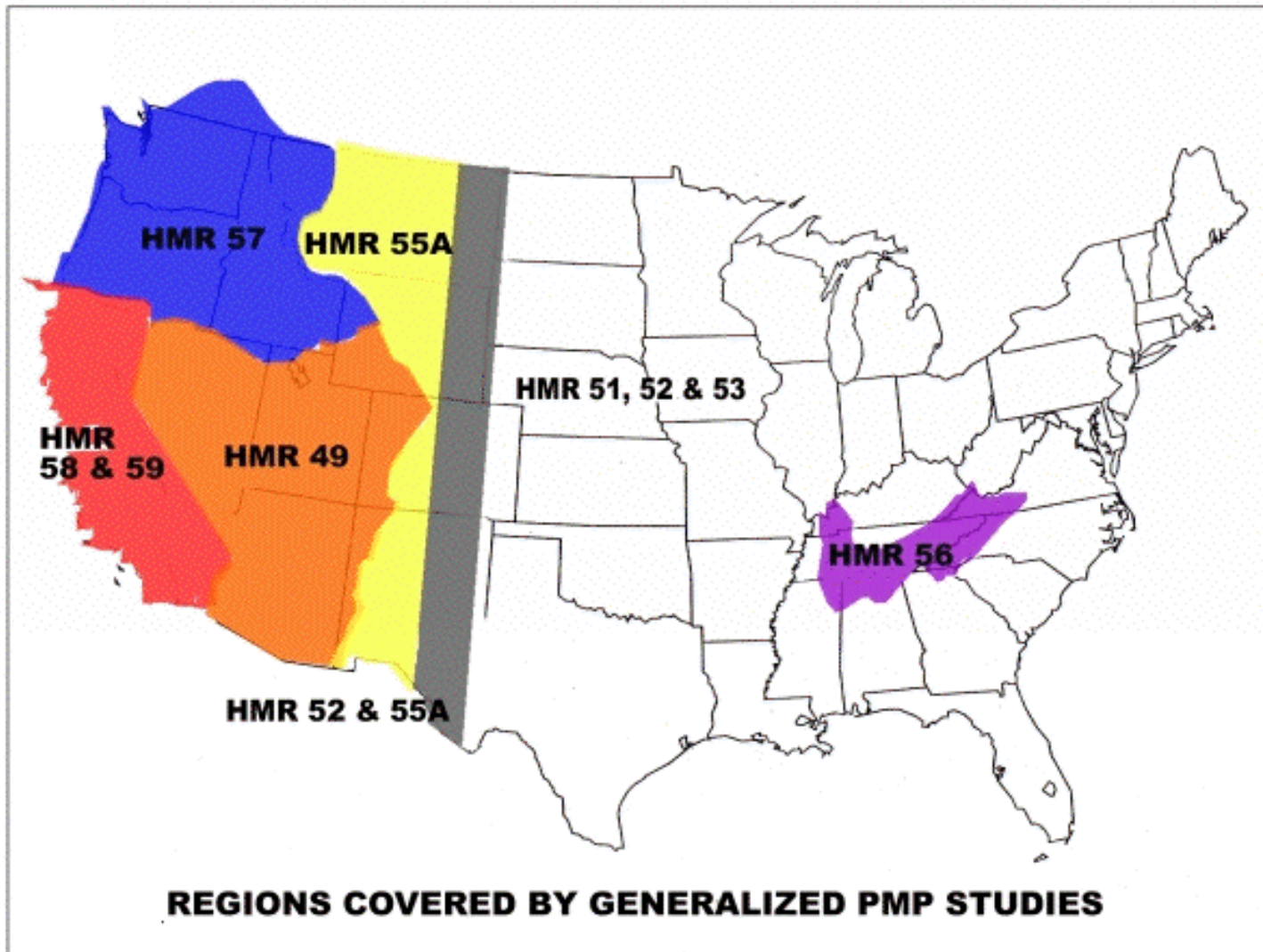
Modeling performed by Christopher Daly using the PRISM model, based on 1961-1990 normals from NOAA Cooperative stations and NRCS SNOTEL sites. Sponsored by USDA-NRCS Water and Climate Center, Portland, Oregon.

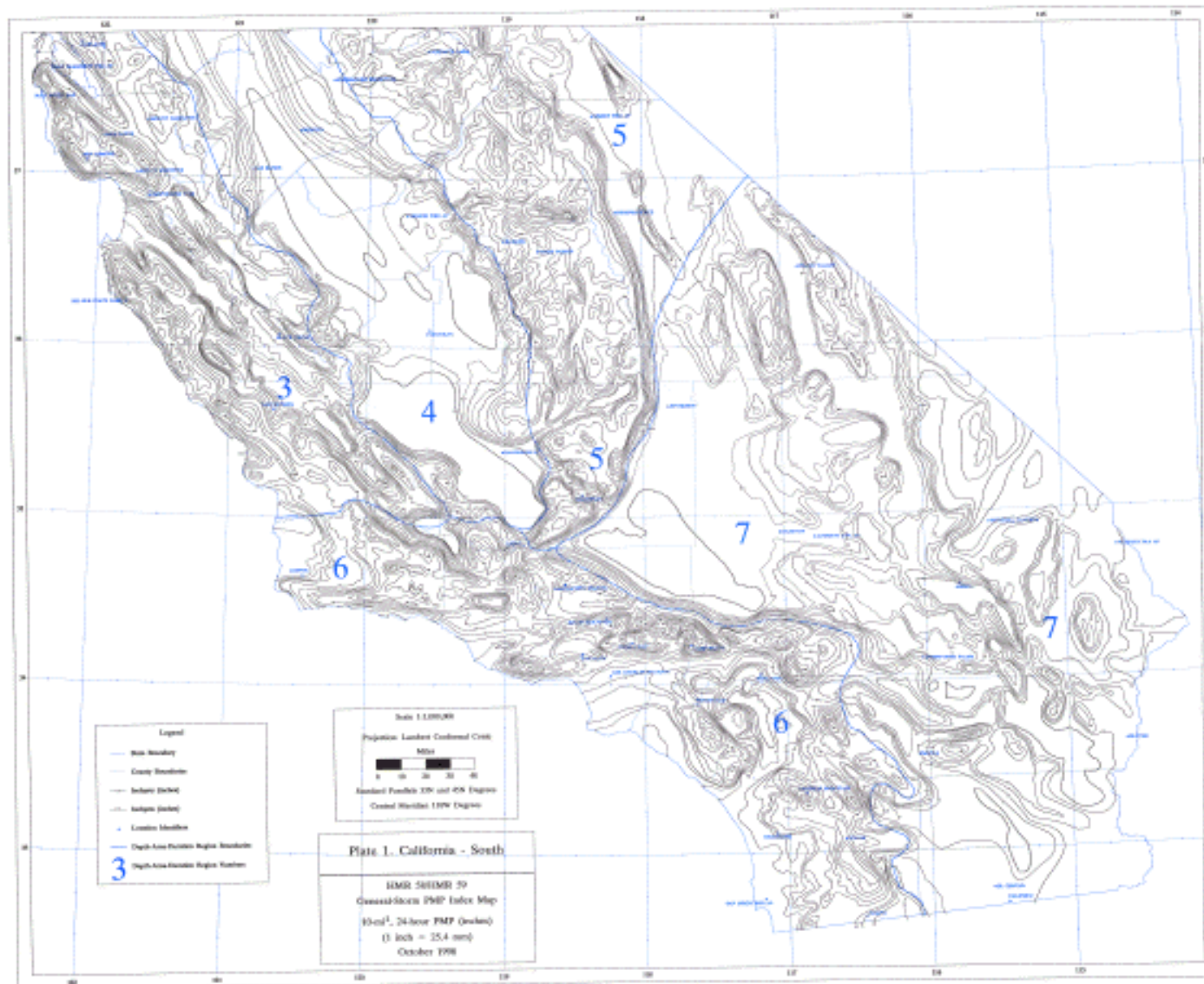
Oregon Climate Service
George Taylor, State Climatologist
(541) 737-5705

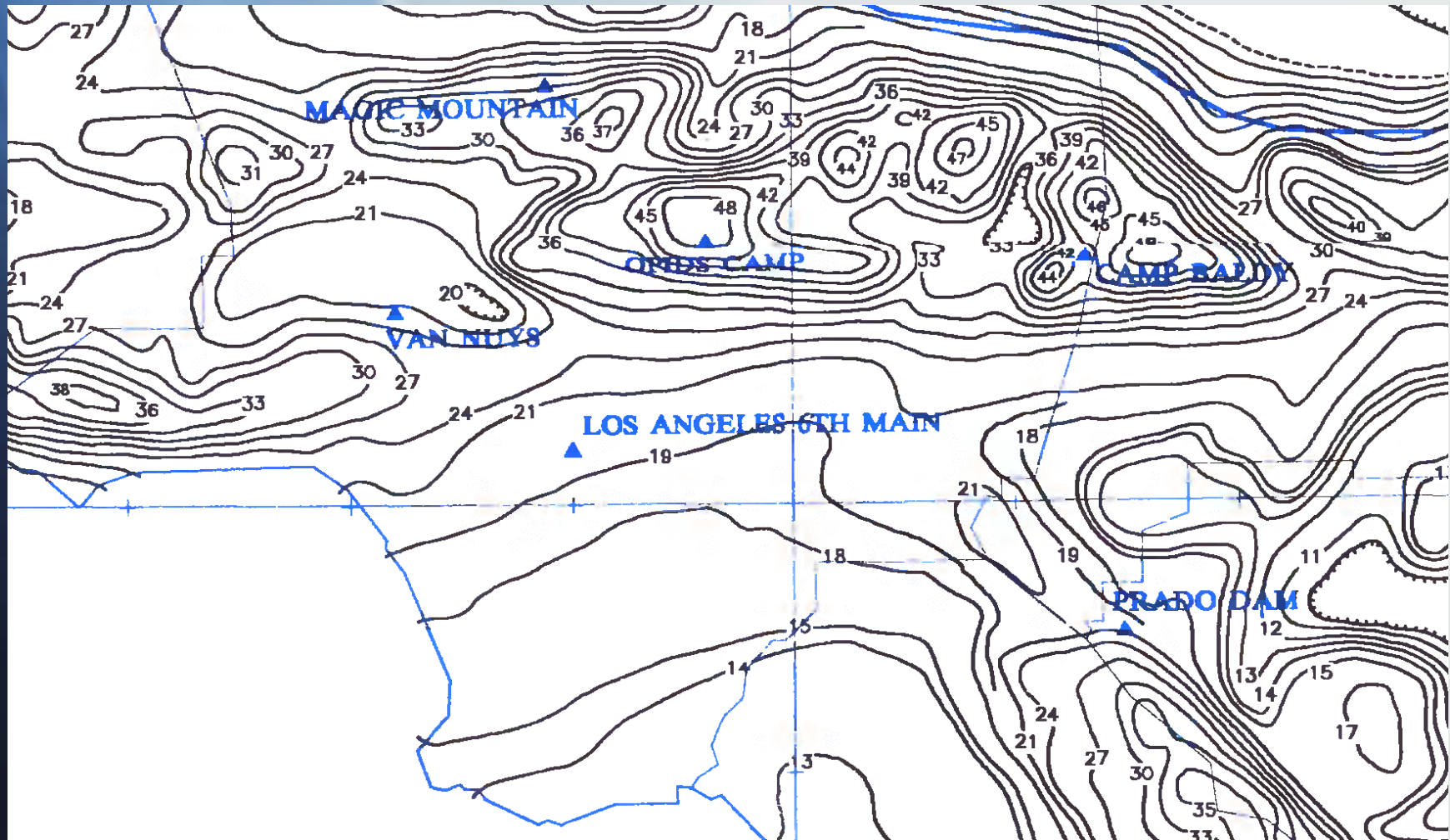
Mean Annual Number of Days with Measurable Precipitation

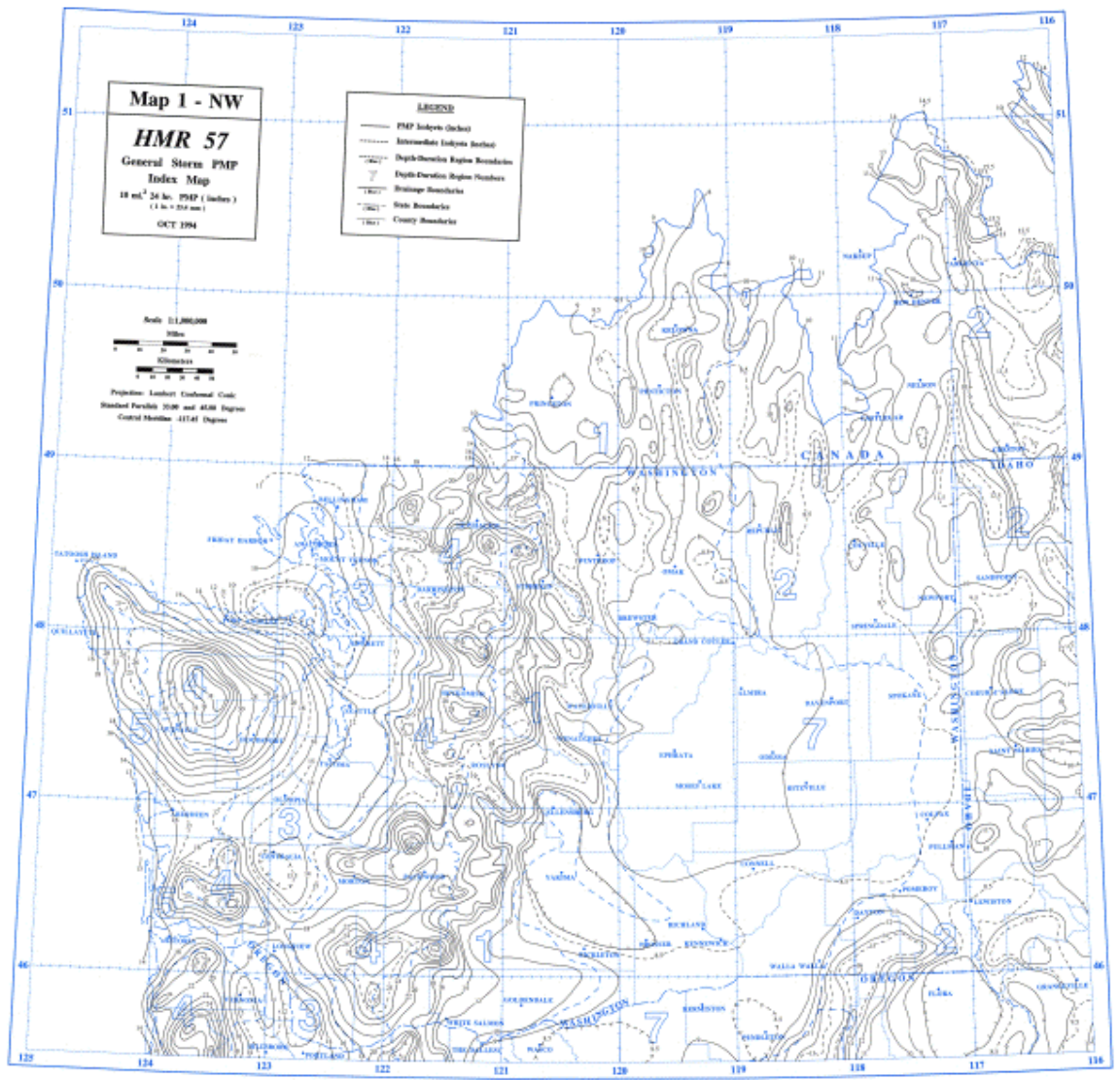


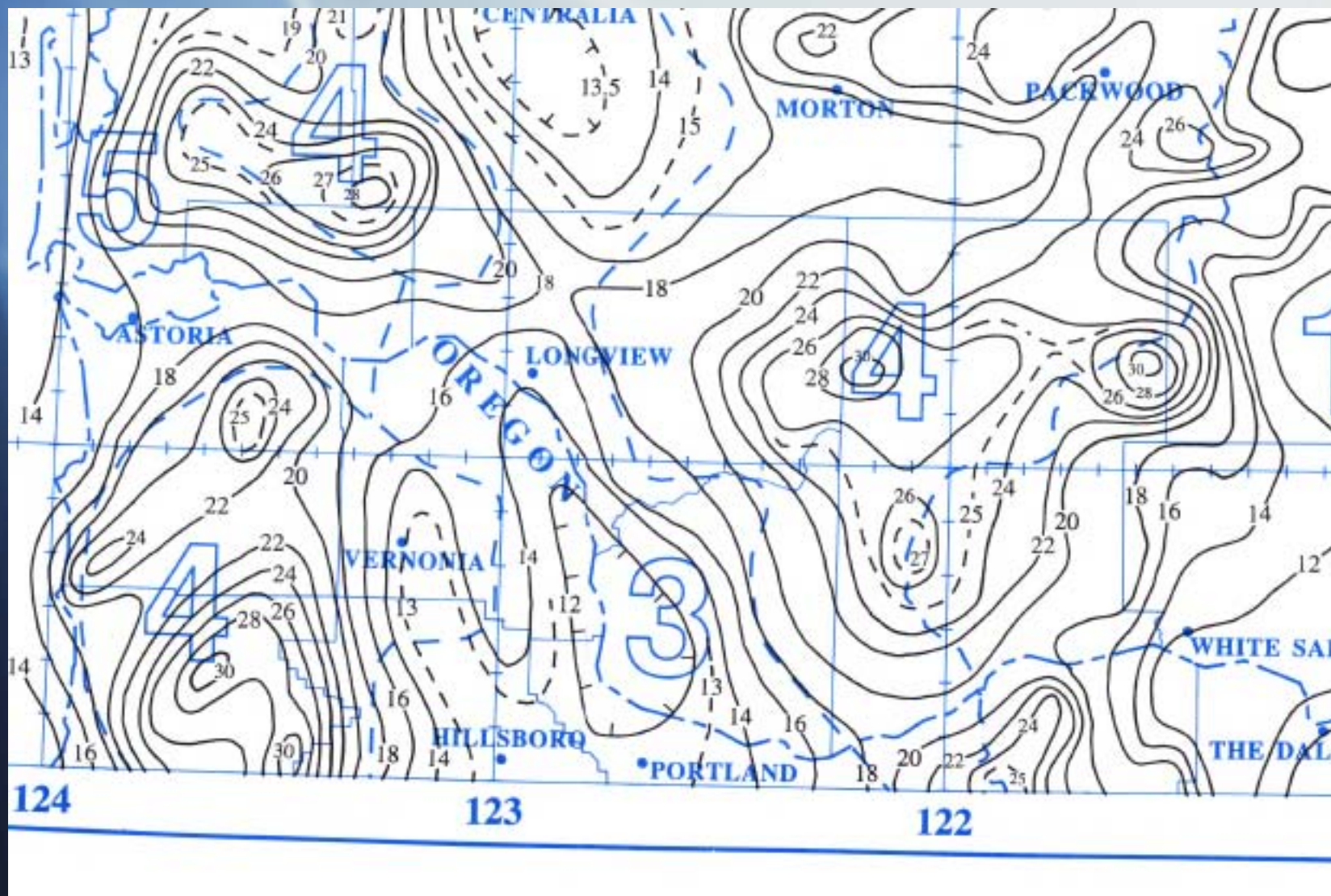
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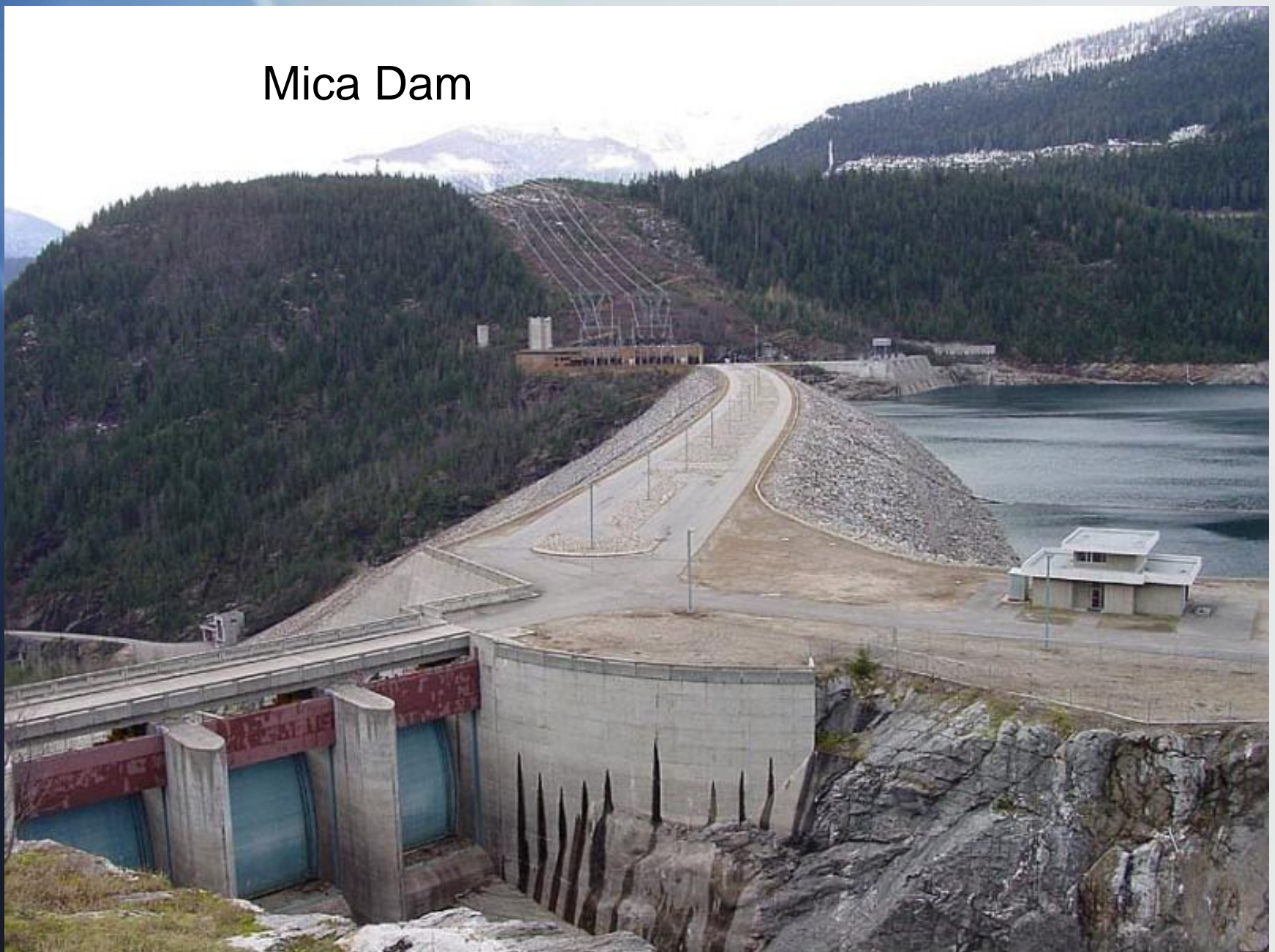
“If PMP isn’t at least twice as big as the 100-year value, I get really worried.”

Prominent PNW hydrologist

Mica Dam: Upper Columbia River, mile marker 956.0, B.C. Canada, completed in 1973, with a powerhouse added in 1977. Mica is owned and operated by BC Hydro. Mica is an earthfill embankment dam, 800 feet in height. It was built in accordance to the Columbia River Treaty to provide water storage for flood control and power. Storage size: 14,800 million cubic metres; capacity 1,805 MW



Mica Dam



**“If Mica Dam failed, Portland
would be under 30 feet of
water.”**

Prominent PNW hydrologist

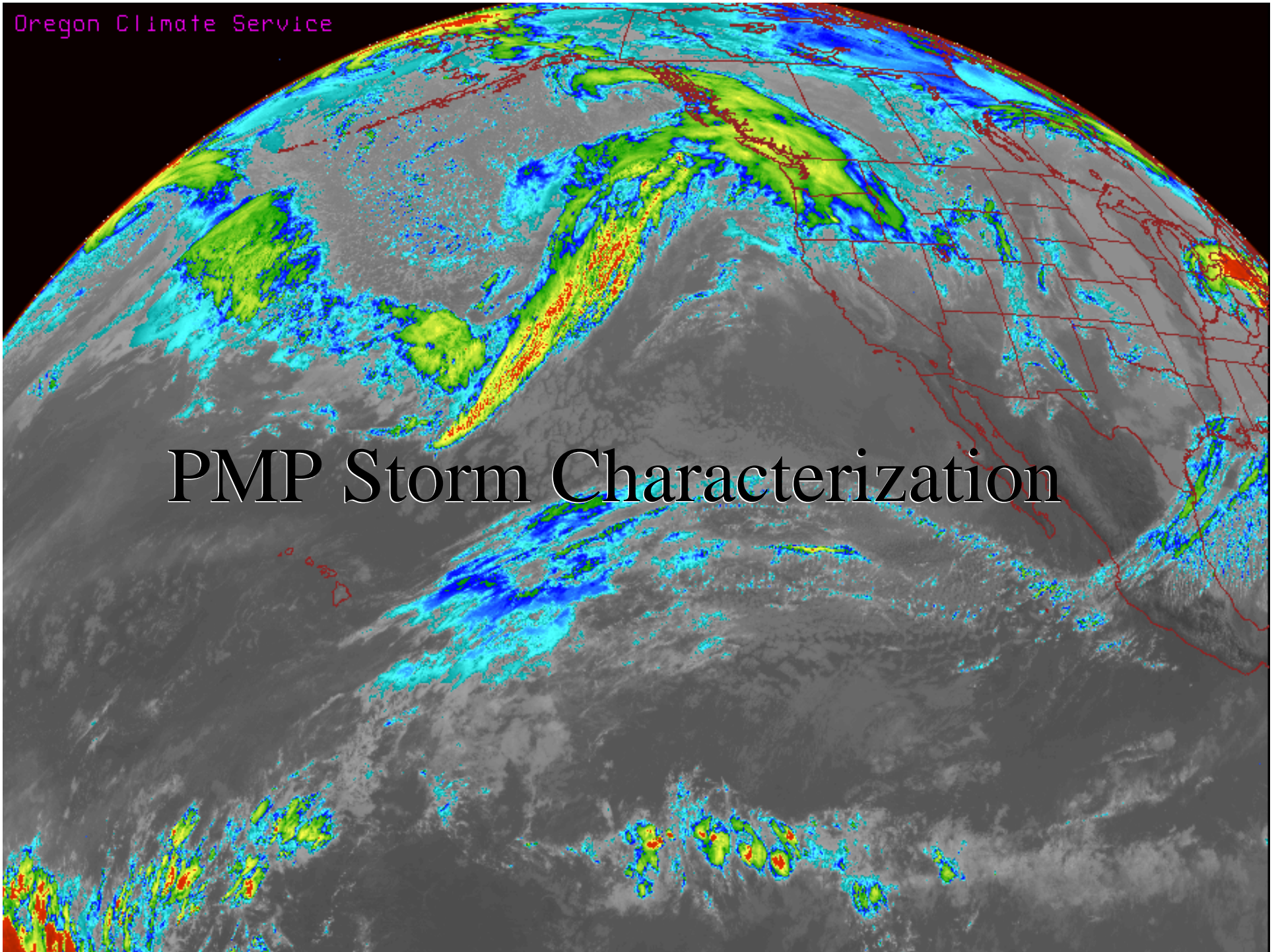
Duncan Dam: B.C. Canada, Duncan River, completed in 1967, owned and operated by BC Hydro. Duncan is a forty-mile high earthfill dam that was built to provide storage (it does not have a powerhouse). It was built under the terms of the Columbia River Treaty.





Aftermath of a Duncan Dam catastrophe

PMP Storm Characterization



Step 1. Select Storms

Month	Day	Year	Latitude	Longitude	Maximum recorded depth in mm		
					6 hour	1-day	3-day
1	21	1935	48.48	123.55	-	304.8	726.4
10	23	1945	48.47	122.32	98.3	183.4	288.3
2	16	1949	48.33	120.70	71.1	192.3	-
11	2	1955	49.08	121.98	88.1	307.1	471.9
12	8	1956	48.50	124.00	79.0	363.0	598.7
1	14	1961	49.43	122.96	-	314.2	485.9
10	21	1963	50.23	121.58	-	204.7	-
1	17	1968	49.20	122.86	74.2	228.6	492.5
1	18	1986	47.65	122.28	61.5	292.6	215.1
11	9	1990	49.36	121.48	71.1	342.9	498.0
11	7	1995	49.43	122.97	-	294.5	-

Storms selected for analysis of PMP for Southwest British Columbia, 2003

Step 2. Determine moisture characteristics for selected storms

Atmospheric Sounding, Feb. 16 1949, 16 GMT, Tatoosh Island

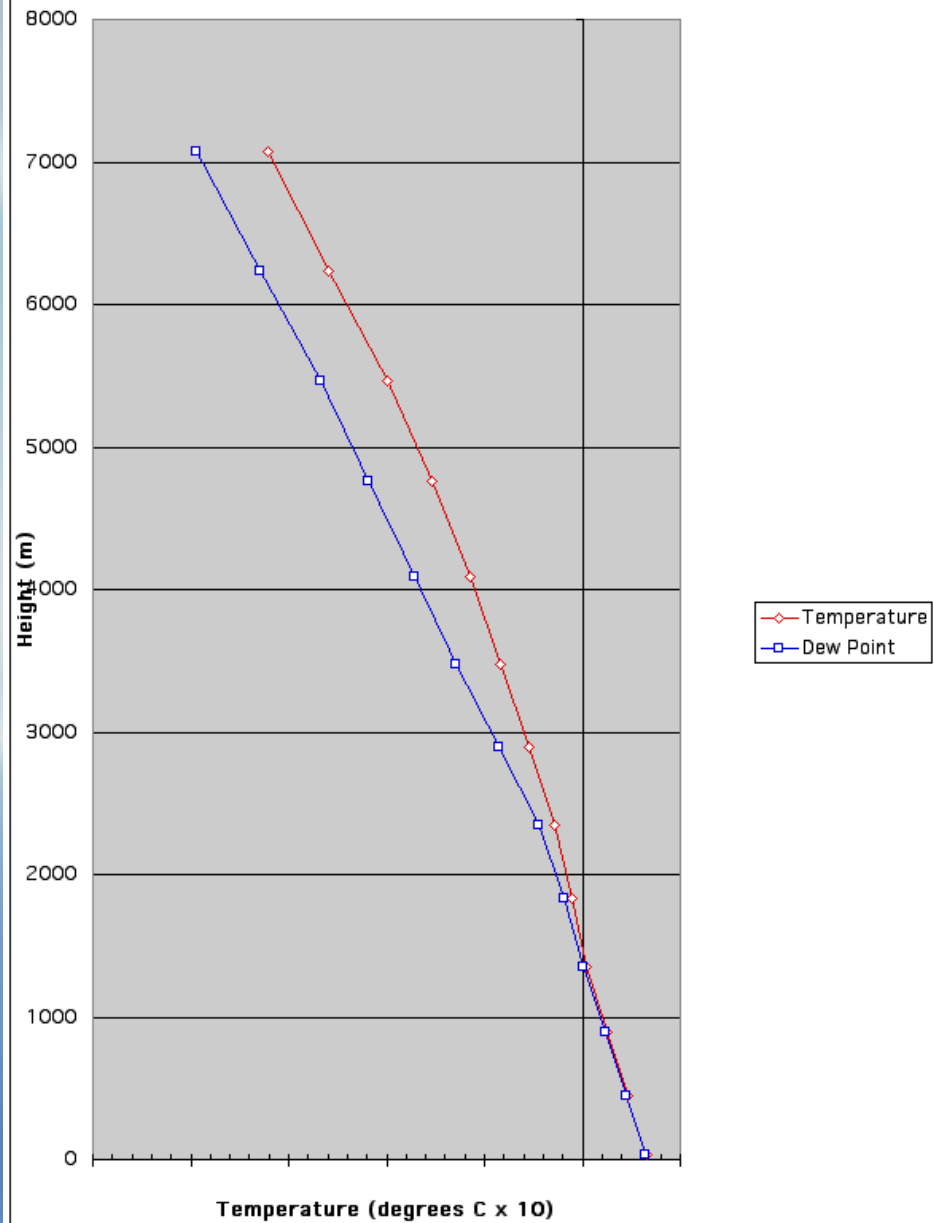
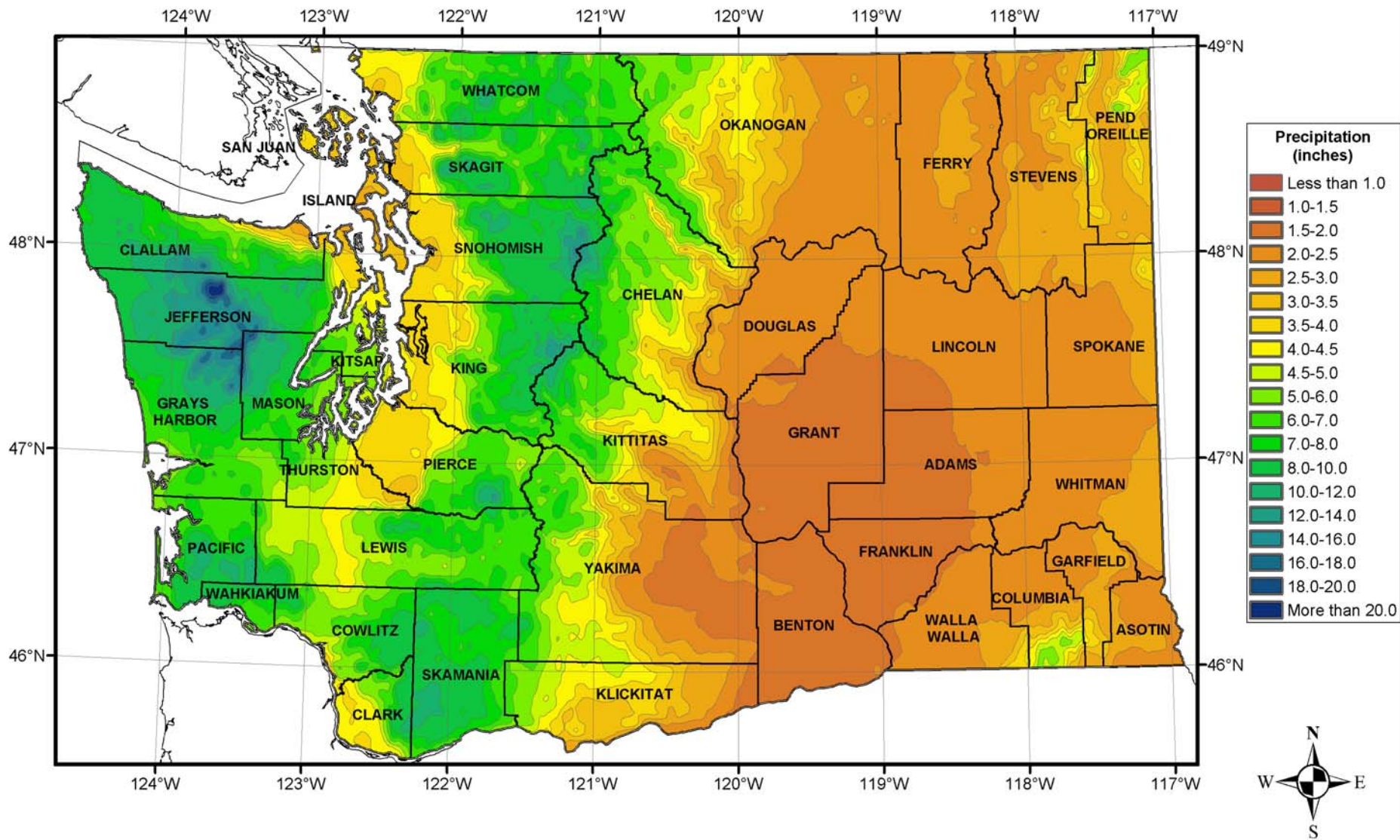


Figure 1 - Upper-air sounding for Tatoosh Island, Washington, February 16, 1949 -
Precipitable water for this sounding was calculated to be 16.7 mm

Step 3. 100-year Precipitation Coverage

Washington 100-year 24-hour Precipitation



Analysis performed by MGS Engineering and Oregon Climate Service

Map Created: January 2006

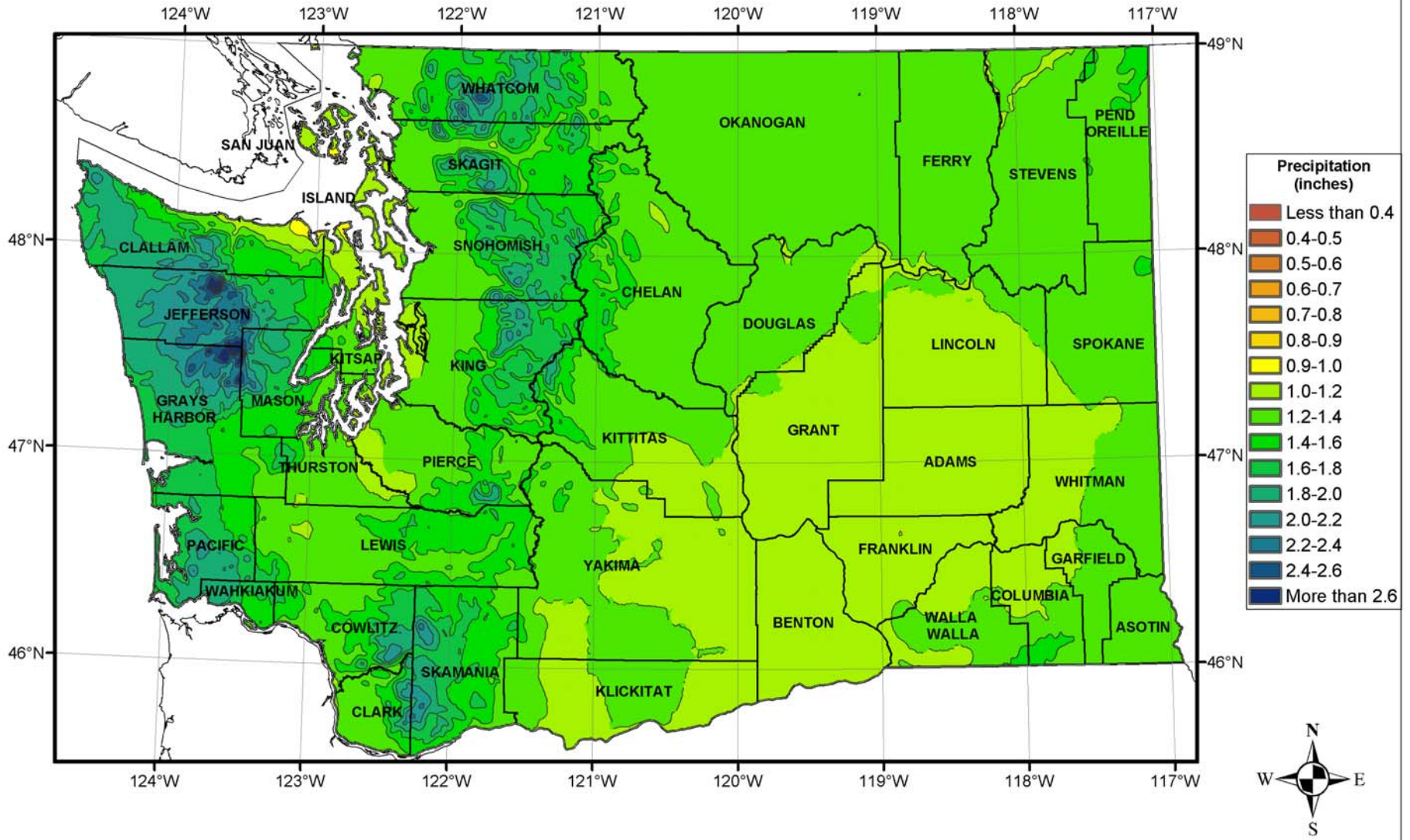
Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.

<http://www.ocs.oregonstate.edu/prism/>

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Washington 100-year 2-hour Precipitation



Analysis performed by MGS Engineering and Oregon Climate Service
 Map Created: January 2006

Map prepared with the PRISM climate modeling system by the Spatial Climate Analysis Service, Oregon State University.
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Step 4. Determine Spatial Extent of Major Storms

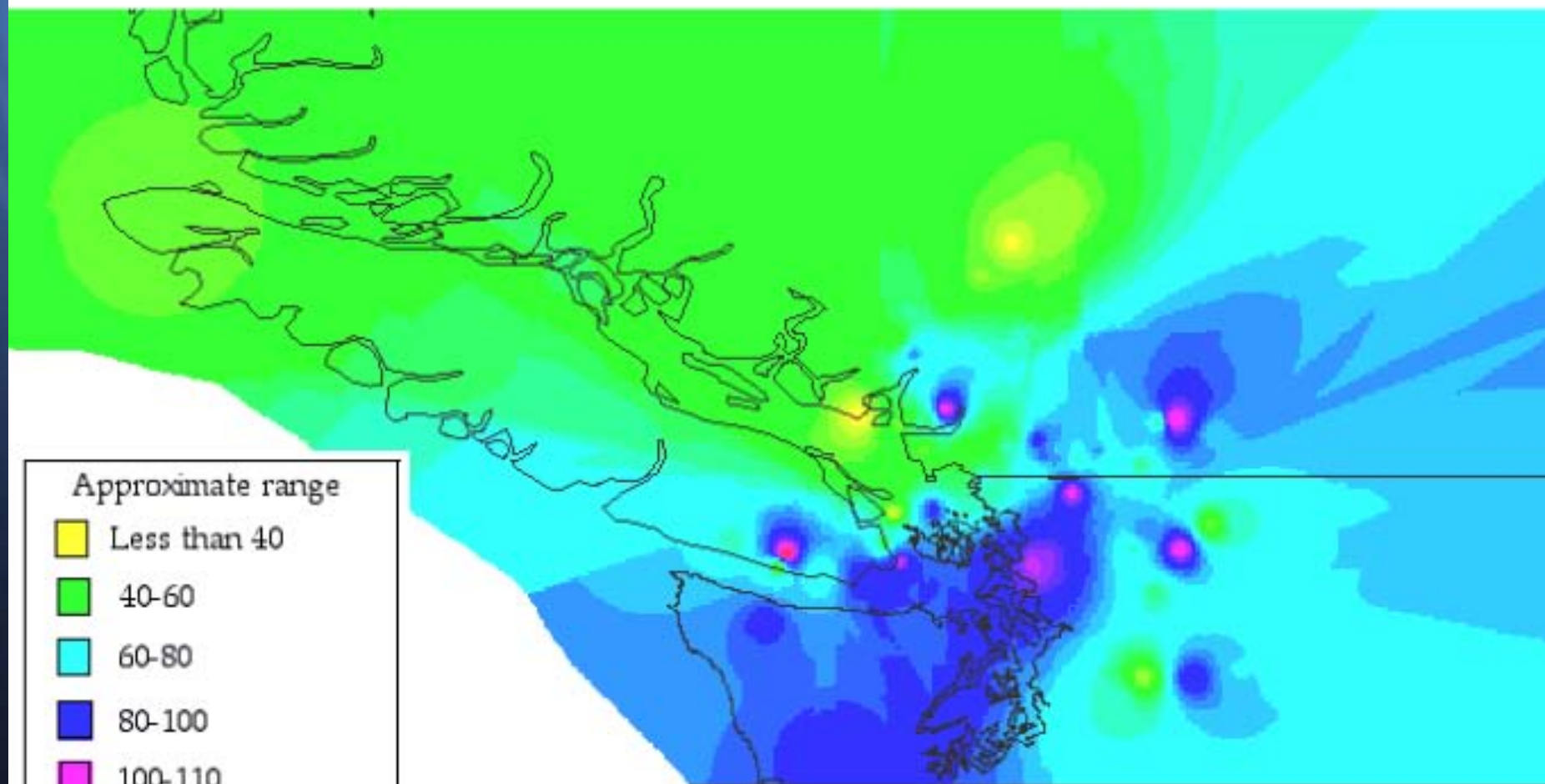
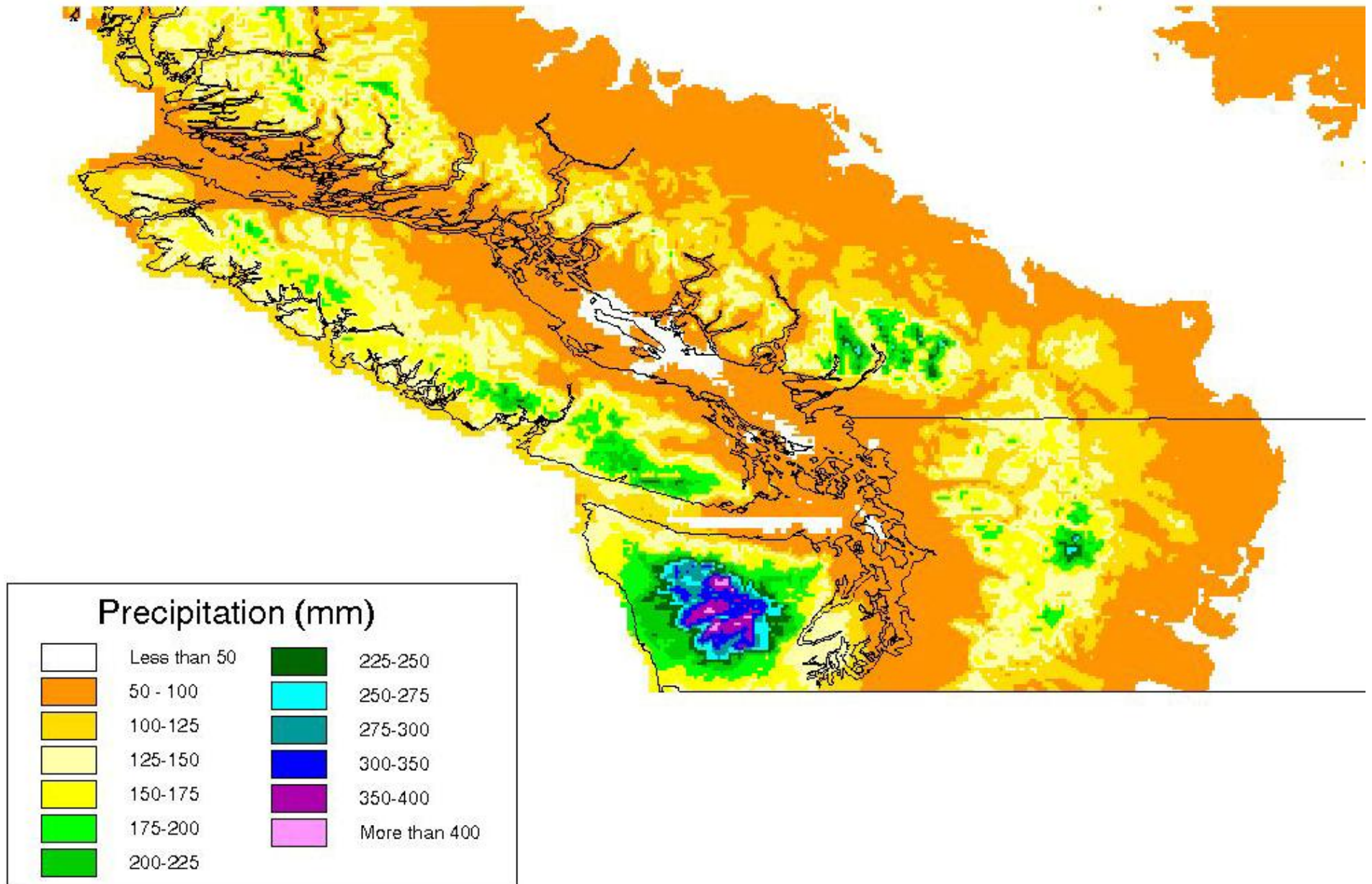
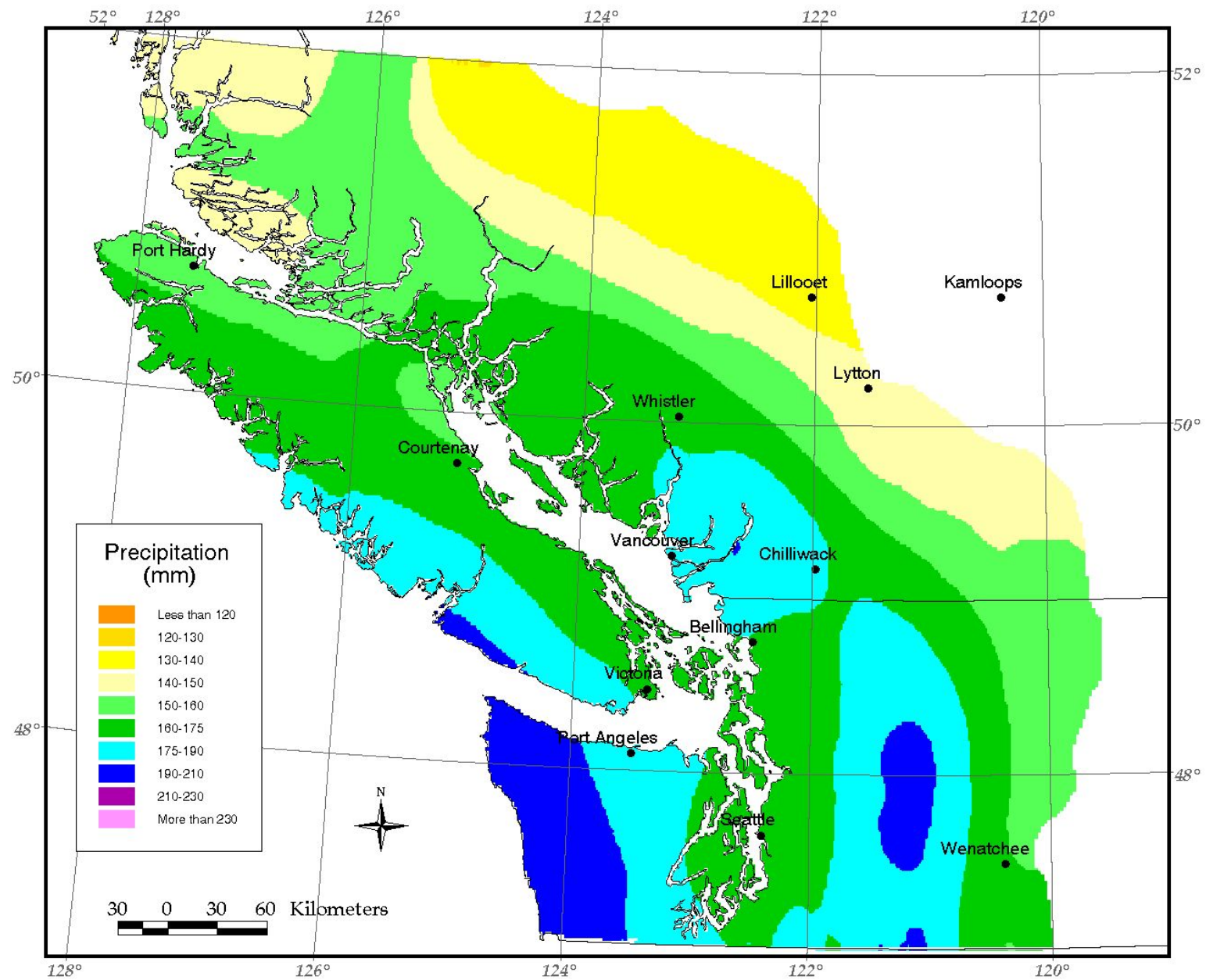


Figure 3. Example of an interpolated map showing the percentage of 100-year precipitation observed during a candidate storm. November 9, 1990

Maximum One-Day Precipitation, January 1935



Step 4. Maximize storms



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Step 5. Determine extent of controlling storms

