Recent Northwest Snow Drought Explained Mainly by Natural Factors and for That Matter May be Over

Recently in a Seattle Times article "How One Number Touched of Big Climate Change Fight at UW" it was reported

"The snowpack in the Cascades, it was said, shrank by 50 percent in the last half-century. It's been presented as glaring evidence of the cost exacted by global warming — the drying up of a vital water source.

That statistic has been repeated in a government report, on environmental-advocacy web sites and in media coverage. Seattle Mayor Greg Nickels recently mentioned it in a guest column in The Seattle Times.

Here's the problem: The number is dead wrong."

That number was originated from an editing error it is believed in a 2004 report by an Oregon Panel of scientists. But actually originated from a cover story article for the Bulletin of the American Meteorological Society in January 2005 on the "Declining Snowpack in the Pacific Northwest" co-authored by Washington State Climatologist Phil Mote in which he showed how the snowpack had declined since 1950 in the Pacific Northwest which he attributed mainly to global warming and probably from his statement in 2004 that "Substantial declines (some in excess of 50%) were common in the Cascades, especially in Oregon."

Nearby embattled Oregon State Climatologist George Taylor recently debated Mote and questioned 1950, the beginning of a very snowy period for the northwest as the choice of a starting point for a change assessment. He pointed out it would have been more appropriate to choose the 1930s or 1940s and showed that changes since those starting points were negligible, suggesting natural variability and not global warming was largely responsible.

Mote's assistant state climatologist, Mark Albright, perhaps taking note of George's data plots, took his own independent look and had an exchange of e-mails with an associate at the University of Washington Professor Cliff Mass and several members of the University's Climate Impacts group suggesting the evidence did not support claims of a dramatically shrinking snowpack. Mass agreed with Albright, and said they see only "a small downward trend in Cascade Mountain snowpacks, perhaps 10 to 15 percent since the 1940s. The measurement can be exaggerated by starting during a time of high snowfall, in 1950, and ending at a time of low snowfall in the mid-1990s", Mass said. "But snowfall has increased again in recent years, and there is little overall change in snowpack in the past 30 years".

Mote insisted the number was more like 35% since the mid-1940s. Mote demanded that Albright let him preview any future emails. When he refused, he was stripped of his

position as Assistant State Climatologist. Mass replied "In all my years of doing science, I've never seen this sort of gag-order approach to doing science.

In late February, professor Dennis Hartman, chair of the UW Atmospheric Sciences Department stepped into referee and issued a ridiculous statement that said snowpack has changed 30%, as if compromising on scientific findings makes any sense.

The real number is probably closer to zero. Snowfall patterns are indeed cyclical and for the most part controlled by natural factors. With climate cycles there are always winners and losers. We all take our turns.

The Pacific Decadal Oscillation flipped in 1978 in what was called the Great Pacific Climate Shift. With it water off the west coast and in the ENSO regions of the tropical Pacific warmed dramatically from the predominantly cold conditions of the prior 30 years.

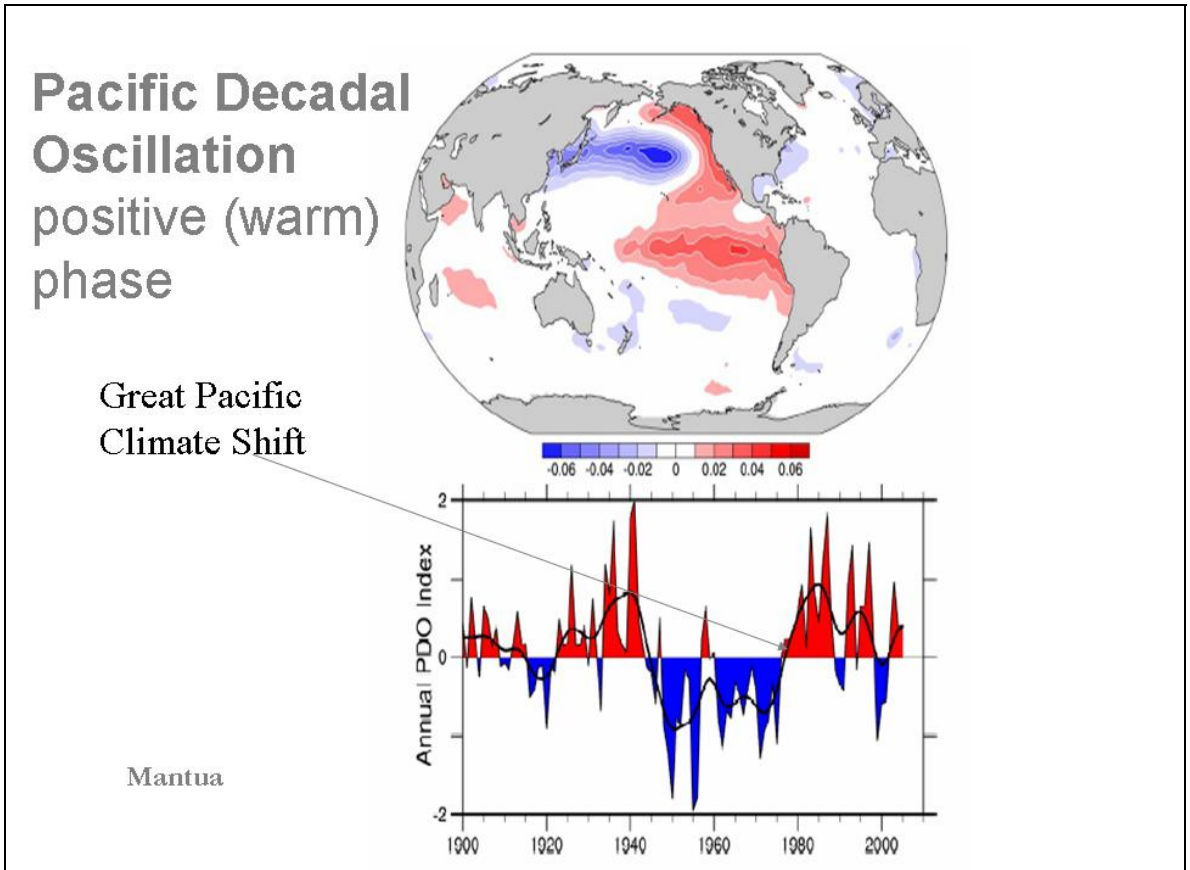


Figure 1: PDO cycle with seas surface temperatures in the Pacific after Mantua. PDO flipped into what is called the warm mode in 1978 and has been predominantly in that mode since.

The warm mode also favored warmer than normal temperatures and less than normal precipitation (figure 2).

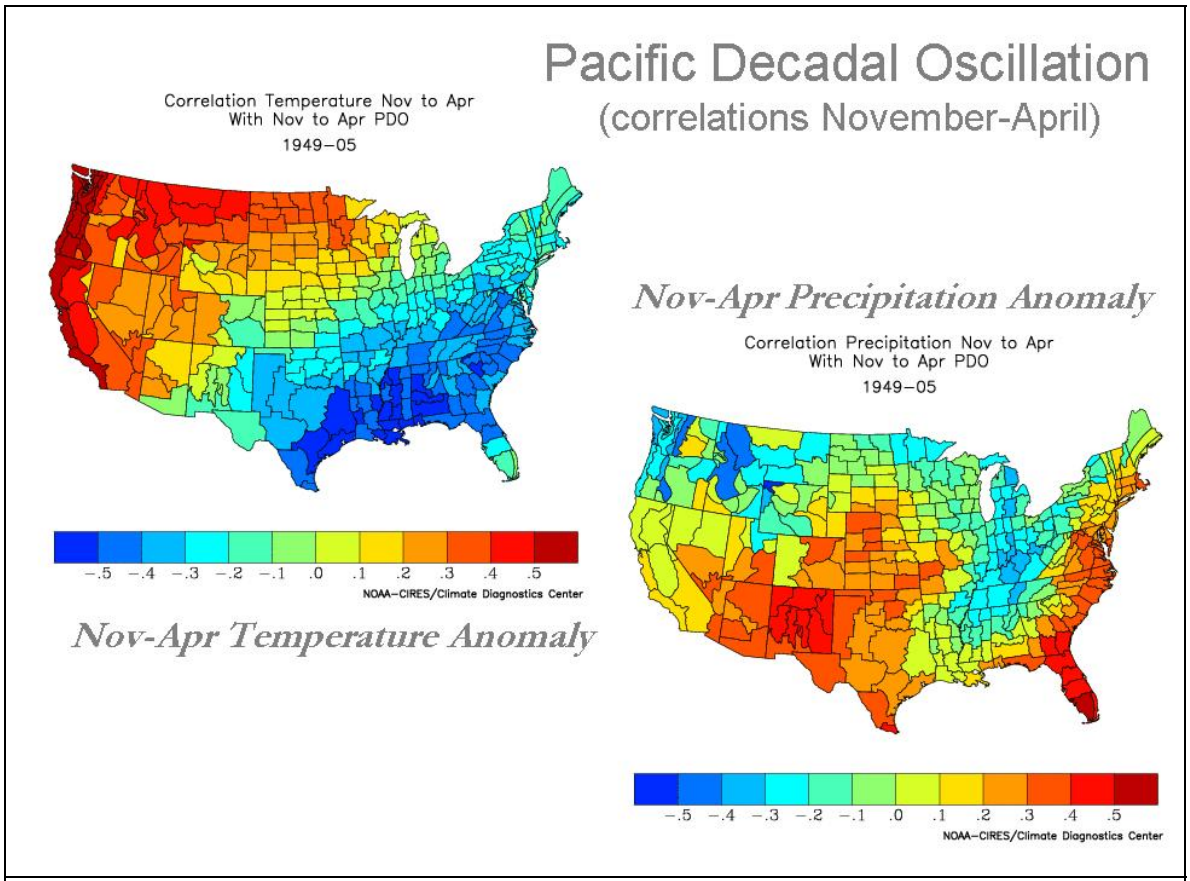


Figure 2: Correlations of Temperatures and Precipitation November to April with the PDO. In the wet season (the heart of the snow season) for the west (November to April), correlations with the positive PDO suggest warm and dry conditions in the northwest and wet conditions to the south.

With the sea surface pattern associated with the PDO warm phase in figure 1, El Ninos are favored. This can be clearly seen by the following plot of Wolter's Multivariate ENSO Index (MEI) (figure 3). Red spikes are associated with El Ninos and blue spikes with La Ninas. You can see the predominance of La Ninas in the cold PDO mode 1947 to 1977 and El Ninos since 1978. Indeed since 1978, there have been twice as many El Ninos as La Ninas.

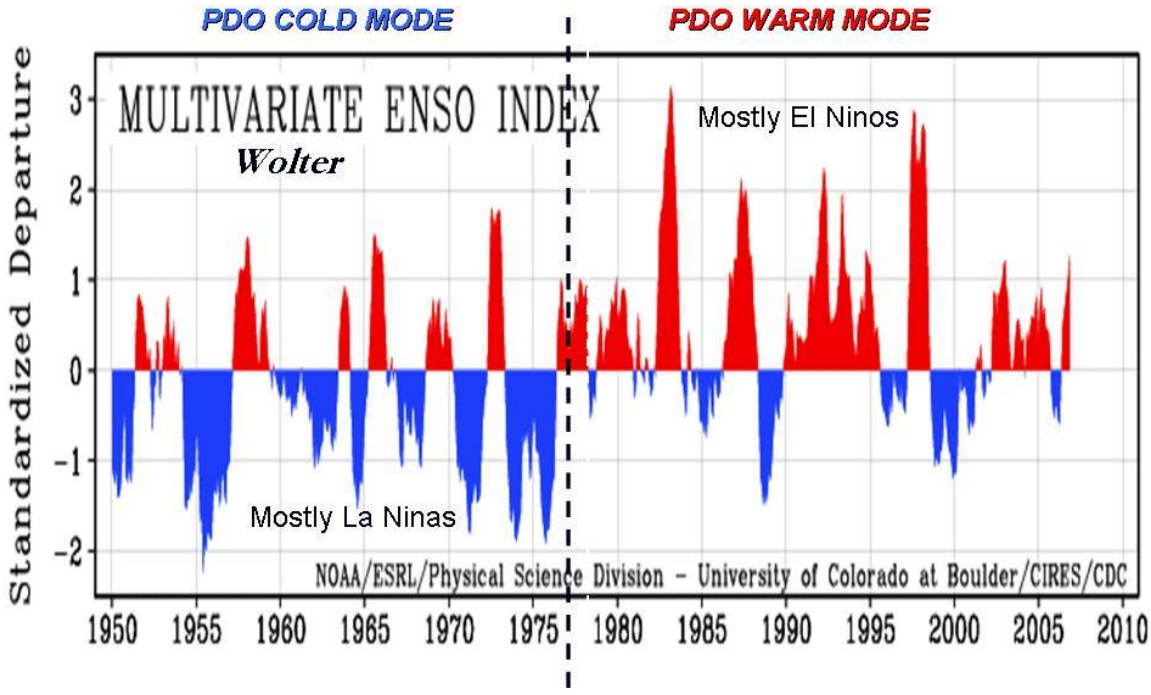


Figure 3: Wolter's Multivariate ENSO Index (MEI) since 1950. The plot starts in the early stages of a cold mode (1947 to 1977) and ends in the latter declining phases of the warm phase (1978-?). Note the increased frequency of La Nina in the cold mode of the PDO and El Nino in the warm mode.

El Ninos cause a shift south of the storm tracks, more snows for the southwest mountains and southern Rockies and less snow for the Pacific Northwest and mountains of southwest Canada across the Northern Rockies. In Mote's 2005 paper, he attributed the declining snowpack in the Northwest mainly to global warming. He did note in the conclusion that the PDO may have had some role (up to one-third) in the warming since 1920 but said only a small fraction of the precipitation changes can be explained by any of the changes in the Pacific (an unfounded statement).

Indeed when one looks at precipitation in the mountains of the west extending back into the 1930s, one can clearly see how well the precipitation anomalies matched to the state of the PDO. Annual precipitation for Cedar Lake, WA is shown below and its relationship with the PDO is clear.

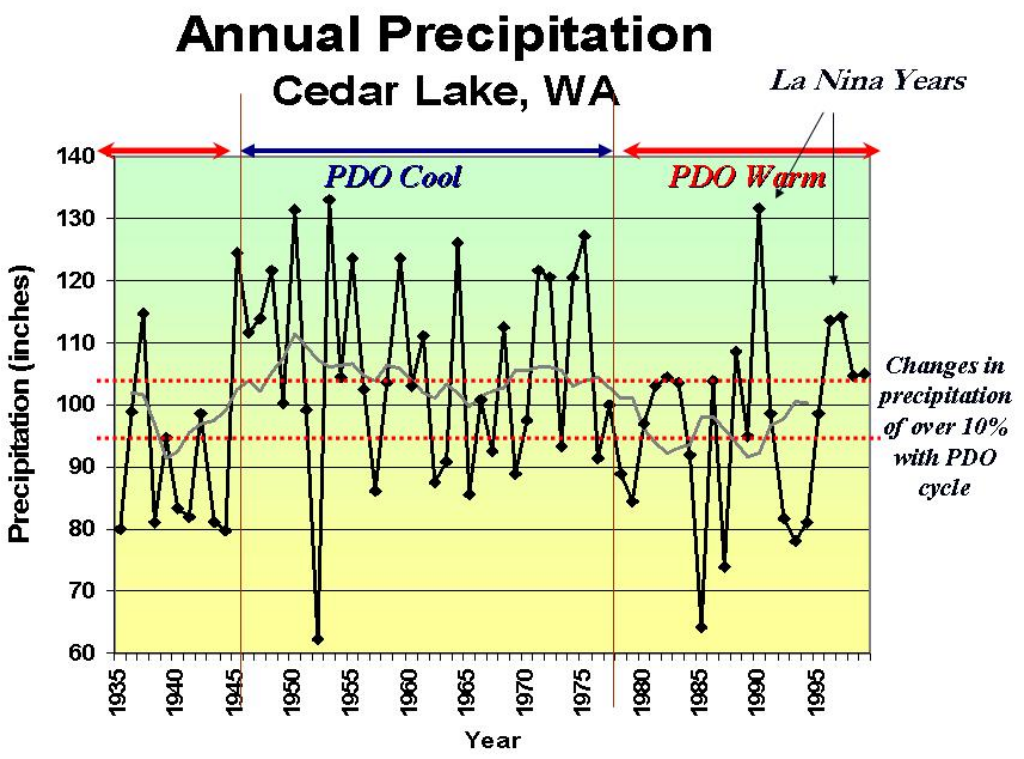
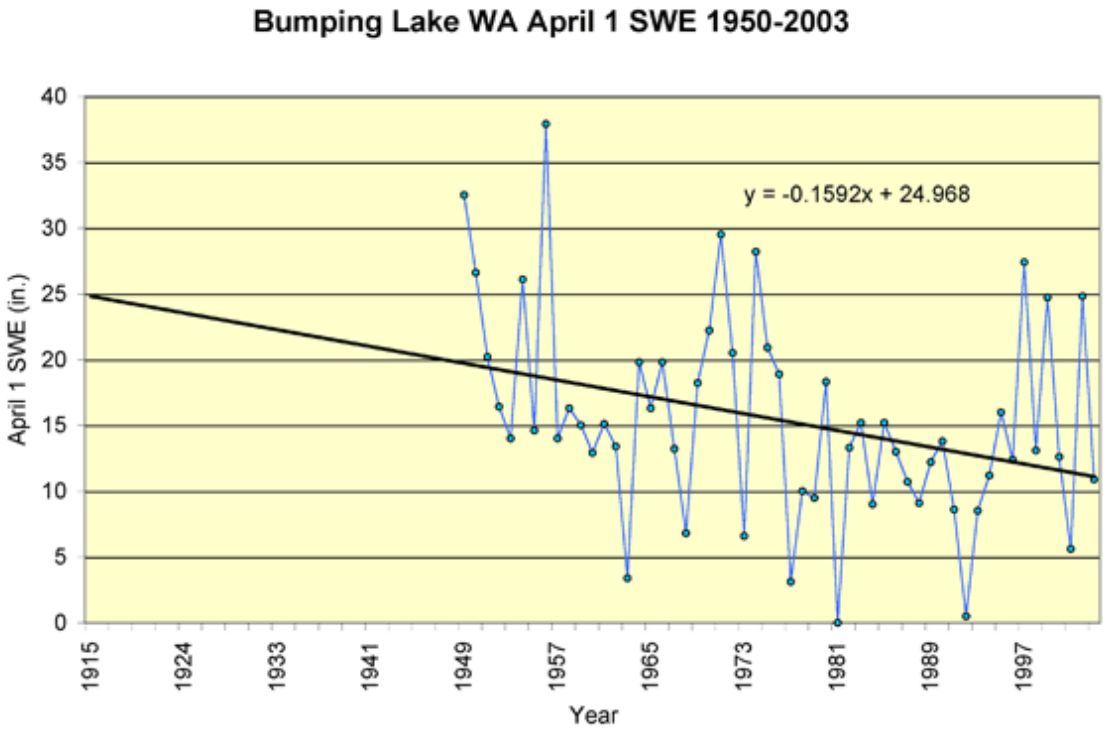
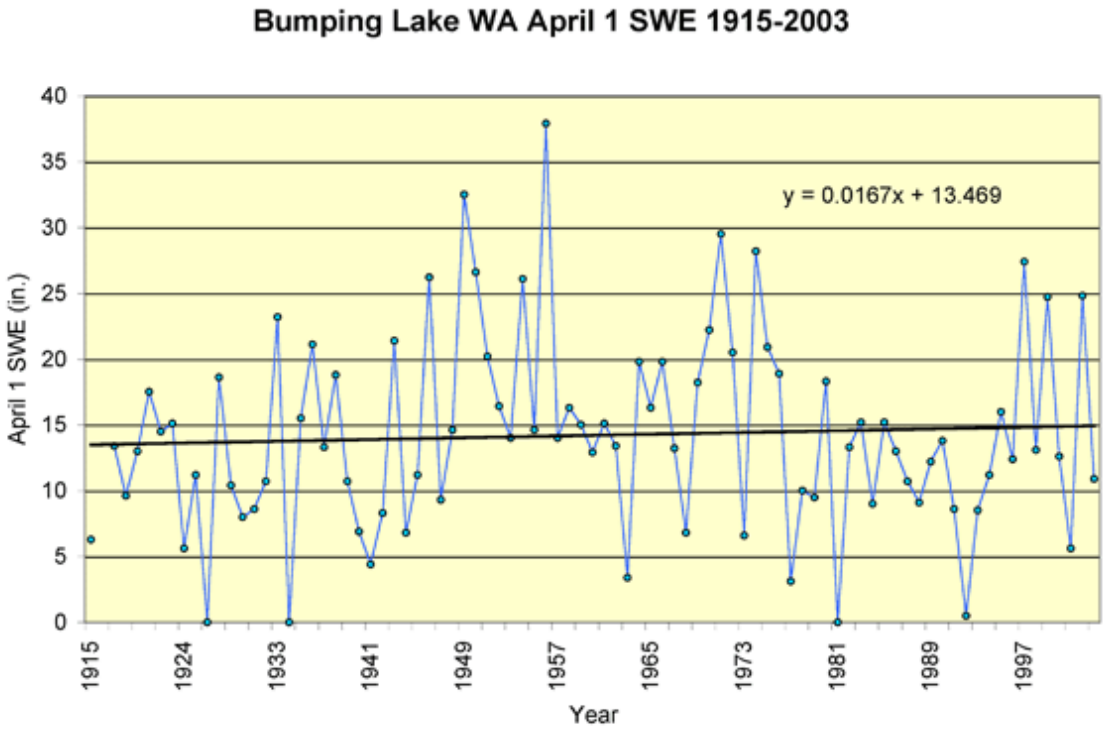


Figure 4: Cedar Lake, WA, annual precipitation since 1935. Note the negative anomalies during the warm PDO eras (1927-1947 and after 1977) but positive anomalies in the cold PDO period.

Even more relevant and dramatic in demonstrating the importance of the starting point in this analysis and of the importance of the PDO is use of the snow water equivalent for Bumping Lake, WA, for the years from 1950 and then from 1915 (data thanks to George Taylor).





Figures 5a, b: Snow Water Equivalent for Bumping Lake, WA in a from 1950 and from 1915

If one uses a third order polynomial, one can clearly see the cyclical nature of thee precipitation. Note the recent rise since the PDO turned neutral or negative in 1997.

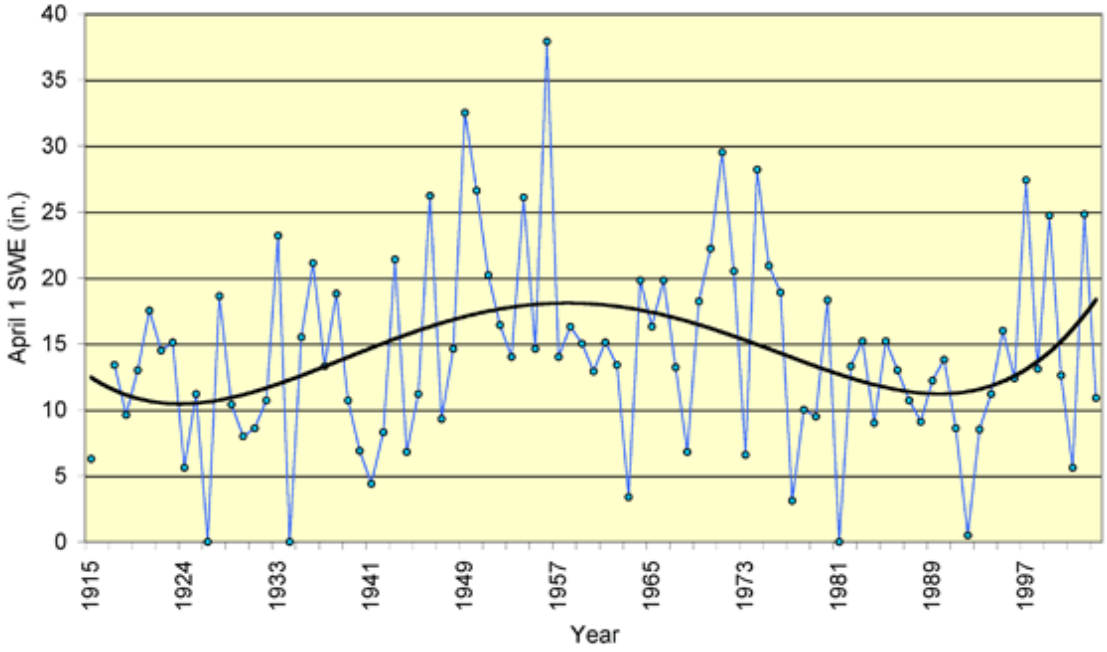


Figure 6: Same snow water equivalent since 1915 for Bumping Lake using a third order polynomial

This matches the PDO cycle to a tee, with enhanced snow during the cold eras from 1947 to 1977 and after 1997 and reduced snowpack during the warm eras (1922 to 1947, 1977 to 1997)

Now you might recall that in 1999/2000 that Mt. Baker in Washington set a new world record for seasonal snowfall. That broke the record set in 1971/72.

New World Seasonal Snowfall

- The Mt. Baker Ski Area in northwestern Washington State reported 1,140 inches of snowfall for the 1998-'99 snowfall season ending June 30, 1999. This was a new world record for seasonal snowfall.
- The previous U.S. and world seasonal snowfall record was 1,122 inches in the 1971-1972 snowfall season at the Paradise Ranger Station on Mt. Rainer, also in Washington State and about 150 miles south of Mt. Baker.

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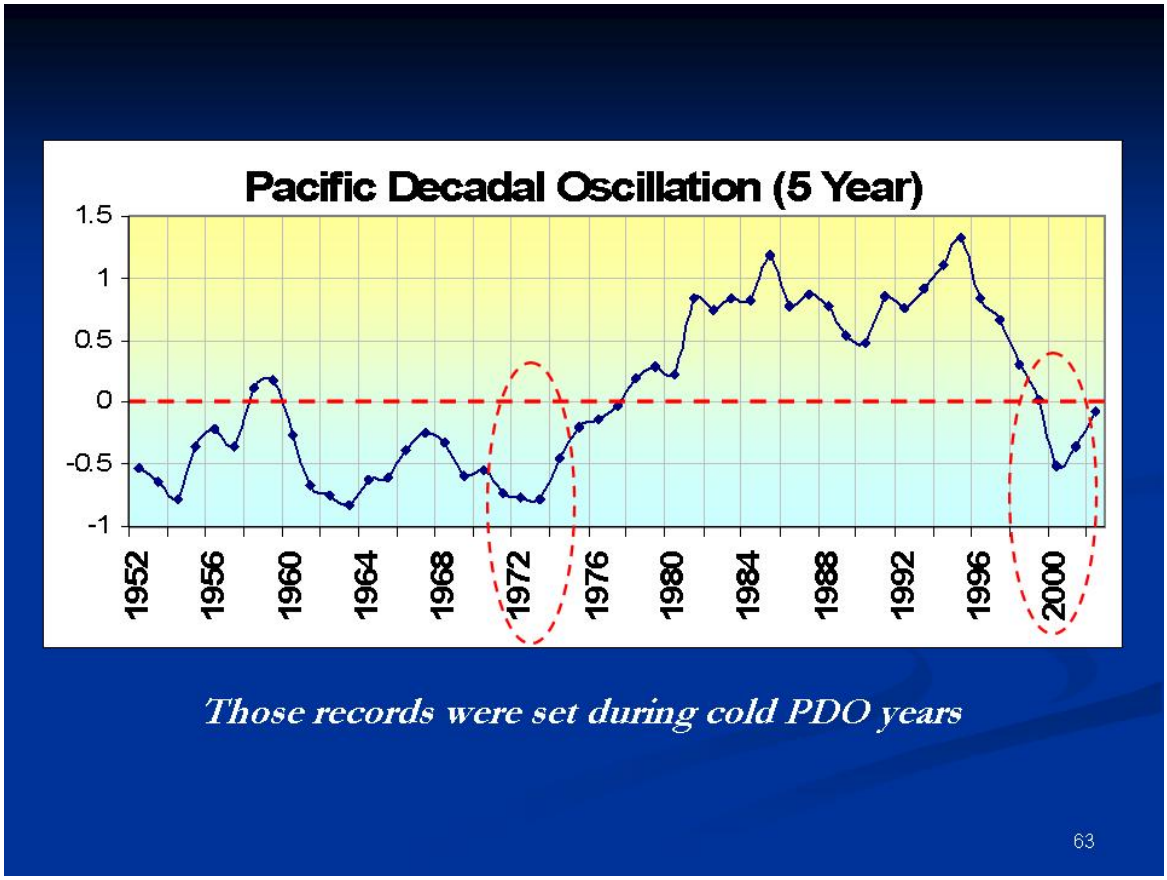
In the late 1990s the PDO reverted back negative for a few years, back to the state it was in 1971/72, when the prior record had been set. A significant three year La Nina shifted the storm track north targeting the Pacific Northwest.



The PDO bounced positive again with the El Nino of 2002/03. The Pacific Northwest even experienced an unusual one year drought with this rebound but now after a few positive years it is again appears to be turning neutral to negative.

When The PDO finally reverts back negative in a more lasting way (probably soon as cycle phases tend to last 25-30 years), the snowfall situation in the Pacific Northwest will stay more consistently positive, refuting Mote's global warming induced declining snowpack hypothesis.

As there were in the last negative phase (1947 to 1977), there will be more La Ninas than El Ninos (in that last phase a very nearly 2 to 1 ratio). The storm tracks will shift back north once again targeting the Pacific Northwest and British Columbia coasts.

Maybe by then Mark Albright will be Washington State Climatologist.