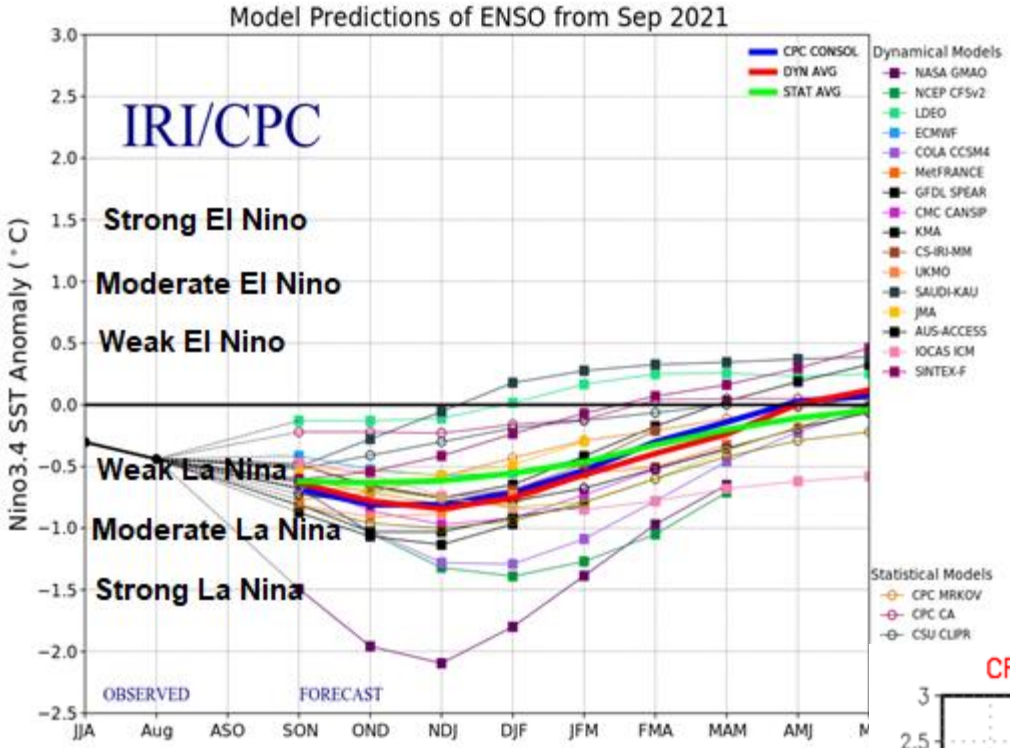
La Niña
and the Upcoming
2021-2022
Winter Season

National Weather Service
Boulder, Colorado

Status of La Niña

La Niña conditions have developed. La Niña is expected to continue with an 87% chance in December 2021- February 2022.

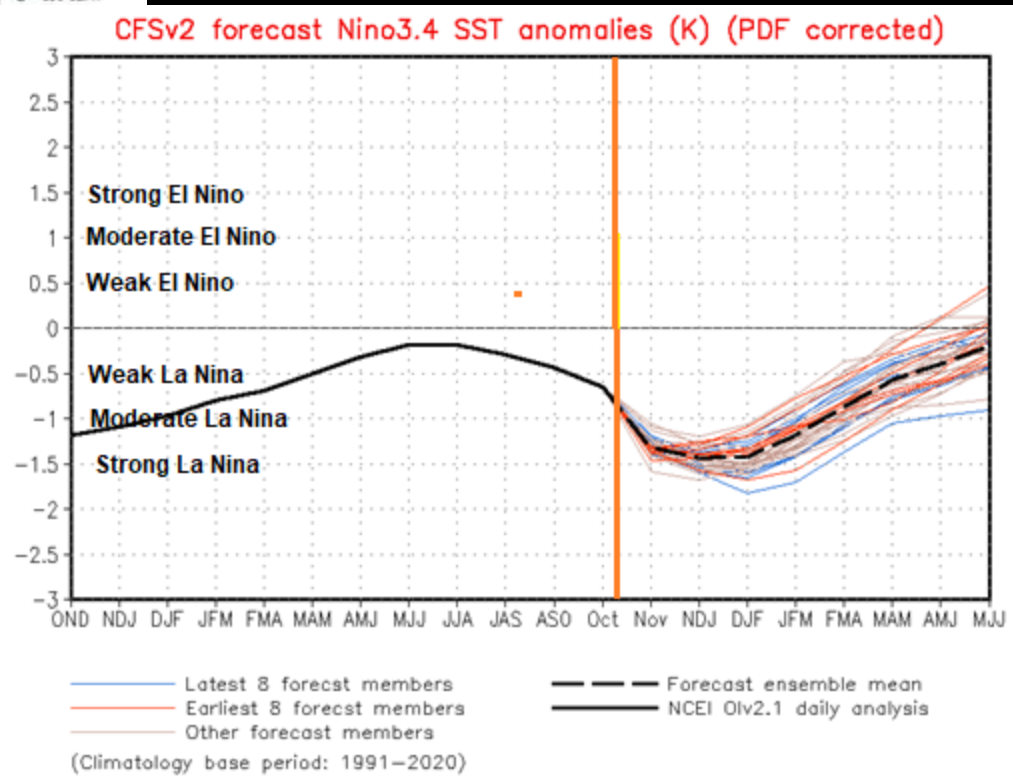
This La Niña is what's known as a 'double-dip', meaning it is formed for a second year in a row. In fact, it is not uncommon for La Niña to occur in consecutive winters.



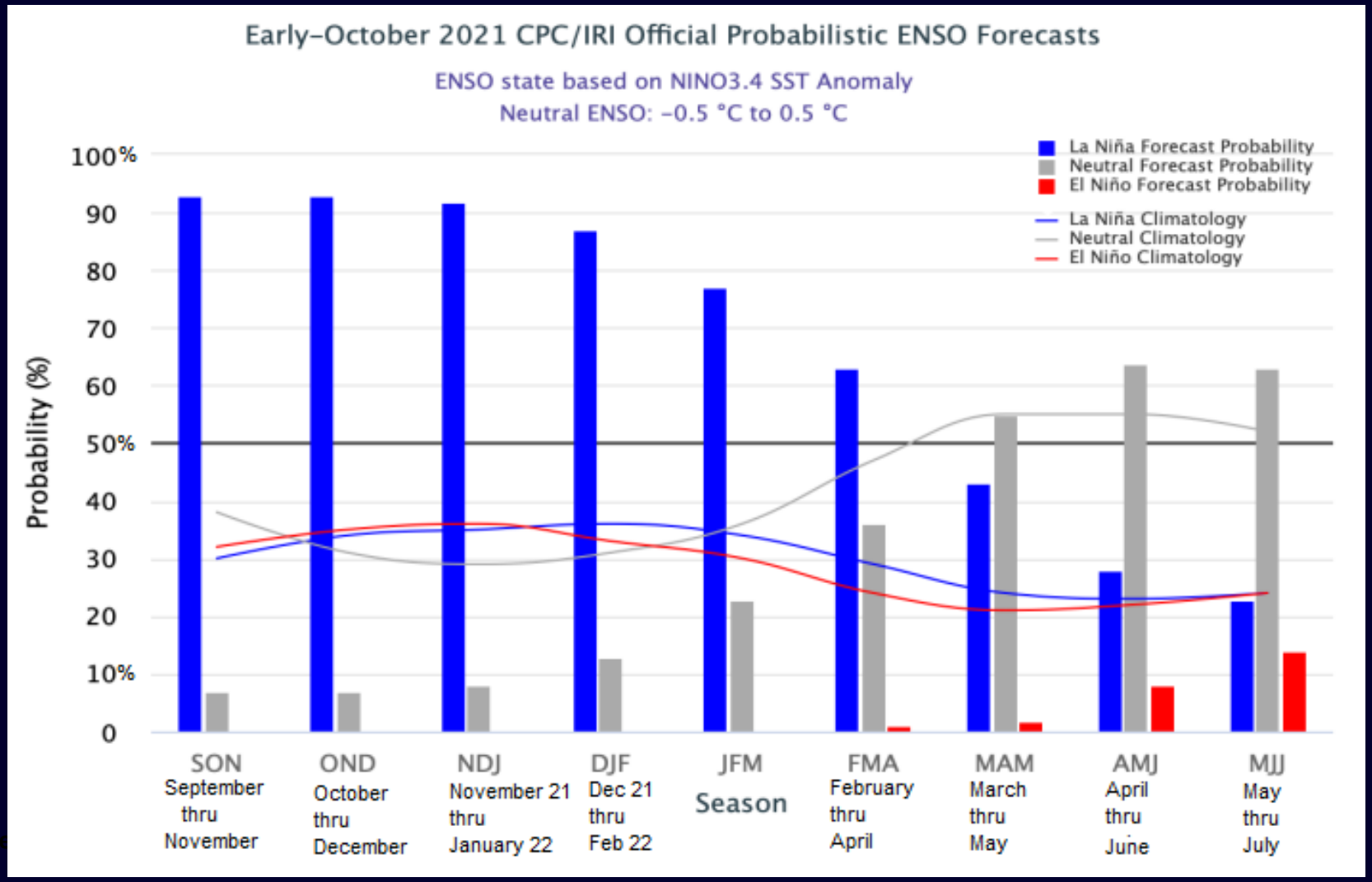
This graph shows all the dynamical & statistical models. The statistical average of these currently indicates a Weak La Niña will continue.

The CFS.v2 model ensemble mean currently indicates the La Niña will get to at least Moderate intensity.

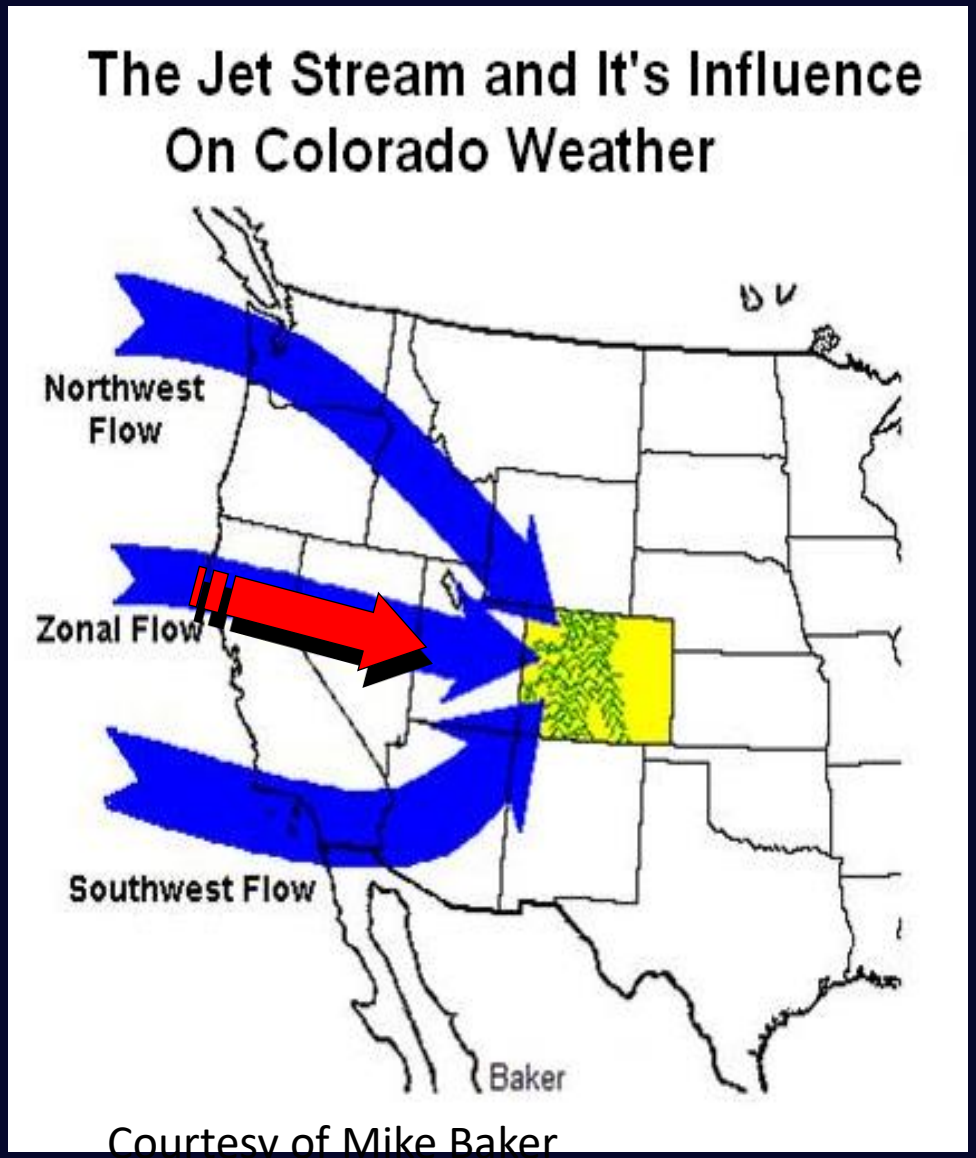
So there is still a lot of uncertainty on how strong this La Niña will become.



The graph shows the probability of La Niña (blue bars), El Niño (red bars) and non-ENSO or neutral conditions (gray bars) for the next nine 3-month climate periods



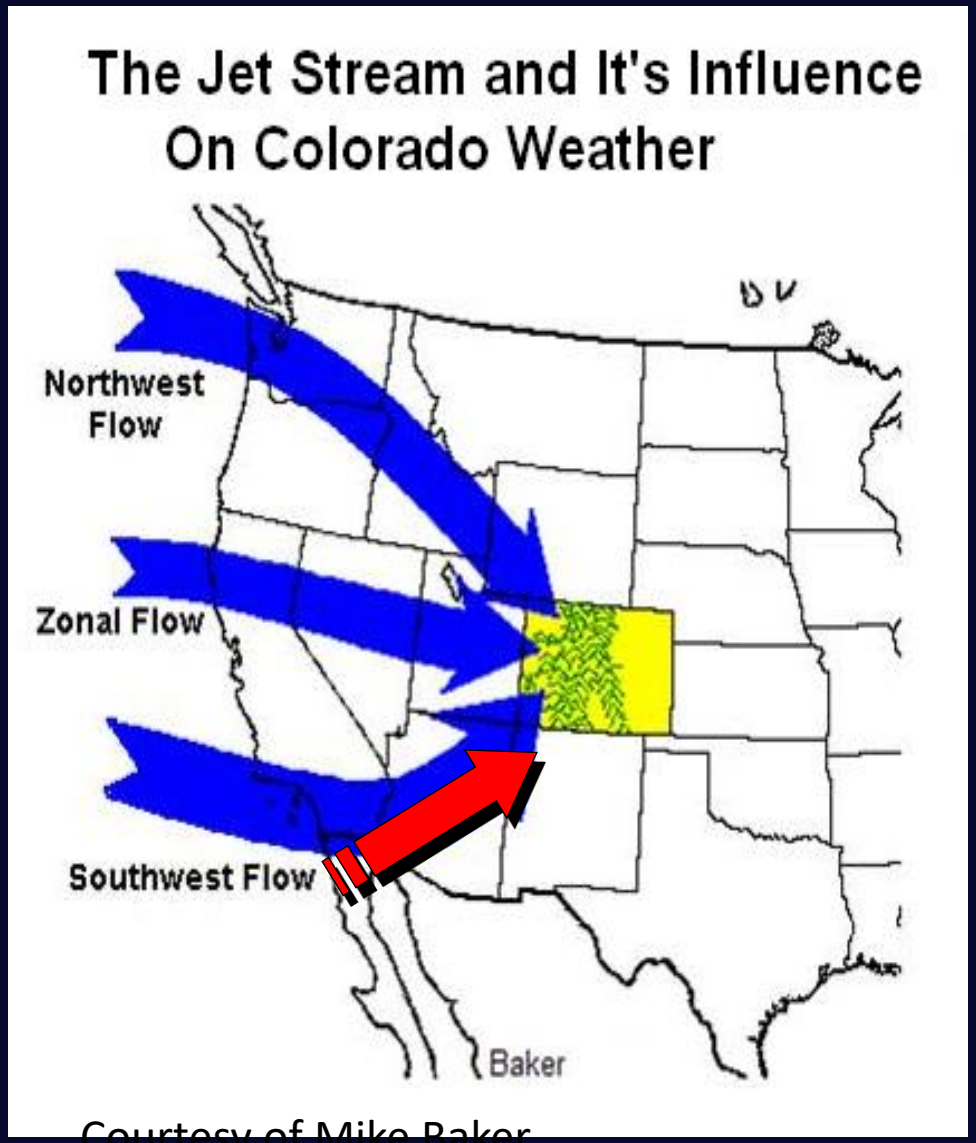
La Niña is likely (>80% chance) from September-November 2021 to December-February 2021-22, with a >60% chance of continuing through February-April 2022.



Courtesy of Mike Baker

A **westerly or zonal jet stream** has a tendency to produce above normal winter and springtime precipitation, increased cloud cover and a greater number of valley fog days across western Colorado.

This same **westerly jet stream** pattern is also associated with below to much below normal precipitation, very low humidity and above average temperatures in areas east of the Continental Divide. There is also an increase in the number of potentially downslope wind events (mainly the warmer Chinook type winds) during the spring of La Niñas.



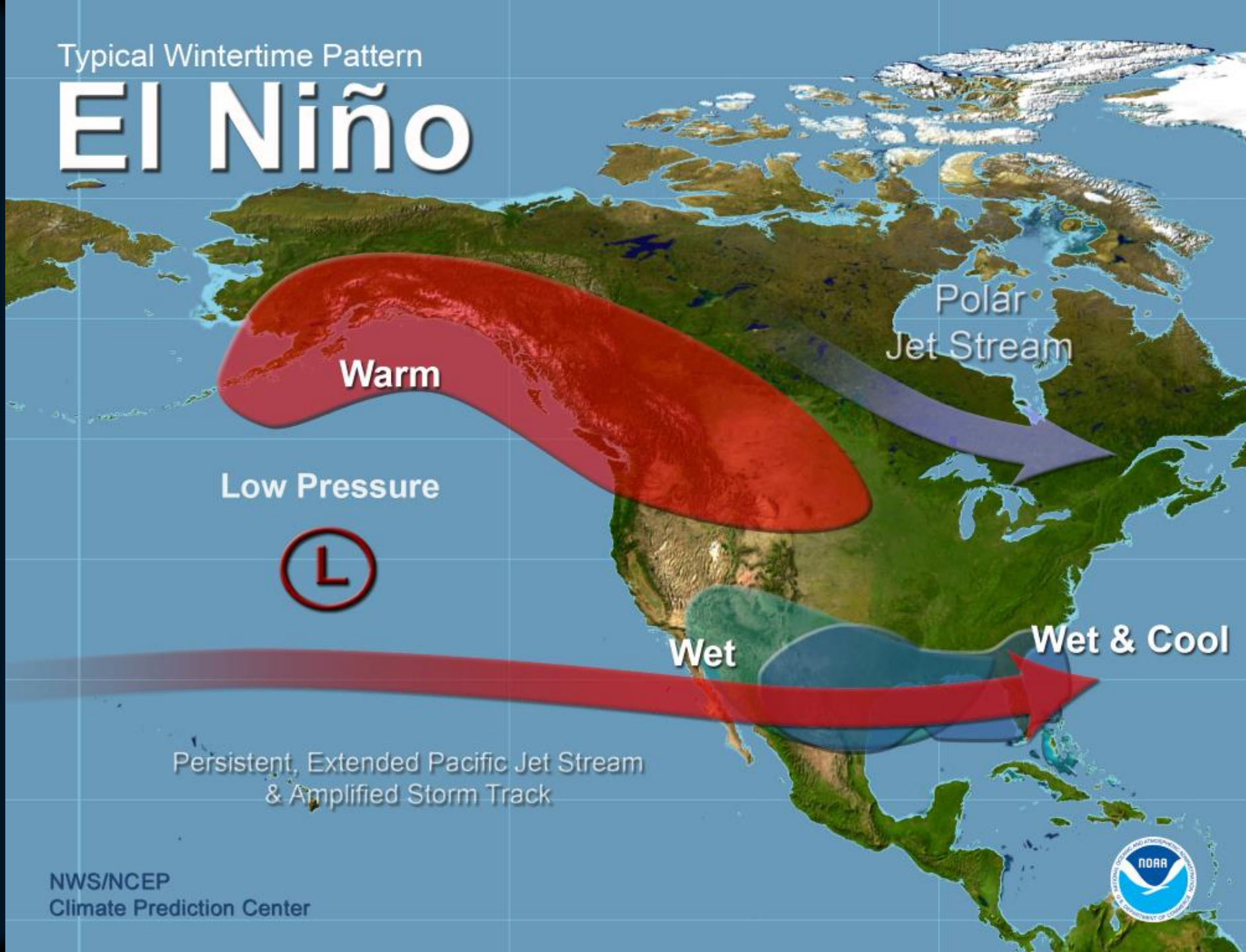
Courtesy of Mike Baker

Finally, a **southwest jet stream** originating over the Desert Southwest **has a tendency to produce above to much above normal precipitation and lower than normal daytime temperatures for the Four Corners region, particularly across southwest and south central Colorado during late winter and spring of El Niño episodes.**

The southwest jet stream pattern has higher chances of producing above normal precipitation and warmer than normal nighttime temperatures in areas east of the Continental Divide, particularly during the late winter and spring of moderate to strong El Niños.

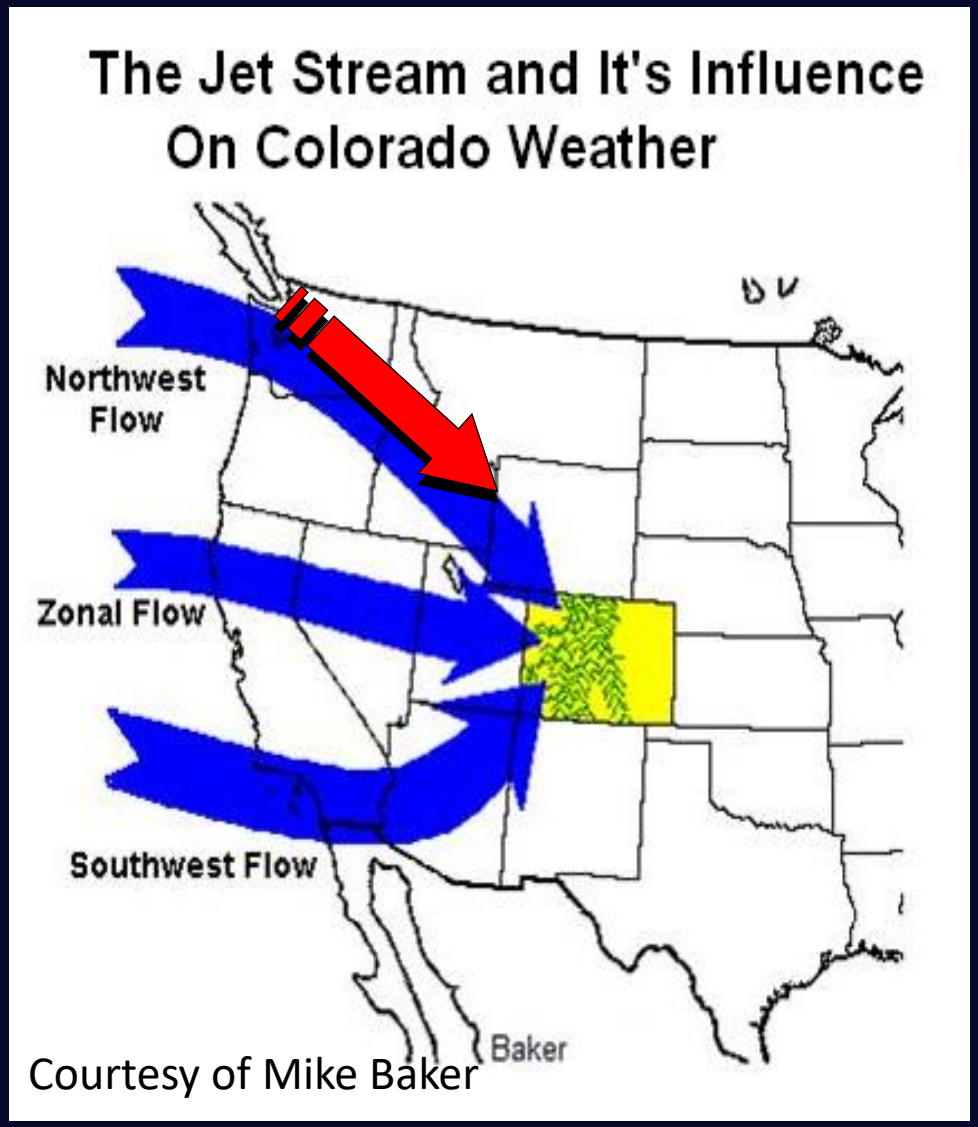
Typical Wintertime Pattern

El Niño



NWS/NCEP
Climate Prediction Center

The Role of the Jet Stream on Colorado Weather

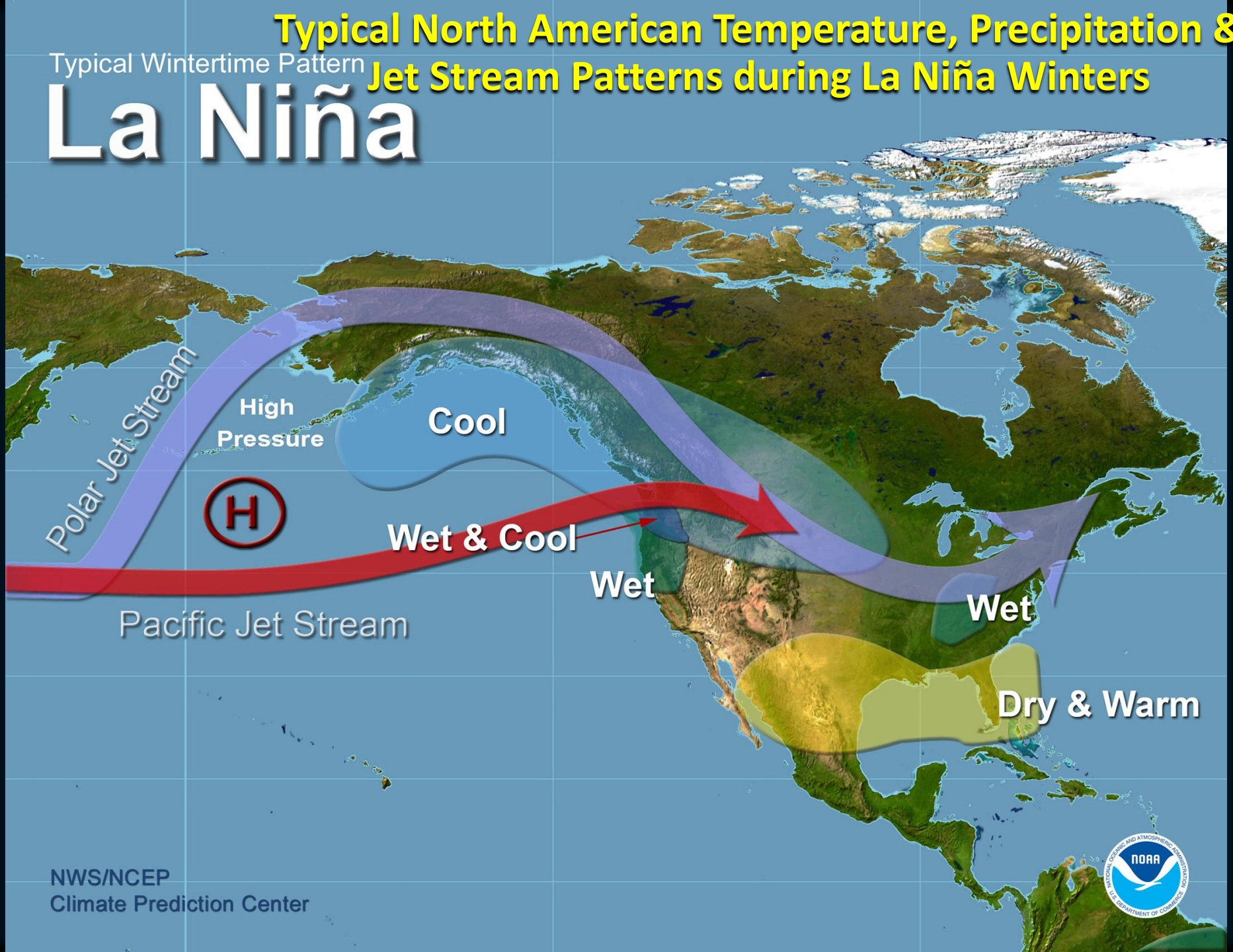


Courtesy of Mike Baker

A **northwest jet stream** originating over the Pacific Northwest **has a tendency to produce above normal precipitation and below normal temperatures across western Wyoming and northwest Colorado during the winter season of moderate to strong La Niñas .**

A **northwest jet stream pattern has higher chances of below normal precipitation , above normal temperatures and periods of strong and gusty downslope winds (Chinook and Bora wind events) east of the Continental Divide**, particularly during the autumn and spring of La Niña episodes.

Typical North American Temperature, Precipitation & Jet Stream Patterns during La Niña Winters



Weather Patterns Prevailing Across Colorado During Moderate to Strong La Niñas.

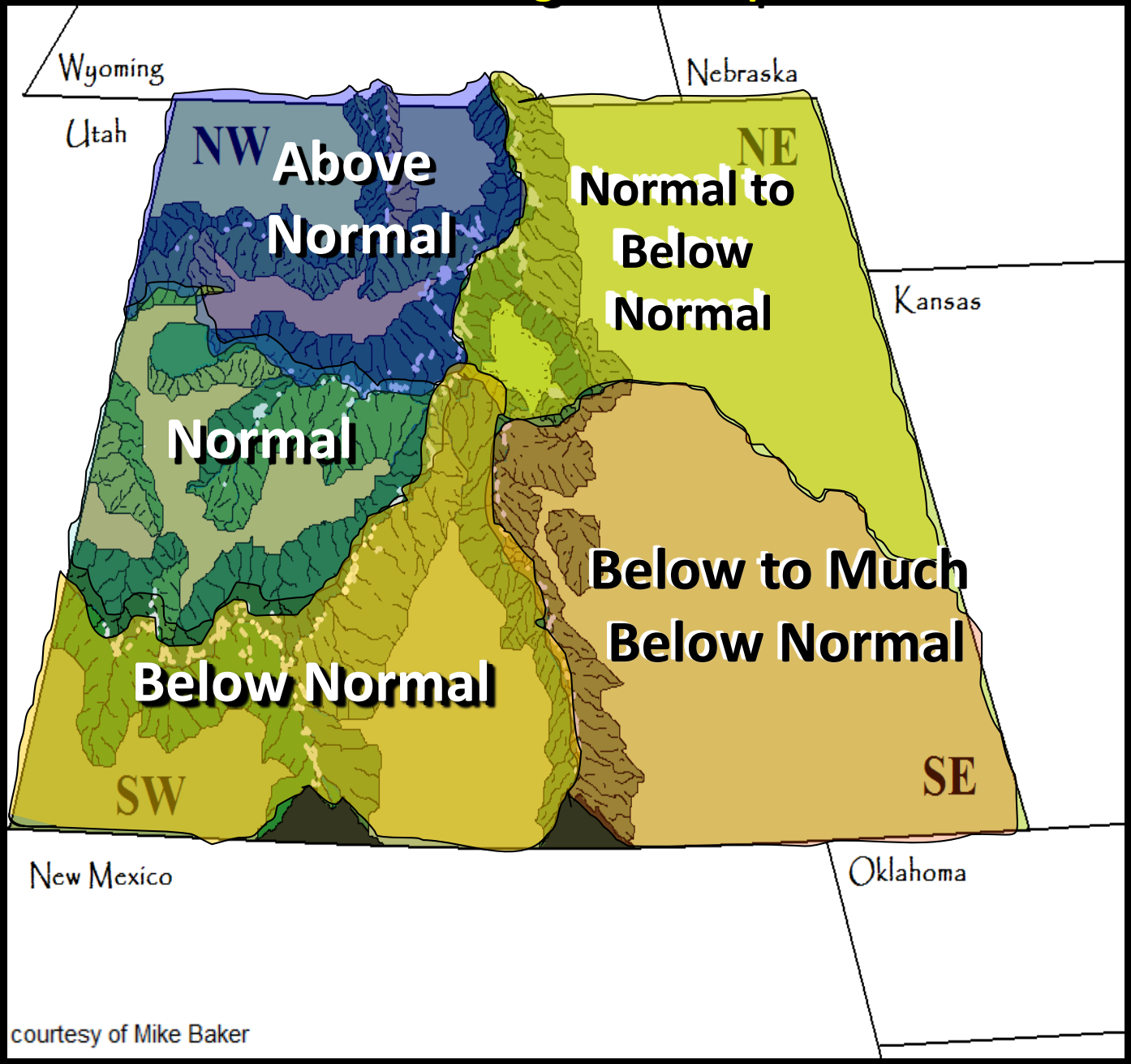
Tend to produce above normal temperatures and below normal precipitation across southern and eastern portions of the state at least through the upcoming winter season.

Meanwhile the northwest and north central portions of Colorado could see above normal precipitation (snowfall) and near to below normal temperatures, particularly during the latter half of this winter and perhaps into the spring of 2022.

Weather Patterns Prevailing Across Colorado During Weak La Niñas.

Since these have has a weather influence on the atmosphere, it is difficult to find local trends during past weak La Ninas.

Cold Season Precipitation Anomalies Possible During Moderate to Strong La Niña Episodes

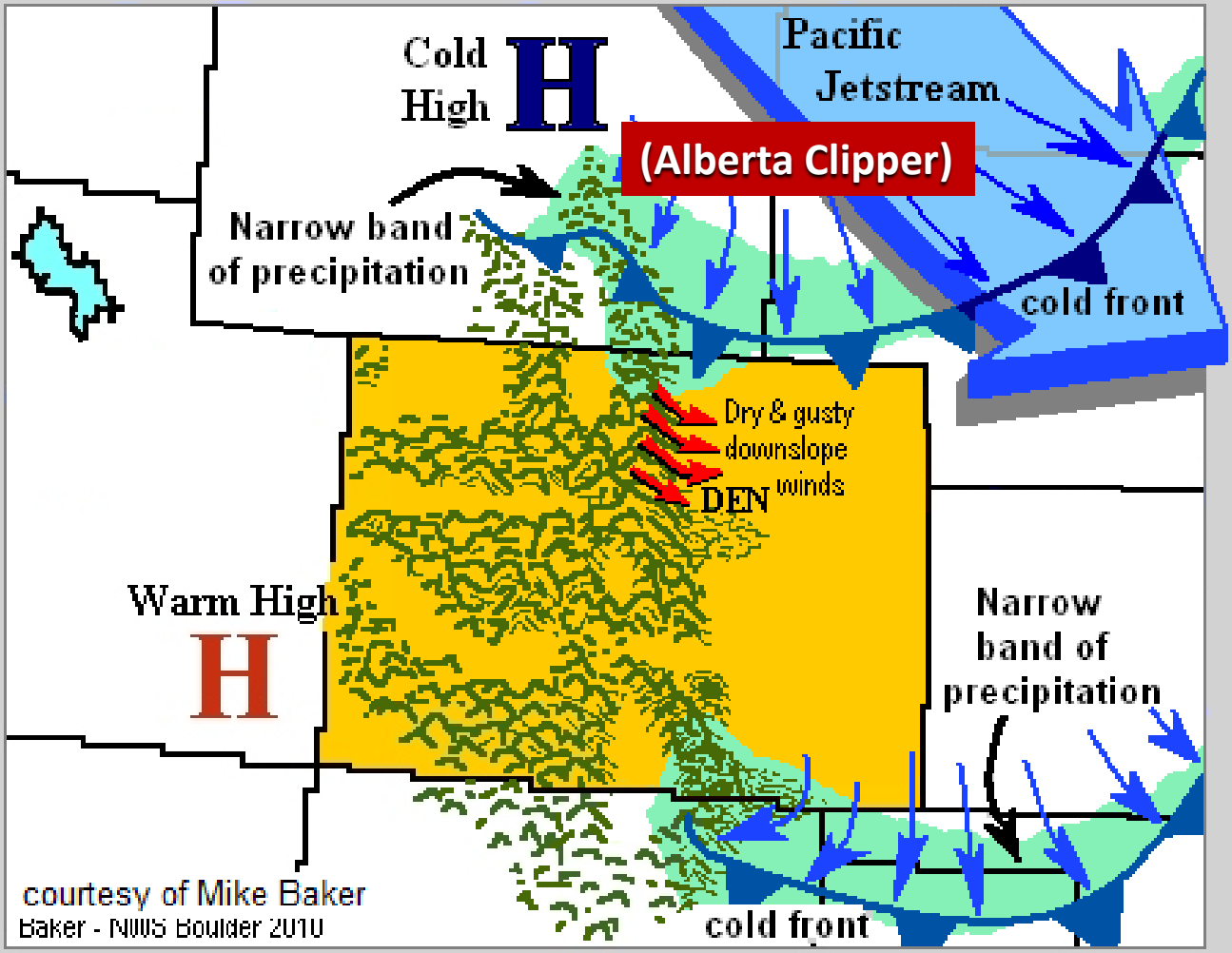


West central and northwest Colorado has higher chances of receiving NORMAL to ABOVE NORMAL precipitation (rain and snow) during Moderate to Strong La Niñas, predominately from mid-winter through mid-spring.

While southwest and eastern Colorado has higher chances of receiving BELOW to MUCH BELOW NORMAL precipitation (rain and snow) during the entire cold season of Moderate to Strong La Niñas.

Moderate to Strong La Niñas during the Fall

Mean Position of the Pacific Jet Stream During the Autumn Season of Moderate to Strong La Niña Episodes

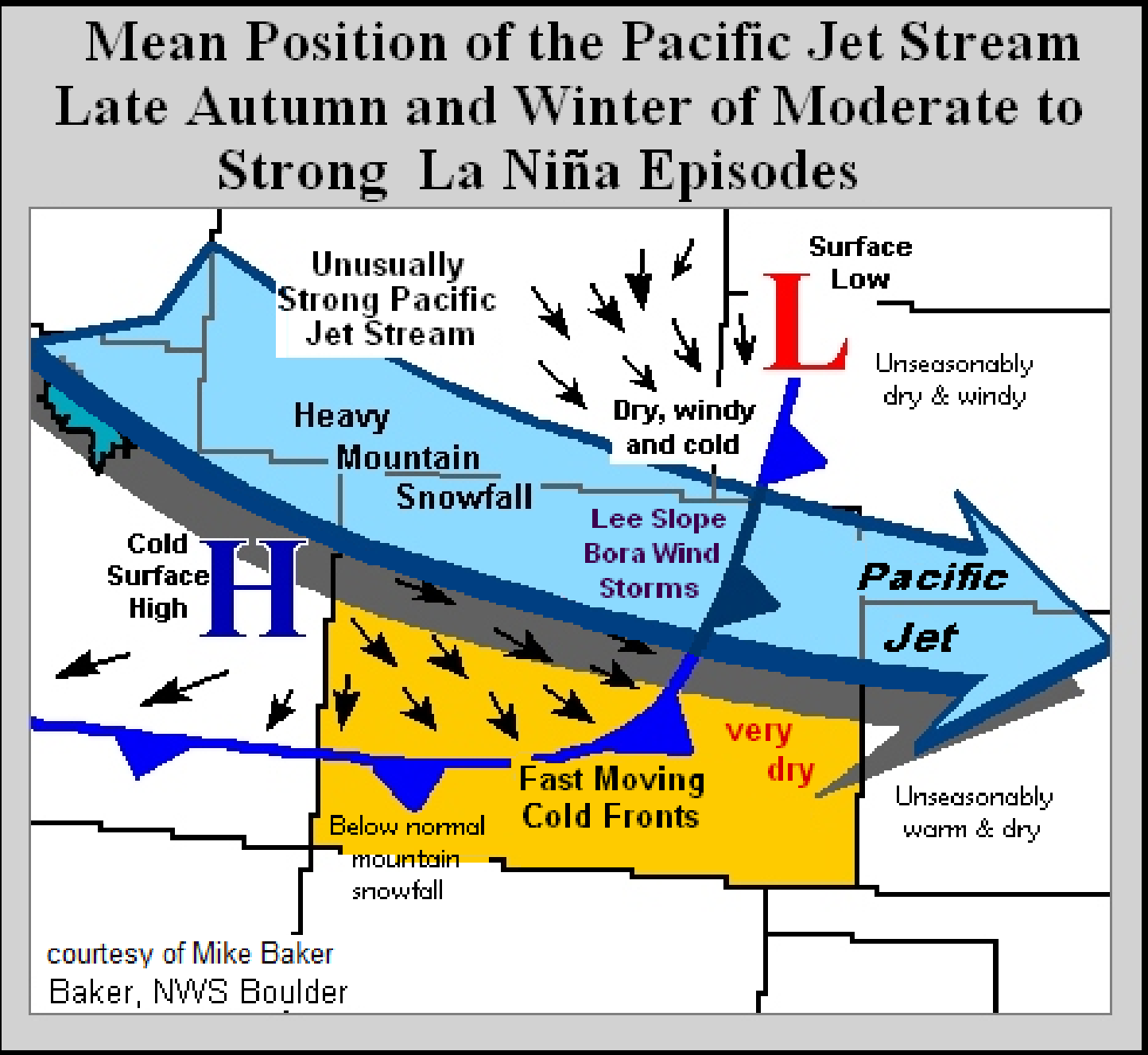


Eastern Colorado may see an increase in the number of "dry" cold fronts, referred to as "Alberta clippers" during the autumn of moderate to strong La Niñas with the Pacific jet stream oriented in this position.

These fast moving cold fronts often produce little precipitation, and due of their fast movement, but often produce strong and gusty northerly winds and sudden drops temperature.

Western Colorado may feel little, if any impact from these high plains frontal systems.

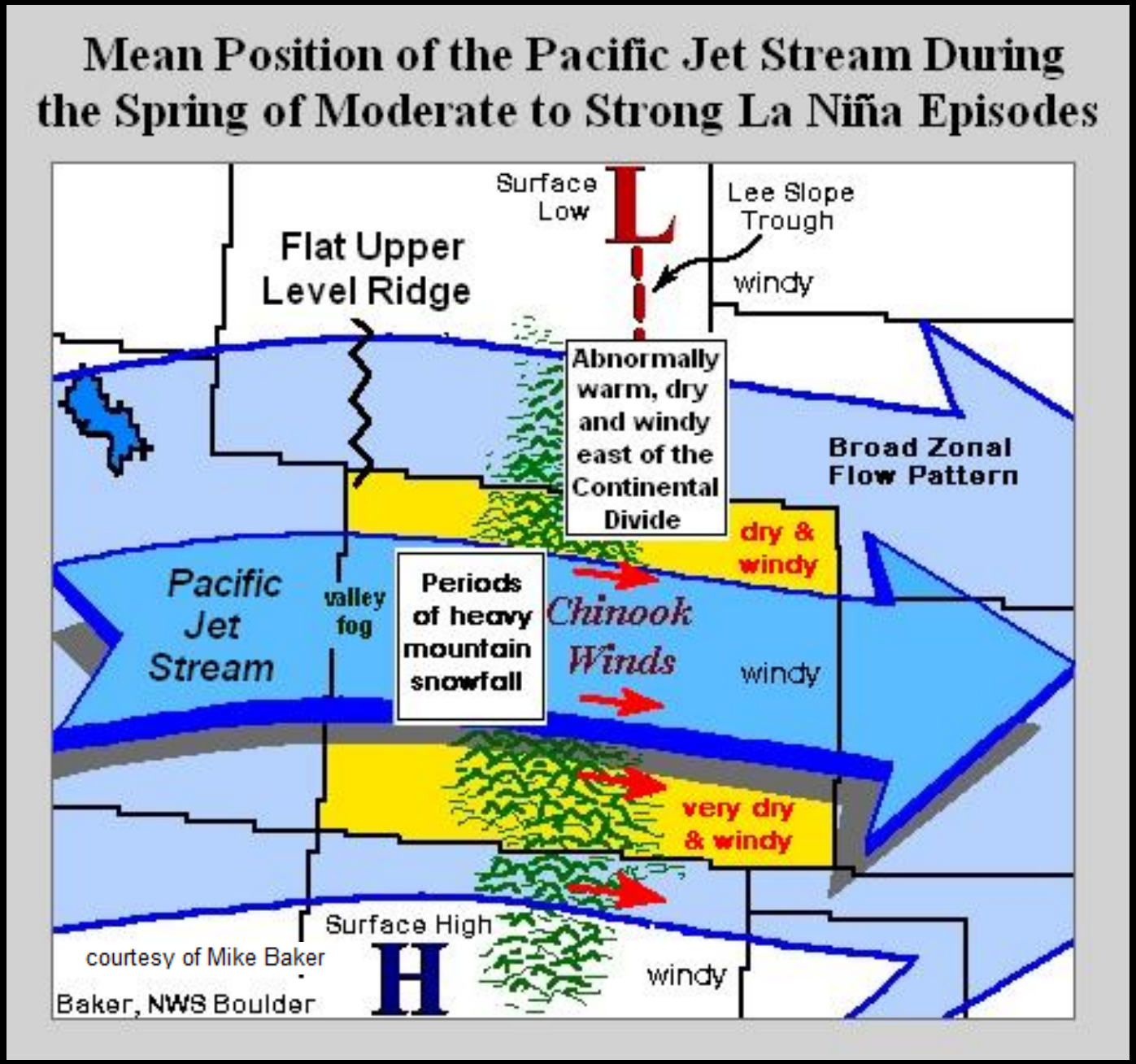
Moderate to Strong La Niñas Late Fall and Winter



As the west coast high pressure ridge weakens and flattens, the Polar jet stream acquires more of a west-northwesterly Component during late autumn and winter.

This southward shift in the jet results in an increase, often a significant increase, in precipitation and wind across the northwest plateau and north central mountains of Colorado.

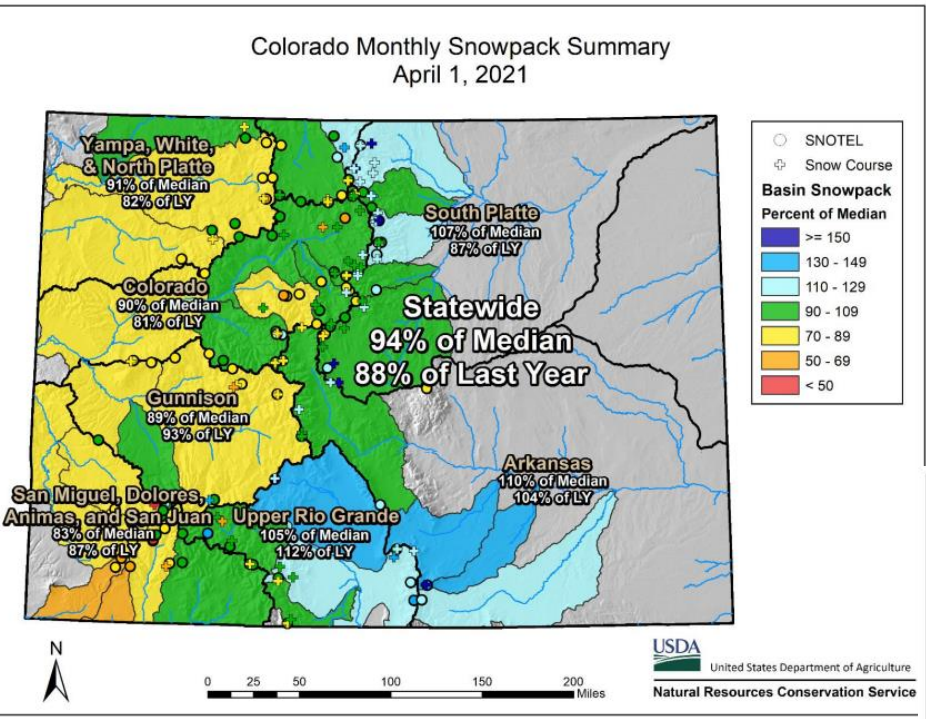
Moderate to Strong La Niñas During the Spring

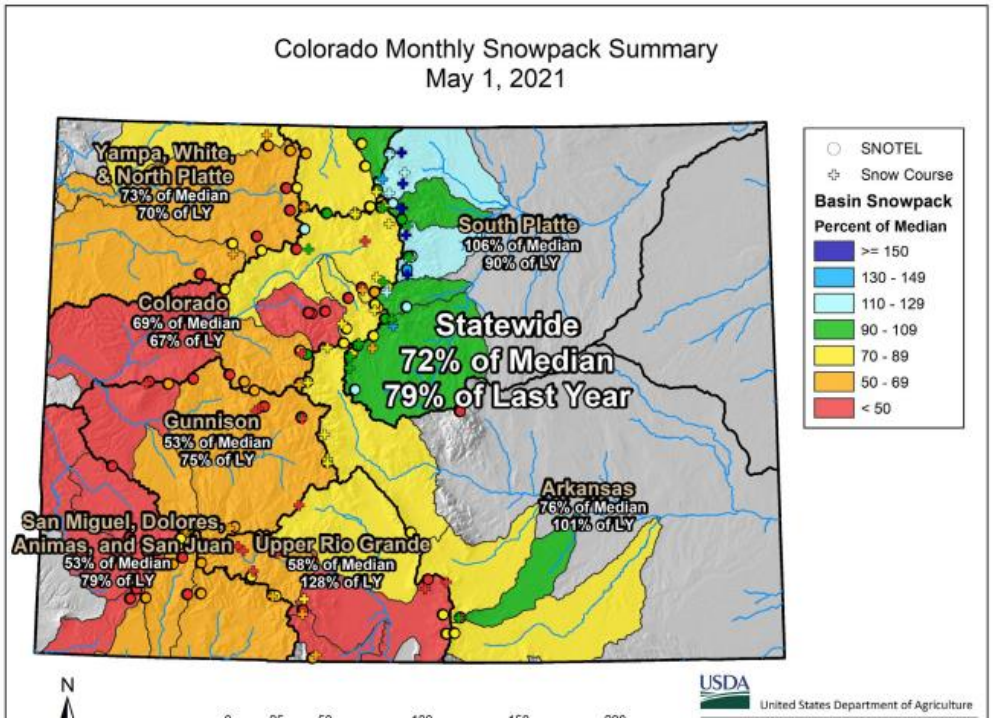


In late winter and spring during the stronger La Niña episodes, the prevailing flow aloft usually becomes predominantly zonal or westerly in direction. This generally warmer and drier flow pattern still manages to produce periods of moderate to heavy snowfall on west facing mountain slopes along and west of the Continental Divide.

Whereas in areas east of the Divide, the weather is often abnormally warm, windy and quite dry for days, if not for weeks at a time.

A La Niña occurred last winter, and it reached Moderate intensity. During the winter of 2020-21, the only major river basins that reached their normal mountain snowpack levels were the Arkansas, Rio Grande and South Platte River basins, all east of the divide. Snowpack peaks in the North Platte Basin in far north central Colorado & major basins west of the divide remained below normal. This does not 'fit' the typical precipitation pattern of Moderate to Strong La Niñas .





CAVEAT: Like other ENSO events, not all La Niña episodes are not created equally. And there are other factors at play in the atmosphere.