The phase of precipitation is one of the most important determinants of hydrological response and parameters to estimate this phase are some of the most sensitive in hydrological models of streamflow response. Air-mass characteristics interact with mountain topography to determine the precipitation phase. In a warming climate, the rain–snow transition elevation is no longer stable, and moves to higher elevations. This can have a dramatic impact on mountain streamflow response to precipitation and its predictability. Almost 50 years of measurements from two long term mountain hydrology research basins in western North America; Reynolds Creek, Idaho, USA and Marmot Creek, Alberta, Canada, were used to investigate the causes, patterns and changes in precipitation phase. The proportion of winter precipitation as rainfall has significantly increased at these sites. The dewpoint temperature was found to be a much more stable predictor of phase than air temperature and phase estimation procedures based on the dewpoint temperature seem to be regionally transferrable. The impact of rising dewpoint temperatures on basin seasonal snowfall is controlled by temperature regime, seasonality of precipitation, and basin hypsometry. Examples of how rising dewpoint temperatures have already impacted seasonal snowfall to these basins are presented. Changes to the rain-snow transition elevation are estimated as are changes to the volumes of rainfall and snowfall inputs to the basins. The future sensitivity of snowfall to these basins to further increases in dewpoint or changes in the seasonality of precipitation is investigated.