Supporting Information for "Midwinter dry spells amplify post-fire snowpack decline"

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Additional Supporting Information (Files uploaded separately)

1. Caption for Dataset S1

Introduction The supporting information provides five figures (S1-S5) that utilize the data described in the main text to extend and further support the primary results of the study. The supporting dataset S1 presents the spectral albedo measurements collected from the Creek and Caldor Fires used in Figure 2 and discussed in the main text. Upon accceptance, Dataset S1 will be uploaded to a permanently available FAIR repository for public use.

Figure S1.

Figure S2.

Figure S3.

Figure S4.

Figure S5.

Dataset S1. Comma-separated value (.csv) file of spectral albedo measurements for the three measured transects presented in Figure 2 of the main text. Columns include "ID","wavelength","Date","Albedo","month","burn". The Creek Fire observations were performed in February and April and the Caldor Fire observations were performed in January. Burn severities were estimated using United States Forest Service Burned Area Emergency Response maps.

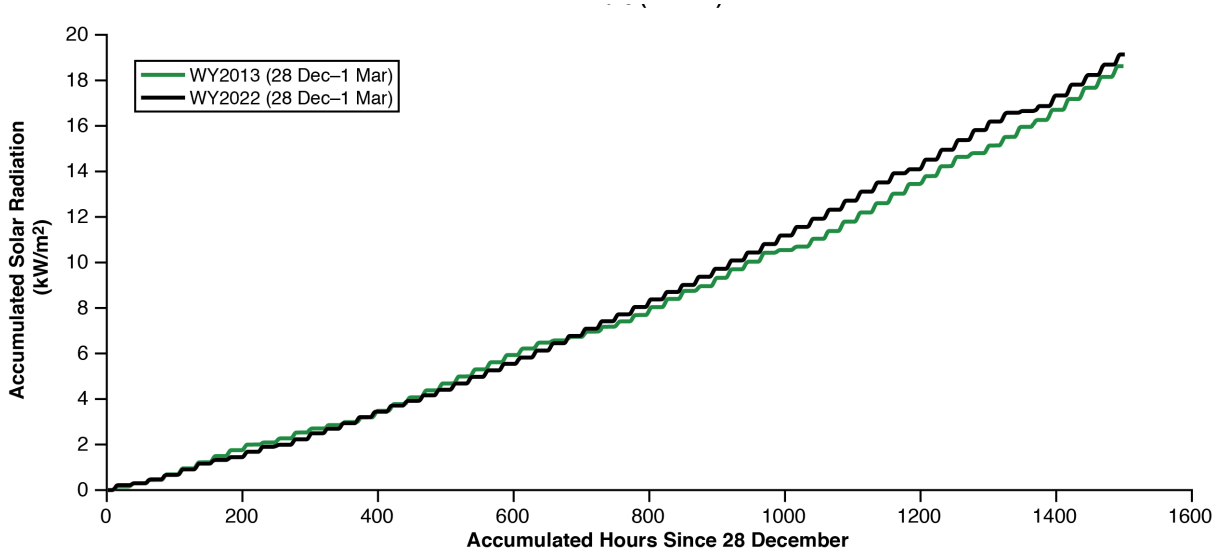

Figure S1. Accumulated hourly solar radiation (kWm^{-2}) from the Red Baron remote automated weather station (RAWS) for 28 December to 1 March period of WY2013 and WY2022. See Figure 2a for the location of the Red Baron RAWS. The total difference in accumulated radiation for the period is 5% higher during WY2022.

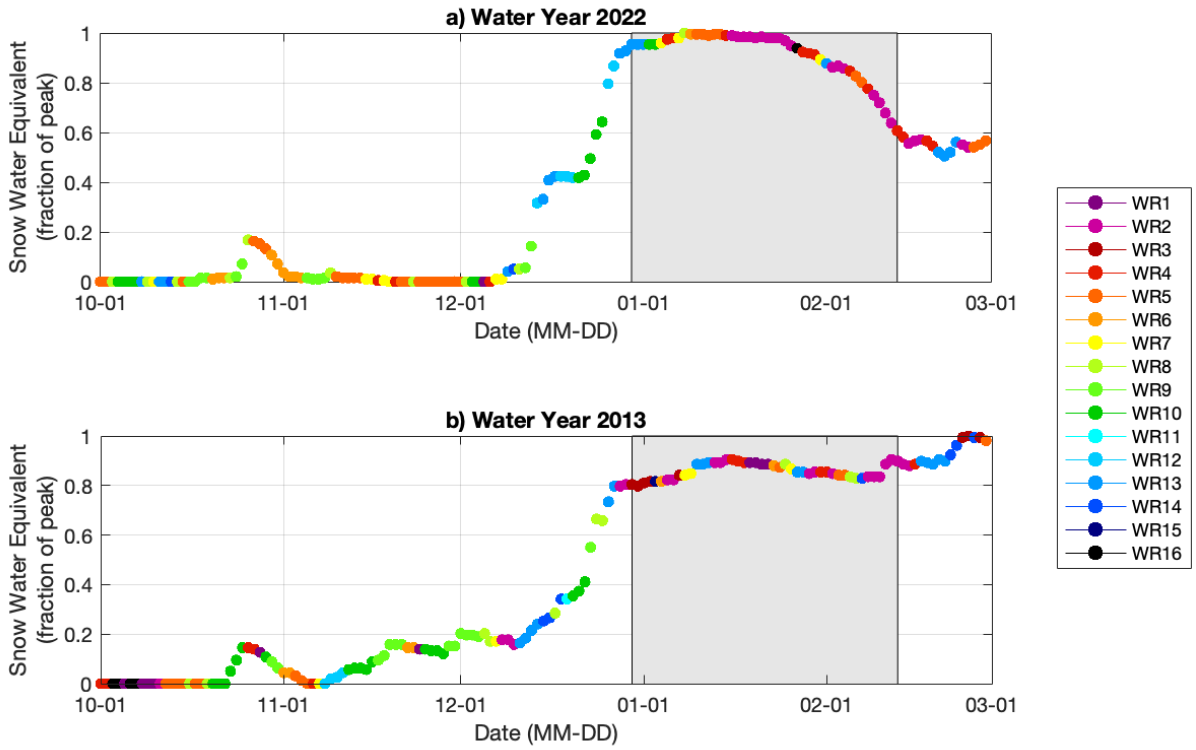

Figure S2. Seasonal evolution of snow water equivalent for the Alpha site, color-coded by the daily observed atmospheric weather regime to indicate the synoptic scale weather patterns driving snow accumulation and depletion. Grey shading highlights the December 30-February 18 dry-spell The mid-winter drought was brought about by a large-scale shift in atmospheric circulation that persisted throughout January and February. The bulk of the snow build-up that occurred in December during both years was associated with weather regimes 8-14 (shown as green or blue), with most accumulation brought by WR9, WR10 or WR12. These weather regimes, all identified by a deep trough positioned offshore from California (Figure S3), have previously been linked to historic atmospheric river landfalls and wet conditions over California, as well as snowpack in the Central Sierra Nevada (Guirguis et al. 2022). Beginning in late December (WY2013) or early January (WY2022) a weather regime shift occurred that brought atmospheric ridging conditions over/offshore from California. This is seen in Figure S3 as a cessation in SWE accumulation associated with the onset and persistence of weather regimes 1-5 (orange-red-pink markers) that brought about the mid-winter drought.

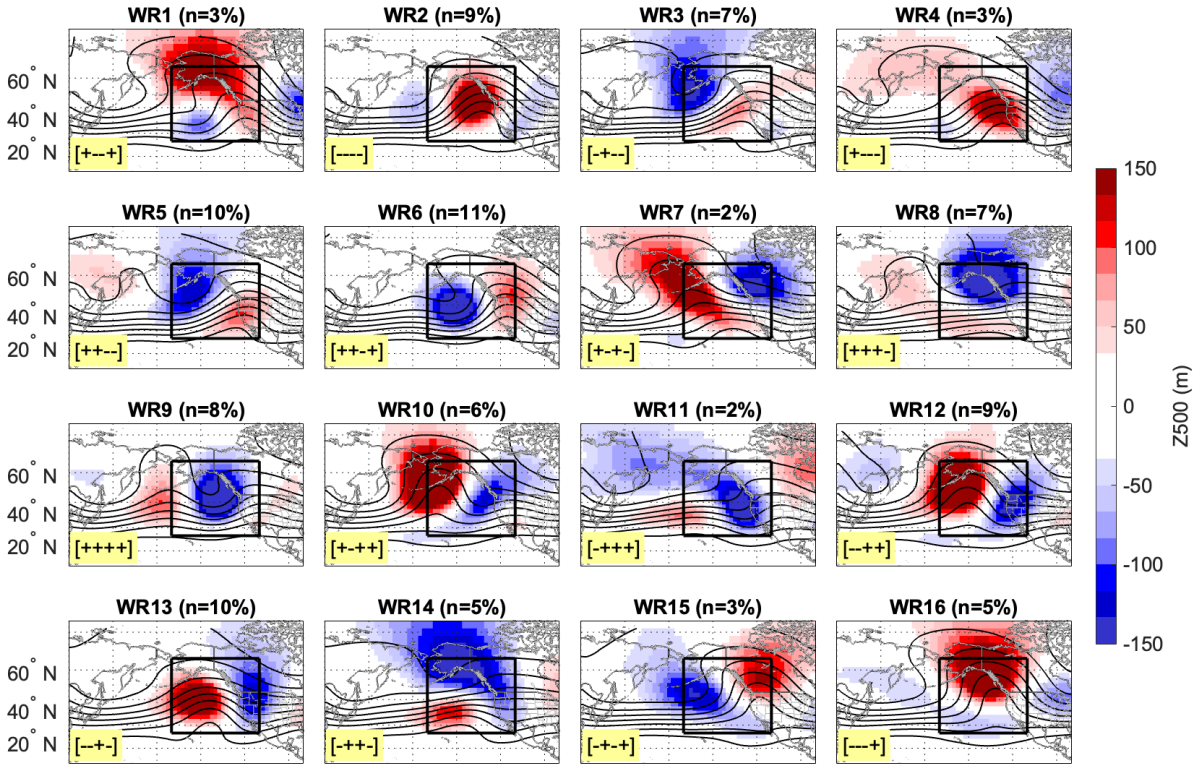

Figure S3. Composites of 500 mb geopotential height anomalies associated with each weather regime based on the methods developed by (Guirguis et al. 2022). The climatological sample size (n) for each weather regime is shown in the title as a percent of days in the historical record.

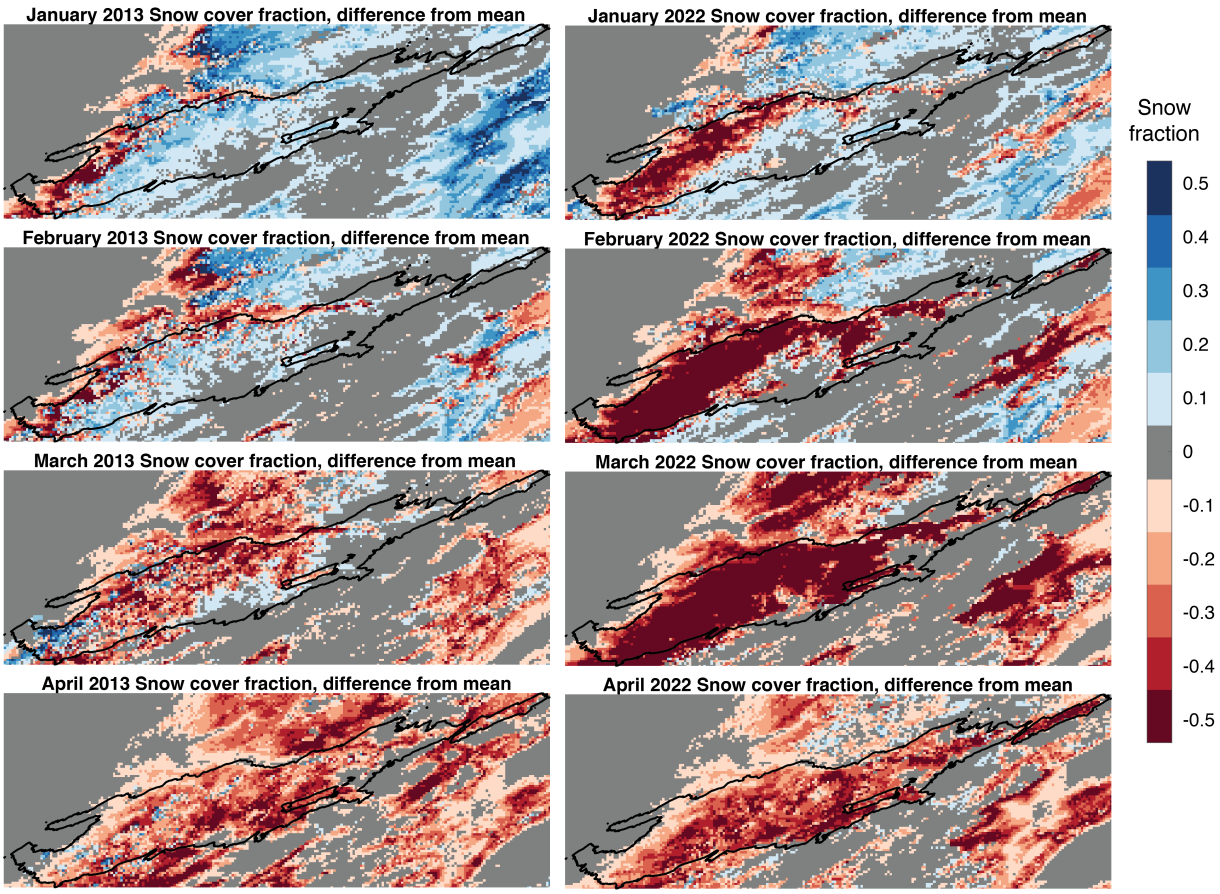

Figure S4. Snow cover days, as differences from WY2001-2022 means, for WY2013 (left column) and WY2022 (right column) for January, February, March, and April.

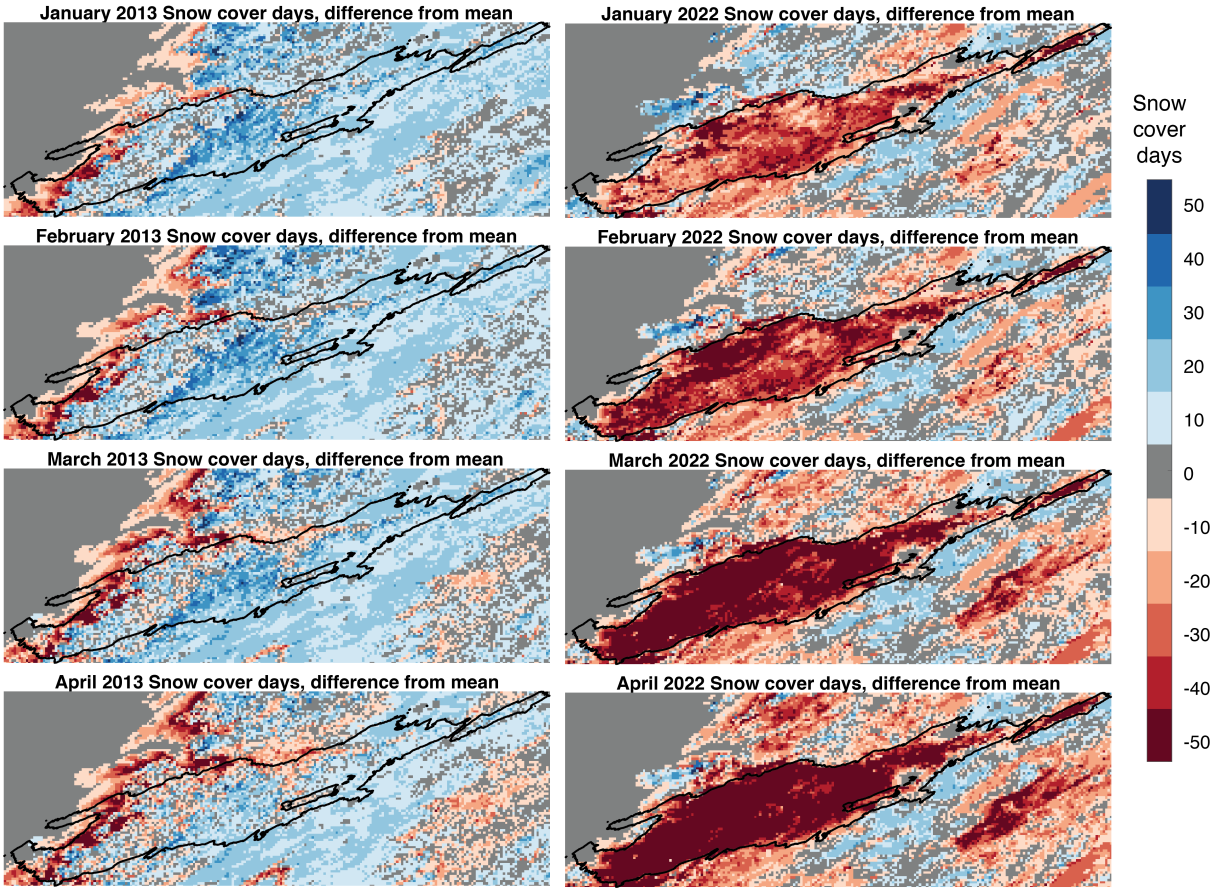

Figure S5. Snow cover fractions, as differences from WY2001-2022 means, for WY2013 (left column) and WY2022 (right column) for January, February, March, and April.