Improved management of water resources in the western USA is critical as the seasonal snowpack changes. This requires a more physically based, spatially distributed modeling approach. High spatial and temporal resolution snow cover and soil temperature data are rarely available and needed for testing of those models. Fiber optic distributed temperature sensing (FO-DTS) is a new technology that uses the light retuned from pulsed laser in fiber optic cable to determine temperature along the cable. We deployed 800 m of fiber optic cable at a depth of 10 cm in the Upper Sheep Creek (USC) watershed, located in southwestern Idaho, USA to test the applicability of FO-DTS under a heterogeneous snowpack. The USC watershed is 26 ha in extent, mountainous with a highly variable, seasonal snow pack. We used the diurnal temperature fluctuations recorded with the cable to determine the location of snow cover on the landscape. With calibration we obtained an accuracy of 0.1 °C with a precision of 0.05 °C. These data showed that: 1. the snow free date within the watershed varied by 2 months, 2., the fall soil temperatures ranged from 6.7 to 2.7 °C, indicating considerable difference in soil heating of the snow, and 3., there was considerable spatial variability of soil temperature under the snow pack, ranging from 0.63 to -0.25 °C in mid-winter. These unique spatial data have important implications for the energy and water balance of the basin and may prove useful for model design and testing.