Snow conditions at 2 ka and the present are determined for Misti volcano, southern Peru, and illustrate possible climate-driven changes in eruption-related hydrologic hazards at tropical snow-clad volcanoes. Many channels draining Misti lead into the city of Arequipa (population over 810,000) increasing the risk from eruption-related hydrologic hazards. Misti is in an arid climate and currently has only up to 0.002 km$^3$ of ephemeral snow. An eruption at 2 ka produced voluminous volcanioclastic deposits, including 0.04 km$^3$ of debris-flow deposits emplaced in many of the channels draining the volcano. To mobilize these debris-flow deposits requires that about 0.01 km$^3$ of water was available on Misti at 2 ka. Water in eruption-related debris flows typically comes from rain, crater lakes, pyroclastic flows interacting with snow and ice, or rarely expulsion directly from fissures in the edifice. Snow and ice is the only likely water source consistent with the deposit distribution that realistically provides the volume of water required to mobilize the debris flows. A regional Neoglacial advance about 2 ka was likely responsible for the increased volume of snow and ice available. Converting the water volume yields 0.01-0.04 km$^3$ of available ice and snow on Misti at 2 ka. The maximum snow now available is inadequate to produce such voluminous debris flows. Arequipa is still at risk from eruption-related hydrologic hazards, but the hazard is now limited to when snow is present or during heavy rain following an eruption. Maximum eruption-related debris-flow volumes are also greatly reduced since 2 ka.