Climate change favors weather conditions conducive to wildland fires. The intensity and frequency of forest fires are increasing, and fire seasons are lengthening. Exposure of human populations to smoke emitted by these fires increases, thereby contributing to airborne pollution through the emission of gas and particulate matter (PM). The adverse health outcomes associated with wildland fire exposure represent an important burden on the economies and health systems of societies. Even though cardiovascular diseases (CVDs) are the main of cause of the global burden of diseases attributable to PM exposure, it remains difficult to show reliable associations between exposure to wildland fire smoke and cardiovascular disease risk in population-based studies. Optimal health requires a resilient and adaptable network of small blood vessels, namely, the microvasculature. Often alterations of this microvasculature precede the occurrence of adverse health outcomes, including CVD. Biomarkers of microvascular health could then represent possible markers for the early detection of poor cardiovascular outcomes. This review aims to synthesize the current literature to gauge whether assessing the microvasculature can better estimate the cardiovascular impact of wildland fires.