The effect of methods of statistical downscaling of daily precipitation on changes in extreme flow indices under a plausible future climate change scenario was investigated in 11 catchments selected from 9 countries in different parts of Europe. The catchments vary from 67 to 617 km² in size and cover different climate zones. 15 regional climate model outputs and 8 different statistical downscaling methods, which are broadly categorized as change factor and bias correction based methods, were used for the comparative analyses. Different hydrological models were implemented in different catchments to simulate daily runoff. A set of flood indices were derived from daily flows and their changes have been evaluated by comparing their values derived from simulations corresponding to the current and future climate. Most of the implemented downscaling methods project an increase in the extreme flow indices in most of the catchments. The catchments where the extremes are expected to increase have a rainfall-dominated flood regime. In these catchments, the downscaling methods also project an increase in the extreme precipitation in the seasons when the extreme flows occur. In catchments where the flooding is mainly caused by spring/summer snowmelt, the downscaling methods project a decrease in the extreme flows in three of the four catchments considered. A major portion of the variability in the projected changes in the extreme flow indices is attributable to the variability of the climate model ensemble, although the statistical downscaling methods contribute 35–60% of the total variance.