ABSTRACT. In this paper, we study global properties of continuous plurisubharmonic functions on complete noncompact Kähler manifolds with nonnegative bisectional curvature and their applications to the structure of such manifolds. We prove that continuous plurisubharmonic functions with reasonable growth rate on such manifolds can be approximated by smooth plurisubharmonic functions through the heat flow deformation. Optimal Liouville type theorem for the plurisubharmonic functions as well as a splitting theorem in terms of harmonic functions and holomorphic functions are established. The results are then applied to prove several structure theorems on complete noncompact Kähler manifolds with nonnegative bisectional or sectional curvature.