The thesis deals with point processes of objects with random lifetime. The form of the likelihood function of an observed spatial-temporal pattern with random lifetimes is derived, where the formula is subsequently generalised to the case of censored lifetimes. Moreover, some simple parametric models are introduced and conditions under which they are non-explosive are derived. In addition, aspects of our implementation of the algorithm which generates a realisation of a given spatial-temporal point process with random lifetimes and of the likelihood-based estimation are discussed. The thesis contains a simulation study in which the use of the (partial) likelihood on simulated data is demonstrated and properties of resulting estimates are discussed. Furthermore, it contains an application of the partial likelihood to the real data, where the question of interest is the spatial dynamics of propagation of an observed population of flowers.