The focus of this thesis is the real-time rendering of participating media, such as fog. This is an important problem, because such media significantly influence the appearance of the rendered scene. It is also a challenging one, because its physically correct solution involves a costly simulation of a very large number of light-particle interactions, especially when considering multiple scattering. The existing real-time approaches are mostly based on empirical or single-scattering approximations, or only consider homogeneous media. This work briefly examines the existing solutions and then presents an improved method for real-time multiple scattering in quasi-heterogeneous media. We use analytically integrable density functions and efficient MIP map filtering with several techniques to minimize the inherent visual artifacts. The solution has been implemented and evaluated in a combined CPU/GPU prototype application. The resulting highly-parallel method achieves good visual fidelity and has a stable computation time of only a few milliseconds per frame.