Sedimentation enables self-assembly of colloidal particles into crystalline structures. Here we describe the sedimentation dynamics and equilibrium of a colloidal monolayer with tunable interparticle repulsion. The resulting crystalline structure can be conveniently controlled by modulating the sedimentation slope and the external magnetic field. After describing the dynamics of sedimentation in the dilute regime, we derive a simple analytical model with a local density approximation that successfully captures the equilibrium experimental density profiles in colloidal monolayers.