During recent decades, fiber-reinforced polymers have been widely used as an alternative to steel in different engineering fields. The purpose of the current paper is to simulate nail-grout interface in soil-nail systems and to evaluate glass-fiber-reinforced polymers nail as an alternative for conventional steel nails. Although numerous studies have been performed on pullout behavior and creep tests of fiber-reinforced polymer and steel rebar in concrete, the behaviors of glass-fiber-reinforced polymer nails are not well investigated yet. A model to predict the maximum creep displacements of glass-fiber-reinforced polymer nails was developed and calibrated based on experimental creep tests. As such, beginning with presenting the results of several experi mental pullout tests with different embedded lengths, to reach the length in which bond stress increment will be negligible, bond stress at nail-grout interface was evaluated with steel and glass-fiber-reinforced polymer nails. Then, time-dependent tests with both glass-fiber-reinforced polymer and steel nails have been carried out under sustained loads which were fractions of ultimate pullout loads. It was clearly noticed that creep displacements are lower with glass-fiber-reinforced polymer nail than steel.