Tree-soil interactions are complex and depend on the site conditions. Here we present results from the Guadiamar Green Corridor (Sevilla, Spain). A former cropland was affected by a mine-spill (in 1998), then the soil was cleaned-up, remediated and afforested with several native shrub and tree species. In 2014 we studied biogeochemical processes in seven of the afforested tree species, three deciduous (*Populus alba*, *Celtis australis*, *Fraxinus angustifolia*) and four evergreen (*Quercus ilex*, *Olea europaea*, *Ceratonia siliqua* and *Pinus pinea*). We sampled five replicates of each tree species and the soil underneath in a random block design, including adjacent open soils as reference. We studied the differential effects of the contrasted tree species on two ecosystem services: 1) the regulation of soil quality by immobilization of trace elements (the remediation technique called “phytostabilization”), and 2) the mitigation of climate change by carbon sequestration in biomass and soils.