Soil water repellency (SWR), which causes uneven water distribution in top soil, is a common problem for sandy soils, especially on sand-based growing media such as USGA (United States Golf Association) greens. The SWR is caused by wax-like organic substances coating on the surface of sand particles which repel water. Wetting agent, which are surface active agents or surfactants, have bi-affinity structure with water-loving (hydrophilic) and water-repellent (hydrophobic) groups on each end of the structure, is the primary tool for treatment of SWR. The hydrophobic end will attach wetting agent compounds with SWR coatings at the sand surface, thus facing the water-loving side towards outside and interact with surrounding water molecules. Wetting agents are developed with mainly two purposes: enhancement of water infiltration and improving water retention. More recently designed products also aim at potentially remove SWR causing organic coatings from the soil profile thus provide longer and more efficient wetting. However, previous studies conducted in turf area on wetting agents related topics often only looked at the treatment effects on turfgrass responses and overall turf performance. The objective of this dissertation study is to comprehensively investigate the direct wetting agents influences on soil hydrology (soil water movement), soil chemistry (hydrophobic organic coating removal), and soil microbiology (soil microbial community), with goal of explaining the working mechanisms of different wetting agents. Except pHAcid, most tested wetting agents mitigated SWR with either enhanced infiltration rate or reduced soil hydrophobicity. While the compounds of OARS strongly sorped into the SWR sand system and increased SWR, Matador successfully removed significant amount of non-dissolved organic materials from the SWR sand and transformed the sand to spontaneous wetting status. The soil microbial community was significantly influenced by the weather conditions, while wetting agents that enhanced infiltration (e.g. Hydro-Wet) potentially reduced soil water holding capacity and led to decreased soil microbial abundancy.