China has been facing serious water environmental challenges due to Eutrophication issue in recent decades. Numerous studies have identified enhanced phosphorus (P) fluxes from diffuse agricultural sources as one of the most dominant causes for freshwater eutrophication in China. Therefore, the main focus of this study is identifying the potential risk of P loss from agricultural soil to targeted water, and got the main findings as following: the areas with close proximity to rivers and the reservoir, as well agricultural land around villages, are the main P sources to the reservoir, which have been found by an amend P index model including source and transportation factors; As a subsequent study, through a relative importance analysis, we also found that the source factors can control the P loss risk in high and very high risk areas, and the transportation factors governed P loss risk in the low and very low risk areas; Based on previous research conclusion, we found that the relative risk for P loss was closely related to the local land use. Therefore, it also conducted a study using readily available data on land use as an explanatory factor for assessing potential P loss risk from a watershed. The results indicated that most soil samples had relatively homogeneous soil physical priorities. P containing minerals, such as Apatite and Vivianite, were not found in any of the soil samples, which imply that the P in the soil is mainly from agricultural practices. The soil content of total P, total inorganic P and soil test P (STP) (a proxy for bioavailable P) increased significantly following the order of increasing management intensity; These studies were followed up by a study focusing on the effects of land use change on P levels in surface waters. The results showed that Kappa indexes above 0.85 verified a satisfactory merit for the coupled land use change model. Scenario predictions reveal that the planned abatement actions, comprising local emigration and a comprehensive ecological restoration, will likely significantly decrease the content of P in receiving surface waters.