

Changes in Forest Cover Regulate Streamflow in Central Nigerian Gallery Forests

Authors : Rahila Yilangai, Sonali Saha, Amartya Saha, Augustine Ezealor

Abstract : Gallery forests in sub-Saharan Africa are drastically disappearing due to intensive anthropogenic activities thus reducing ecosystem services, one of which is water provisioning. The role played by forest cover in regulating streamflow and water yield is not well understood, especially in West Africa. This pioneering 2-year study investigated the interrelationships between plant cover and hydrology in protected and unprotected gallery forests. Rainfall, streamflow, and evapotranspiration (ET) measurements/estimates over 2015-2016 were obtained to form a water balance for both catchments. In addition, transpiration in the protected gallery forest with high vegetation cover was calculated from stomatal conductance readings of selected species chosen from plot level data of plant diversity and abundance. Results showed that annual streamflow was significantly higher in the unprotected site than the protected site, even when normalized by catchment area. However, streamflow commenced earlier and lasted longer in the protected site than the degraded unprotected site, suggesting regulation by the greater tree density in the protected site. Streamflow correlated strongly with rainfall with the highest peak in August. As expected, transpiration measurements were less than potential evapotranspiration estimates, while rainfall exceeded ET in the water cycle. The water balance partitioning suggests that the lower vegetation cover in the unprotected catchment leads to a larger runoff in the rainy season and less infiltration, thereby leading to streams drying up earlier, than in the protected catchment. This baseline information is important in understanding the contribution of plants in water cycle regulation, for modeling integrative water management in applied research and natural resource management in sustaining water resources with changing the land cover and climate uncertainties in this data-poor region.

Keywords : evapotranspiration, gallery forest, rainfall, streamflow, transpiration

Conference Title : ICECC 2018 : International Conference on Environment and Climate Change

Conference Location : Paris, France

Conference Dates : July 19-20, 2018