Tracy J. Baker | Scott N. Miller

Land cover and land use changes in Kenya's Rift Valley have altered the hydrologic response of the River Njoro watershed by changing the partitioning of excess rainfall into surface discharge and groundwater recharge. The watershed contributes a significant amount of water to Lake Nakuru National Park, an internationally recognized Ramsar site, as well as groundwater supplies for local communities and the city of Nakuru. Three land use maps representing a 17-year period when the region underwent significant transitions served as inputs for hydrologic modeling using the Automated Geospatial Watershed Assessment (AGWA) tool, a GIS-based hydrologic modeling system. AGWA was used to parameterize the Soil and Water Assessment Tool (SWAT), a hydrologic model suitable for assessing the relative impact of land cover change on hydrologic response. The SWAT model was calibrated using observation data taken during the 1990s with high annual concordance. Simulation results showed that land use changes have resulted in corresponding increases in surface runoff and decreases in groundwater recharge. Hydrologic changes were highly variable both spatially and temporally, and the uppermost reaches of the forested highlands were most significantly affected. These changes have negative implications for the ecological health of the river system as well as Lake Nakuru and local communities. © 2013 Elsevier B.V.

Haleh Nampak | Biswajeet Pradhan | Mohammad Abd Manap

The objective of this paper is to exploit potential application of an evidential belief function (EBF) model for spatial prediction of groundwater productivity at Langat basin area, Malaysia using geographic information system (GIS) technique. About 125 groundwater yield data were collected from well locations. Subsequently, the groundwater yield was divided into high (≥11 m³/h) and low yields (< 11 m³/h) respectively, based on the groundwater classification standard recommended by Department of Mineral and Geosciences (JMG), Malaysia. Out of all of the borehole data, only 60 wells possessed higher yield at ≥ 11 m³/h. Further, these wells were randomly divided into a testing dataset 70% (42 wells) for training the model and the remaining 30% (18 wells) was used for validation purpose. To perform cross validation, the frequency ratio (FR) approach was applied into remaining groundwater wells with low yield to show the spatial correlation between the low potential zones of groundwater productivity. A total of twelve groundwater conditioning factors that affect the storage of groundwater occurrences were derived from various data sources such as satellite based imagery, topographic maps and associated database. Those twelve groundwater conditioning factors are elevation, slope, curvature, stream power index (SPI), topographic wetness index (TWI), drainage density, lithology, lineament density, land use, normalized difference vegetation index (NDVI), soil and rainfall. Subsequently, the Dempster-Shafer theory of evidence model was applied to prepare the groundwater potential map. Finally, the result of groundwater potential map derived from belief map was validated using testing data. Furthermore, to compare the performance of the EBF result, logistic regression model was applied. The success-rate and prediction-rate curves were computed to estimate the efficiency of the employed EBF model compared to LR method. The validation results demonstrated that the success-rate for EBF and LR methods were 83% and 82% respectively. The area under the curve for prediction-rate of EBF and LR methods were calculated 78% and 72% respectively. The outputs achieved from the current research proved the efficiency of EBF in groundwater potential mapping. © 2014 Elsevier B.V.

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© 2014 The Authors. Changes in lake hydrological regimes and the associated impacts on water supplies and ecosystems are internationally recognized issues. During the past decade, the persistent dryness of Poyang Lake (the

https://www.journals.elsevier.com/journal-of-hydrology/most-cited-articles#
largest freshwater lake in China) has caused water supply and irrigation crises for the 12.4 million inhabitants of the region. There is conjecture as to whether this dryness is caused by climate variability and/or human activities. This study examines long-term datasets of catchment inflow and Lake outflow, and employs a physically-based hydrodynamic model to explore catchment and Yangtze River controls on the Lake's hydrology. Lake water levels fell to their lowest during 2001-2010 relative to previous decades. The average Lake size and volume reduced by 154km $^2$ and $11\times10^8$ m $^3$ during the same period, compared to those for the preceding period (1970-2000). Model simulations demonstrated that the drainage effect of the Yangtze River was the primary causal factor. Modeling also revealed that, compared to climate variability impacts on the Lake catchment, modifications to Yangtze River flows from the Three Gorges Dam have had a much greater impact on the seasonal (September-October) dryness of the Lake. Yangtze River effects are attenuated in the Lake with distance from the River, but nonetheless propagate some 100km to the Lake's upstream limit. Proposals to build additional dams in the upper Yangtze River and its tributaries are expected to impose significant challenges for the management of Poyang Lake. Hydraulic engineering to modify the flow regime between the Lake and the Yangtze River would somewhat resolve the seasonal dryness of the Lake, but will likely introduce other issues in terms of water quality and aquatic ecosystem health, requiring considerable further research.

Assessing the impact of urbanization on storm runoff in a peri-urban catchment using historical change in impervious cover

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This paper investigates changes in storm runoff resulting from the transformation of previously rural landscapes into peri-urban areas. Two adjacent catchments (~5km $^2$) located within the town of Swindon in the United Kingdom were monitored during 2011 and 2012 providing continuous records of rainfall, runoff and actual evaporation. One catchment is highly urbanized and the other is a recently developed peri-urban area containing two distinct areas of drainage: one with mixed natural and storm drainage pathways, the other entirely storm drainage. Comparison of observed storm hydrographs showed that the degree of area serviced by storm drainage was a stronger determinant of storm runoff response than either impervious area or development type and that little distinction in hydrological response exists between urban and peri-urban developments of similar impervious cover when no significant hydraulic alteration is present. Historical levels of urbanization and impervious cover were mapped from the 1960s to the 2010s based on digitized historical topographic maps and were combined with a hydrological model to enable backcasting of the present day storm runoff response to that of the catchments in their earlier states. Results from the peri-urban catchment showed an increase in impervious cover from 11% in the 1960s to 44% in 2010s, and introduction of a large-scale storm drainage system in the early 2000s, was accompanied by a 50% reduction in the Muskingum routing parameter k, reducing the characteristic flood duration by over 50% while increasing peak flow by over 400%. Comparisons with changes in storm runoff response in the more urban area suggest that the relative increase in peak flows and reduction in flood duration and response time of a catchment is greatest at low levels of urbanization and that the introduction of storm water conveyance systems significantly increases the flashiness of storm runoff above that attributed to impervious area alone. This study demonstrates that careful consideration is required when using impervious cover data within hydrological models and when designing flood mitigation measures, particularly in peri-urban areas where a widespread loss in pervious surfaces and alteration of drainage pathways can significantly alter the storm runoff response. Recommendations include utilizing more refined urban land use typologies that can better represent physical alteration of hydrological pathways. © 2014 The Authors.

Source-control stormwater management for mitigating the impacts of urbanisation on baseflow: A review

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