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HYDROLOGICAL EFFECT OF ARTIFICIAL DRAINAGE IN LOWLAND RIVER CATCHMENTS IN LITHUANIA

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Abstract

Although in Lithuania artificial land drainage is a common water management practice, there are still concerns about its downstream hydrological effects. Due to the complexity of flow driving factors, the hydrological effect of drainage is very uncertain, making it difficult to determine its relative importance. Aiming to distinguish between the influence of drainage and other factors in this study, the extent of changes of twenty hydrologic variables (flow magnitude, frequency, duration, timing and rate of change) downstream of drained areas and five explanatory factors that described different aspects of streamflow regimes in a non-redundant way were analysed. The resolution of the task involved the application of principal component and canonical correlation analyses. The results based on data collected from six tile-drained lowland river catchments ($A=167\text{-}2290\text{ km}^2$) within the period 1940-1990 revealed that weather and catchment soil conditions were the primary factors determining the variability of most streamflow variables. The extent of the drained land area in river catchments affects only a few hydrologic variables - it tends to extend the duration of high pulses and causes later occurrence of annual peaks. The extended duration of high pulses along with the lag in occurrence of annual peaks are attributed to the “sponge effect” of drainage. The study also showed that artificial drainage results in a reduced number of low pulses by creating a more pronounced hydrological connection to groundwater. Most probably this occurs due to the greater depth of tile drains, providing a deeper outlet for shallow groundwater drainage. A larger groundwater inflow may also contribute through deepened stretches of channelized streams and newly dug ditches collecting water from lateral tiles.

Key words: agricultural catchments, artificial drainage, hydrological effect, Lithuania

Received: May, 2012; Revised final: April, 2013; Accepted: April, 2013
