

论文

土地利用及不透水地表对河流流量的影响

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摘要:

利用美国地质调查局的逐日连续流量数据计算了美国切斯比克湾地区150个小流域的34个河流流量指标,并在整个区域和划分的3个自然地理区对选择的17个指标与4种土地利用类型和不透水地表做了相关分析。结果表明,森林在降水较少的冬春两季增加流量,雨量较高的秋季减少流量,森林面积比例的增加可以削减洪峰、延长洪峰历时、稳定流量变化。农业用地比例的增加表现为稳定流量变化,延长洪峰历时,在高原地区还可以削减洪峰流量。草地比例的提高均表现为削减洪峰流量,稳定流量变化,延长洪峰历时。随着不透水地表面积增加,洪峰流量、雨季、汛期和年流量增加,流量变化加剧,洪峰历时减少,不同地理区对不透水地表的水文响应也有所不同。

关键词: 土地利用 不透水地表 流量指标 水文响应

Impacts of Land Use and Impervious Surface on Stream Flow Metrics in Chesapeake Bay Watershed

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Abstract:

Using daily discharge data from the US Geological Survey, we calculated 34 stream flow metrics for 150 watersheds (area < 282 km²) within the Chesapeake Bay basin, and selected 17 of the metrics. We quantified the proportions of forest, agriculture, grassland, developed land, and impervious surface in each watershed. For each of the three physiographic provinces, we correlated the flow metrics with the land cover proportions to elucidate how different land cover types affect the flow regime. Higher proportions of forest increased stream flow in relatively dry winters or springs and reduced stream flow in comparatively rainy autumns. Higher forest proportions also reduced flooding, prolonged pulses of higher flow, and reduced flow variability. Higher proportions of agriculture reduced flow variability and prolonged pulses of higher flow in all physiographic provinces and reduced flooding in the highland physiographic provinces. Higher grassland proportions reduced flooding and flow variability and prolonged high flow pulses in all provinces. Higher proportions of developed land and impervious surface reduced infiltration, increased flooding and flow during high rainfall periods, intensified flow variability, and shortened high flow pulses; there are different hydrologic effects in different urbanized areas.

Keywords: land use impervious surface flow metrics hydrologic response

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