

The mutual relation between vegetation and inundation characteristics in floodplains

A case study of the Duursche Waarden

In the Netherlands water management is an ongoing challenge, of which the idea behind the solution has changed several times. This led in recent times to giving the rivers more room to flow during high water ("Ruimte voor de rivier"), however the effect of the vegetation growth in the floodplains has not been studied very well. It is known that vegetation growth leads to an increase in the flood risk for that area, as the vegetation increases the hydraulic roughness and therefore causes increased water levels. It is therefore important to know how vegetation evolves in an area, to be able to manage it better and maintain water safety. Understanding the mutual relation between vegetation and inundations will help water managers to better manage the floodplains and possibly predict where vegetation might lead to problems for the water safety.

To investigate this relation, firstly the environmental conditions (inundation frequency/duration, flow velocity and dry periods) are mapped for the Duursche Waarden. For this, a model (WAQUA) is used to simulate flood waves to determine a local Q-h relation and calculate the flow velocities. These mapped environmental conditions are linked to vegetation classes of the ecotope map (grass, shrubs and forest) which remained the same over the years of 1998, 2005 and 2012. Areas which experienced changes in the vegetation classes were also linked to the environmental conditions, to see if this can be explained by the environmental conditions. See Figure 1.

Secondly, the effect of vegetation on the flood characteristics is investigated. To do so, the Duursche Waarden are simulated as completely covered by paved surface, grass, shrubs or forest. The results from the simulations show how much different types of vegetation affect the flood characteristics and with that the water safety. The resulting information is compared to the current situation.

This results to the conclusion that linking vegetation to environmental characteristics can help predict where certain vegetation is likely to change into another type of vegetation. Furthermore, not all vegetation types form a risk for the water safety. Depending on the amount and where it is located the effect could almost be negligible. Knowing this mutual relation between vegetation and environmental conditions could help water managers to manage the floodplains, while still reserving space for nature.

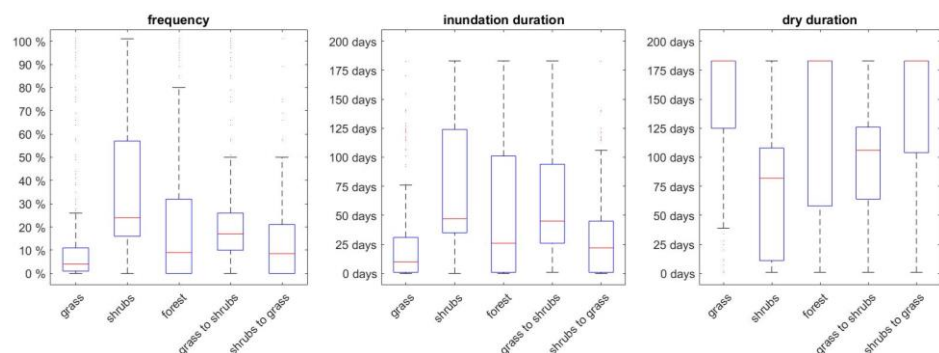


Figure 1: Box plots illustrating the relation between ecotopes and three environmental conditions.

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