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Hydrological impacts of climate change on a restored UK floodplain: simulation results using MIKE SHE / MIKE 11 and UKCP09 scenarios

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Thirty UKCP09 climate change scenarios for the 2050s and 2080s are simulated using a MIKE SHE / MIKE 11 model of a recently restored floodplain in Norfolk, eastern England. Projections of annual precipitation exhibit uncertainty in the direction of change with declines of up to 27% for the 10% probability level (very likely to be exceeded) and increases of a similar magnitude for the 90% probability level (very unlikely to be exceeded). Small (2 – 4%) declines are projected for the central 50% probability level (as likely as not to be exceeded). More central (30% – 70%) probabilities project wetter winters and drier summers. Potential evapotranspiration (PET) increases for all scenarios except the 10% probability level (range of change in annual PET: -41% – +2% for 10% and 90% probabilities). Declines in mean discharge predominate (all 10% – 50% and half the 70% probability level scenarios) and are as large as 41% (10% probability). The central probability is associated with declines of between 11% and 17%. Increases of up to 25% occur for the 90% probability level. High and low (Q5 and Q95) discharges as well as the frequency of bankfull discharges being exceeded decline for all scenarios apart from the 90% probability level. Most scenarios project drier conditions on the restored floodplain. Although in most cases the water table still reaches the ground surface in winter, the duration of high water tables declines. Summer water tables are on average at least 0.11 m and 0.18 m (and up to 0.31 and 0.34 m) lower for the 2050s and 2080s, respectively. Simulated flood extent also declines for most scenarios. Drier conditions are likely to induce ecological responses including impacts on floodplain vegetation.