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Modelling the hydrogeologic controls on the seepage of water from the Kildare aquifer to Pollardstown fen affecting moisture conditions in the habitat of the protected rare whorl snail, (Vertigo geyeri)

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The Kildare aquifer is an unconfined sand and gravel aquifer on the Eastern side of Ireland. With an approximate area of 200 km^2, it is the largest aquifer in Ireland. At its eastern slopes is Pollardstown Fen, fed by groundwater from the aquifer. Near the aquifer-fen interface, the watertable in the aquifer is higher that the ground surface and groundwater seeps through the ground surface providing moist conditions and a suitable habitat for the protected snail, Vertigo geyeri. However, a major highway was constructed in a cutting in the centre of the aquifer close to the aquifer divide. Concerns arose on the possibility of increased drainage of aquifer water by this cutting and how this might affect the habitat of the snail at the aquifer-fen margin. Various approaches were adopted to simulate the situation and predict any potential changes in the snail's habitat. Here we describe a modelling chain consisting of (i) a recharge model (bespoke), providing the inputs for (ii) an aquifer model (MODFLOW), providing the boundary conditions for (iii) a saturated-unsaturated porous medium model of the fen margin (Hydrus). The latter revealed the importance of surface topography and subsurface heterogeneity in determining effects on the location and quantity of seepage flows. In addition to assessing the effects of the road cutting, this combination of models also allows the assessment of the effects of weather variability and climate change on aquifer recharge and thus seepage to the fen and changes in the wetness of the snail's habitat.