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# Hydrological process and its ecological effects on a re-established freshwater wetland in the Yellow River Delta, China

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**Abstract** A national program for the restoration of freshwater wetlands in the Yellow River Delta National Natural Reserve was initiated in 2000. A new re-established freshwater wetland was constructed in the reserve and was first rewetted in 2009 during water regulation in the upper reaches of the Yellow River. This paper assesses the effects of the re-established wetland on local hydrological processes and the corresponding ecological response. Basic observation has shown that after water was diverted into the artificial wetland, the water body covers 1200 ha with an average water depth of 1.5 m. Regional groundwater level fluctuates with both net precipitation and the re-wet process. The rewetting process has a noticeable impact on reducing salinity of groundwater. Aquatic and herbaceous plants quickly respond during the growing season, switching from seepweed-dominated to ditch reed-dominated. A groundwater flow model was then built by Visual Modflow and a corresponding groundwater salinity prediction model was constructed by multi-variable regression method (from 23 June 2010 to 31 August 2010). Numerical simulation results show that local groundwater balance mainly consists of precipitation (73% of total recharge), wetland (26%) and evapotranspiration (92% of total discharge). Total infiltration to groundwater from the wetland during the simulation period is $112.8 \times 10^4$ $m^3$. The model simulation is in good agreement with the sample plots. Due to the fine sediment of this region, hydraulic conductivity of the aquifer is as low as 0.03 m/day, therefore groundwater infiltration is restricted to local scale and the radius of the capture zone of groundwater adjacent to the wetland is from 1000 m to 1500 m. Some management measures to increase infiltration and to enlarge the capture zone of the wetland are proposed in the last section.

**Key words** Yellow River Delta, China; re-established freshwater wetland; restoration; numerical simulation