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Modeling of ground water flow for Przemkowsko-Przeclawskie wetlands restoration

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Przemkowsko - Przecławskie wetlands, situated in south-west Poland in the catchment of the Szprotawa River, are an example of the swampy area where natural environment was transformed to a large extent due to intensive melioration.
The study on historical maps and as well as available historical documentation of the area revealed that most likely a fluviogenic type of wetlands had existed there with the main meandering river and its' tributaries joining together in the central part of the wetland. Frequent occurrence of surface water inundation used to be the main characteristic of that system.
Owing to the construction of a complicated network of drainage-irrigation channels, which led to limiting inundation phenomena, most of the area was transformed into productive grasslands and arable fields. However, the land reclamation system had never been fully operational and after several years the intensive management of that area was abandoned, followed by decades of lack of proper grassland and water management. This brought about a complicated pattern of environmental changes. At present, a research on hydrological restoration of Przemkowsko- Przeclawskie wetlands is being carried out. It has been found out that a complete reconstruction of the river system is not possible in the contemporary times, on account of existing social and technical constraints. Since the complete restoration of the fluviogenic system is not possible, an action should be taken to make use of the existing network of channels for a ground water-fed wetland restoration. The justified solution, that emerged from the ongoing studies, is to raise the water levels in the existing network of channels causing in this way the increase in ground water levels . A question arises, to which extent the system can undergo the restoration, by the increased ground water recharge, and if there is a possiblilty to maintain desired ground water levels in the vegetation season. A common and recognized ground water model MODFLOW was used in order to look for possible answers to the restoration problems. Using the model, transient simulations of ground water flow were performed for the period 1964-1988 which made possible to analyse long-term hydrological characteristics for the proposed water management scenarios. It was found that ground water reacharge was insufficent to maintain the desired water conditions on the wetland area. In order to keep optimum moisture of that area it was necessary to use surface water reserves.
In conclusion, possible measures of Przemkowsko- Przeclawskie wetlands restoration were discussed and hydrological characteristics involving : inundation frequency, mean, minimum and maximum ground water levels were presented, regarding the possible management of the wetland area and its surroundings.