



Using a GIS-based load transfer model (AVGWLF) for improving management of Lake Kinneret watershed, Israel

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Lake Kinneret (also known as Lake Tiberias or Sea of Galilee) is the only large surface water body in Israel, supplying some 30% of Israel's water consumption. The watershed, located in the northern part of the Dead Sea Rift Valley, comprises an area of 2730 km². The major water source for the lake comes is the Jordan River. Some 200,000 people live in the Israeli part of the watershed where land is used primarily for agriculture. Point-source pollution in the watershed has decreased drastically with the development of wastewater treatment. However, diffuse pollution from agricultural activities is still an unresolved issue.

A GIS-based watershed load model called AVGWLF was applied to the Lake Kinneret watershed in order to evaluate the contribution of different pollution sources and to plan a pollution load reduction management. The model enables simulation of daily stream flows and monthly nitrogen, phosphorus and sediment loads entering the lake from the surrounding watershed.

Daily water flows at Pkac Bridge were simulated for the calibration period with an R² of 0.9092. For the validation period the correspondence between simulated and measured water flow is slightly weaker than during the calibration period (R²=0.8799). Some of the deviations from perfect match are due to the slightly higher simulated water flow than measured water flow during flood events. This is explained by the

maximum water flux limitation imposed at Pkak Bridge, which caused a backup of water and flooded the upstream Hula Valley.

Sediment load (TSS) was calibrated using a genetic algorithm (GA) which is a domain heuristic independent global search technique that imitates the mechanics of natural selection and natural genetics of Darwin's evolution principle. The calibration process using GA technique led to a significant improvement of R^2 correspondence coefficients from 0.6 and 0.5 to 0.8 and 0.7 for the calibration and validation periods relatively.

A decision support system (PRedICT – Pollution Reduction Impact Comparison Tool) has been linked to the model in order to evaluate different BMPs and pollution mitigation strategies for the purpose of minimizing sediment, phosphorus and nitrogen loads flow to Lake Kinneret. At this stage such analysis is premature. However, preliminary results indicate that future management should be focus on septic systems removal, pasture and crop management.