

Hydrological Modeling of Athabasca River Basin, Canada using Soil and Water Assessment Tool

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Summary

Recent observations showed that the ecological status of Athabasca River Basin (ARB) is generally good. However, ever increasing industrialization and growing population have put immense pressure to the water resources and therefore, to the ecological status of the basin. An integrated terrestrial and aquatic modelling framework of the river basin is thus necessary which would allow to: (a) quantify the water resources of the basin (b) identify different pollution sources and track their pathways, and (c) test impact of different management scenarios. In this context, this paper presents preliminary results of hydrological modelling of the river basin as the first step towards achieving an integrated terrestrial and aquatic modelling framework. We used Soil and Water Assessment Tool (SWAT) for this purpose. The SWAT model is built up using the recent spatial datasets of elevation, land use and soil, combined with several hydro-meteorological, point and diffused source pollution datasets. Model sensitivity, calibration and validation, and uncertainty analysis was carried out using SWAT CUP using stream flow data set recorded at 33 gauging stations across the basin. The accuracy of stream flow simulation results varied from 'Satisfactory' to 'Very Good', as assessed using various goodness-of-fit statistics. Results showed that the contribution of surface runoff and groundwater return flow was almost the same. While the green water storage and blue water yield varied across the basin, upstream sub-basins were storing and contributing the most. We believe that availability of such integrated modelling framework would help to test different management scenarios so that the impacts to the environment and economy could be lessened.