

Understanding the Water Quality Implications of Inter Basin Water Transfers Using a Source Tracking Modeling Framework

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Reservoir water balance models are often used in water management studies to analyze the impact of various operational strategies on the performance of water resource systems. However, the water quality implications of reservoir operations are relatively less explored as it entails additional processes in the model, which in turn would require data and parameterization. Water quality implications are particularly important in projects such as inter-basin water transfers (IBWTs) in which water is diverted from one basin to other in the presence of considerable regional differences in water supply and demands between two basins. When water from one basin is transferred to another, the difference in water quality can affect the local flora and fauna of the recipient basin. So, it is important to understand the relative proportion of water from either basins present in the recipient reservoir at any time. Here, we propose a source tracking framework to quantify the contribution of water from either basins to various reservoir-related fluxes in the recipient basin. These include water released from the recipient basin for: demand satisfaction, maintaining minimum environmental flows, preventing dam failure, and demands in basins. For each flux, we quantify the proportion of water supplied from the donor basin and from the recipient's own inflows. We apply this framework to a proposed water transfer project in southern India that transfers water from the Godavari basin to the Krishna river basin. Our results show that under extreme droughts observed in the simulated inflows, up to 50% of the minimum environmental flows released downstream of the recipient reservoir are supplied from the water transferred from the donor basin. This generally occurs in the months from June to December in which the recipient experiences high demands. We also note that more than 50% of the water transferred out of the recipient reservoir to other basins arrives from the donor basin. Our framework can be used to evaluate the possible implications of water quality in the donor basin on the minimum environmental flows and other reservoir-related fluxes from the recipient reservoir.