Management strategies, such as targets for maximum sediment discharge are required to protect the marine environment along the Queensland coast, particularly the world-renowned Great Barrier Reef. The Fitzroy catchment is a large, mostly dry catchment (142 000 km²) including 4 major subcatchments. The Isaac subcatchment, the wettest of the 4 subcatchments, has 6 times as high runoff and half to one tenth of flow-weighted sediment concentration as compared to the other 3 subcatchments. The objective of the research is to assess the impact of the different runoff and sediment sources and mixing of flows from major sub-catchments on sediment discharge to the marine environment.

It was found that most of the runoff during all large flow events (peak flow rate > 5000m³/s) recorded in the lower Fitzroy River originated from the Connor River within the Isaac subcatchment, and all of these flows produced lower sediment concentrations in the lower Fitzroy. For small to medium flow events, the mean sediment concentration was high and contribution from the Connor was invariably low. The distinct flow and sediment characteristics of the Isaac subcatchment in connection with the lower Fitzroy allow separate sediment–discharge relationships according to the source of flow. This partitioning reduced the variability and uncertainty in the sediment–discharge relationships for the Fitzroy River, thus improved the accuracy of the estimated sediment loads.

Based on these finding, for the lower Fitzroy at least two water quality targets are recommended to be set according to the source of flow.