The effects of irrigation effluent on a Western Canadian prairie river

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Abstract

Field studies were conducted during the peak irrigation period (July–August) at the mouth, 50 m upstream and 50 m downstream of four irrigation return flows draining a 50 km stretch of the Oldman River in the short grass prairie zone of southern Alberta. Water samples were analyzed weekly. Physico-chemical variables changes only slightly at each site but salinity and conductivity were significantly higher at the downstream site (Expanse Coulee) and all sites showed an increase over 1978 data. Conductivity along the left bank of the river was measured at 50 m intervals downstream of Expanse Coulee until, after 1.5 km, it declined to the upstream level which in the laboratory was shown to require a 660% dilution of the effluent. In field experiments conducted at Expanse Coulee it was shown that macroinvertebrate biomass was significantly lower downstream of the mouth and significantly higher upstream. Chlorophyll-*a* was not significantly different between the mouth and upstream with both significantly higher than downstream where it was not detectable. Inorganic carbon assimilation by epilithic algae and heterotrophic potential of the bacteria were both significantly higher at the mouth and upstream and significantly lower downstream.

Organic matter in the sediment was not significantly different upstream or downstream of the mouth but there was a higher percentage of large particles (125–250 μm) at the mouth and downstream of EC a higher percentage of medium (60–125 μm) and small (0–60 μm) particles were found 50 m upstream. It is concluded that at present differences in invertebrate biomass, chlorophyll-*a*, inorganic carbon assimilation by epilithic algae and heterotrophic potential of epilithic bacteria at Expanse Coulee are not directly attributable to increase in salinity but are more probably the result of increased suspended solids and saltation.