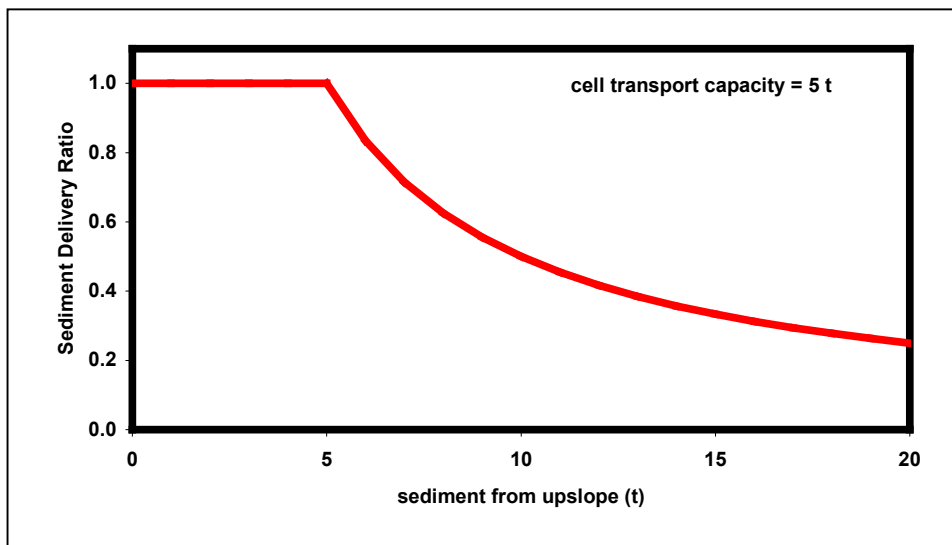


A comment on modelling the impacts of erosion in catchments using the USLE/RUSLE and Sediment Delivery Ratios.

The approach used by many authors to determine sediment delivered to channels involves modifying predictions of annual erosion within a catchment by a sediment delivery ratio (SDR). Although this approach is common, and despite the fact that the authors may have used a conceptually attractive method of predicting SDRs, the approach lacks scientific rigor. The problem lies in the fact that using SDRs in way will always result in sediment delivered to the channel from any given cell varying directly with erosion. This may not happen in reality.

Take, for example, a 1 ha cell whose lower boundary is a channel. Consider that this cell can produce 2 t/ha of erosion and the sediment transport capacity associated with that cell is 5 t – i.e. 5 t can pass across the lower boundary during some given period of time. Consider that the area upslope of the cell yields 20 t of sediment to the cell so that 15 t is deposited in the cell and, as a consequence, there is no erosion in that cell. The SDR for the system is $5/20 = 0.25$. Now consider that erosion in the upslope area is reduced by half. 10 t passes into the cell but still only 5 t exits and again there is no erosion in the cell. The SDR is now $5/10 = 0.5$. Now consider that the erosion in the upslope area is reduced so that 2 t enters the cell. No deposition occurs in the cell and so it can erode to add 2 t to the sediment delivered to the channel. The SDR is now $4/4 = 1.0$.



The values used here are arbitrary but illustrate that fact that SDR values depend on how erosion amounts vary and are not simply determined by topography, water yield and surface roughness. **The only time that the sediment delivered is directly related to erosion is when SDR = 1.0.**

The erosion and SDR approach to predicting sediment delivery to channels is a misuse of SDRs.

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