



A channel sediment budget for the ‘Kleine Noordwaard’ in the Biesbosch area, the Netherlands

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Many deltas in the world are subject to drowning and loss of land due to accelerated soil subsidence, sea level rise, and sediment starvation. Effective delta restoration requires a thorough understanding of the rates and mechanisms of delta aggradation and their controls. This study aims to quantify the rates and patterns of aggradation in the Kleine Noordwaard, a former polder area in the Biesbosch area in the south-west of the Netherlands, in which water and sediment have been reintroduced since 2009. A sediment budget was established using existing bathymetric data collected using a multibeam echosounder and LiDAR digital elevation models collected since the opening of the polder, supplemented with field observations of the location and height of cut banks carried out between July and December 2014. Consecutive measurements of channel bathymetry showed a positive sediment budget in the channels between March 2009 and March 2013. During this period 59533 m³ of sediment was retained in the channels in the Kleine Noordwaard, which corresponds to an average sedimentation rate of 16.8 mm/year in the channels and 3.4 mm/year over the entire area. Sedimentation and aggradation primarily took place in the channels in the central part of the former polder area, whereas the channels near the entrance and outlet of the area underwent considerable erosion. It is therefore likely that a part of the sediment deposited in the central part of the system was supplied internally by upstream erosion of the channels. The results from the field observations suggest that cut-bank retreat also significantly contributes to internal sediment redistribution.