**Importance of stream and buffer zone characteristics for bank erosion and phosphorus inputs to surface water**

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A recent Danish national upscaling exercise on the importance of different pathways for diffuse phosphorus losses to surface waters showed that bank erosion was one of the most important sources. As an outcome a research project was initiated with the aim of testing the hypothesis if stream banks and buffer strips were a major P source to surface waters. In the project (BUFFALO-P), bank erosion has been studied along thirty six 100 m reaches in the River Odense catchment during three years (2006/07, 2008/09 and 2008/09). Two replicate 100 m stream reaches covering different stream sizes (3 stream orders), channel planform (channelized versus naturally meandering), uncultivated buffer zone width (< 2m and > 10 m) and buffer zones with low (grass/herbs) and high vegetation (trees) were selected utilising a stratified random procedure in GIS. Each reach was instrumented with five 1 m x 1.6 m plots each consisting of three verticals lines of erosion pins deployed 5 cm, 10 cm, 20 cm, 40 cm, 80 and 160 cm above the stream bed. A total of 180 erosion plots were established in autumn 2006 having a total of *ca.* 3000 erosion pins deployed (60 cm long steel pins). The results show that neither stream size, nor stream planform or the width of uncultivated buffer zone had any significant ($p<0.05$) influence on the bank erosion measured as bank retreat (mm) during each of the three years studied. Vegetation type in the buffer strip showed to significantly influence bank erosion as buffer zones with natural trees lowered the annual bank retreat significantly as opposed to buffer zones with grass and herbs. Bank slope and vegetation cover on the banks was also significant factors influencing bank erosion. We conducted a GIS analysis of the different stream and buffer zone types in the 485 $km^2$ River Odense catchment that enabled us to perform a calculation of the gross sediment and phosphorus input from bank erosion during all three study years. Average annual gross bank erosion during the first wet winter of 2006/2007 amounted to 41.2 tonnes sediment $km^{-1}$ stream channel and 27 kg P $km^{-1}$ stream channel. The total gross erosion of sediment and phosphorus amounted to 15,800 tonnes sediment and 10,300 kg phosphorus (0.21 kg P $ha^{-1}$ catchment area) within the entire catchment. This equals 325 tons sediment $ha^{-1}$ and 0.19 kg P $ha^{-1}$ catchment area. Although part of the eroded sediment and phosphorus is stored within the channel or captured on natural or restored flooded riparian areas, bank erosion seems to be a significant source of total and particulate P in lowland streams.