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Erosion caused by surface land drains in upland peatlands and the impact of remediation strategies

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Drainage of peatlands has been a common (and detrimental) practice throughout the world. In the northern hemisphere open cut drains are common. These are often shaped in a herringbone fashion and are cut to connect to the stream network. The purpose is to lower the water table within the peatland. Land drains increase the drainage density and promote enhanced coupling of hillslope sediment sources with the stream. Many peat drains can rapidly incise and become major sources of fine organic sediment within the stream system. This can be a major problem as it removes particulate organic carbon, covers gravel bed spawning grounds for fish and infills reservoirs. Incision may continue into the underlying substrate and gullying may ensue. Other drains may naturally revegetate. This poster presents data based on i) a survey of the geomorphology of peat drains (erosion and deposition/revegetation within drains) related to variables such as slope, aspect, and drainage area; ii) measured comparison of sediment flux from open drains, intact peat slopes, drains that are revegetating and drains which have been blocked by peat dams and iii) measurement of flow velocities in drains related to scour and deposition. Natural infilling of drains was often found to occur on gentle slopes under 4^o. Drains on slopes below 2^o rarely erode, while drains on slopes over 4^o rarely infill. Erosion tends to rapidly become more severe as slope increases. Usually vertical incision is associated with the undercutting of ditch sides and block failure. The rate of erosion slows once the underlying substrate is reached but many drains with a large catchment area feeding into them can continue to erode into the substrate. Nick-point retreat at the confluence of drains is often observed. The intact drains are found to be major sources of organic sediment within the survey catchments with over 60 % of the sediment originating from the drains (which only drain 8 % of the area). However, blocked drains have approximately the same sediment production as undrained peat. Even poorly blocked drains with slumped peat

insufficient to raise the local water table have mean flow velocities two orders of magnitude lower than that in clear drains. They also have three orders of magnitude less sediment production than clear drains. Thus if land managers cannot afford to properly block drains to raise the peatland water table using artificial dams, then simply slumping some peat along the course of a drain will reduce the water velocity and disconnect the sediment source from the stream channel.