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Ecological Impact of Plantation Forestry on Blanket Bog on a Low Order Stream

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Blanket peat directly underlies between 11% and 13% of Ireland, with catchments containing more than 10% blanket bog coverage hosting the majority of Water Framework Directive High Status sites. Since 1998 approximately 40% of these sites have experienced a decline in status, with catchments having peat coverage greater than 40% experiencing disproportionate impacts. Declines in status have typically been accompanied by anthropogenic activities that have affected bog hydrology; these include planting / maturing of plantation forestry on deep peat (> 1 metre thick). Although our understanding of mechanisms driving aquatic ecosystem degradation in these areas immediately after planting and following felling has improved considerably in recent years, the impact of mature closed canopy forestry on runoff remains less well defined. Moreover, where research has been carried out, it has focused on sampling conditions during high (quick) flow, while base flow conditions have received less attention.

Comparison of runoff quality, in a stream draining a relatively intact blanket bog-covered catchment, with conditions further downstream, after it had flowed through a mature Sitka Spruce (*P.sitchensis*) plantation on deep peat, aimed to better characterise the impact of the forestry on the stream's ecology. The study area selected for investigation receives approximately 1600 mm/yr of precipitation, occurring throughout the year (259 days with >0.2mm precipitation). Pairwise comparisons of runoff quality between areas draining open bog land and afforested areas further downstream failed to detect significant differences during high flow events. By contrast samples collected under drier conditions proved significantly more mineralised downstream, with water containing significantly higher levels of Calcium and Magnesium at the afforested area sampling point. Similarly, visual observations in forest drains feeding the stream revealed the presence of tufa mounds, which had developed following planting, and zones of focused iron oxyhydroxide-bearing groundwater upwelling; these features proved absent upstream of the forestry.

Screening for biotic status at the outlets of blanket bog and forested catchments, using the Irish biological quality rating system (Q-scores), suggested that the upstream sampling point was indicative of Good status (Q4), whilst the findings at the downstream forested site were more indicative of High status (Q4-5). However, more detailed analysis of the species sampled suggested that although the sampling point in the forested area (downstream monitoring point) had higher biodiversity and as such allowed for the improvement in Q-score, it had slightly lower species density through lower counts of certain species. This is consistent with findings elsewhere which have highlighted the capacity of aqueous iron oxyhydroxides to detrimentally impact sensitive species, such as freshwater pearl mussel (*M. margaritifera*). Study results provide further evidence of the capacity of plantation forestry to impact on the aquatic ecology of low order streams, while further highlighting the need for alternative ecological metrics when investigating the impacts from human activity on lower order streams draining blanket bog.