ENVIRONMENTAL AND ECOLOGICAL ASPECTS OF PEAT CUTTING AND REMOVAL

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Summary

The most important environmental issue in the harvesting of peat is the runoff, released from harvesting areas. Drainage mainly causes changes in regional hydrology and quality of surface waters. The leaching of phosphorus and nitrogen causes eutrophication problems into the watercourses and decomposing organic matter consumes their oxygen reserves. The load of solid peat particles causes silting of downstream water bodies. Also dust emissions in particular in the production fields close to settled areas could have some environmental impacts. Main part of the dust emissions appears in pneumatic harvesting method in milled peat production.

1. Introduction

Mires affect the quality of runoff waters by holding elements and thereby reducing leaching potentials. By insulating surface waters from reaching mineral soils, peat layers reduce the leaching of weathering products, but increase the leaching of organic carbon and airborne elements not retained by peat. Drainage and utilization of mires always causes inevitable ecological changes. A common global problem is the state of the atmosphere and the changes that take place in it. On account of the peat harvesting and combustion the global warming has been the matter of the debate. Pristine peat lands are long-term sinks of atmospheric carbon due to an unbalanced ratio of primary production and decomposition. It has been estimated that only 2 to 16% of the yearly produced plant biomass accumulates in the form of peat. Consequently, a huge amount of carbon, at least 250 Gt (=10^{12}kg), is stored in global peat lands.

2. Impacts on Watercourses

In terms of environmental impacts, drainage changes the peat land from a hydro chemically accumulation area to an area releasing also chemical compounds. The leaching of phosphorus and nitrogen cause watercourses to become eutrophicated, and decomposing organic matter consumes their oxygen reserves. When eutrophication starts, the nutrients, accumulated in the bottom sediment of many lakes begin to redissolve in water due to oxygen depletion. This internal load slows down the recovery of eutrophicated lakes even if the external load can be attenuated. For example in Finland, where peat industry operates in a production area of about 50 000 to 60 000 ha annually, the nutrient load accounts for only 0.7 percent of the phosphorus and 0.9 percent of the nitrogen load of the country.

The typical, average annual phosphorus release from peat harvesting areas in northern boreal zone is 21 kg per 100 ha and that of inorganic nitrogen from 650 to 1000 kg per 100 ha. Compared with the more conventional modes of land use, phosphorus and nitrogen releases from a peat mining areas are about 20% and 80%, respectively of those from arable area of the same size. The preparation of peat harvesting areas increases the release of iron. Concentrations of dissolved iron compounds in the runoff are highest during dry periods. In oxygen- bearing peat layers the iron compounds precipitate. It has been noted that iron release declines after a peat harvesting area has been drained.

The concentrations of trace elements in peat vary depending on the type of peat, its decomposition degree, ash content, acidity and even on the type of subsoil. In relation to mineral soils, the metal contents of peat are low, although in recent years, the atmospheric deposition has increased also heavy metal contents of superficial peat.

A nuisance, typical of peat harvesting is the drifting of solids, that is, peat particles, into watercourses from ditches and harvesting fields. The load of solids causes silting of water bodies. In a well-planned and managed harvesting area, less than 0.5% of the average peat yield is washed out.

As harvesting fields are not protected by vegetation, a sudden heavy shower may also transport material from drying milled peat into ditches. Preventing of the outwash is done with ditch retainers, sedimentation, filtering, and soil infiltration or surface runoff. A properly working settling pond reduces the amount of solids washed out by 30–40%; moreover, improving the retention capacity enables over 80% of the solids in a harvesting field to be retained.

Using the same chemicals as those used to treat drinking water can treat dissolved nutrients. By this method the most distinct changes are the improvement in water clarification by 70–90% and the decline in concentrations of dissolved organic compounds by an average of 88%. The purification degree for nitrogen compounds has been 28%, for phosphorus compounds over 80% and for solids over 70%.The most common water protection measure used for nutrient retention is based on surface runoff. To be feasible, the method requires a rather flat (gradient not more than 1%) undrained area. The drainage waters will be guided to this area. Surface runoff as well as filtration of the drainage waters in mineral soils is natural purification systems.

Suspended solids in the run-off waters are the principal environmental impact of milled peat production. By using artificial floodplains, isolation ditches and shallow sedimentation ponds, covered with hygrophyte vegetation (eg. *Phragmites australis*, *Typha latifolia*, and *T. angustifolia)*, the load of fine-grained and slowly depositing material can substantially be reduced.

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Bibliography

Nyrönen T. (1996.) Peat production. *Global Peat Resources* (ed. E. Lappalainen), pp 315– 318. Jyskä, Finland: International Peat Society.

Selin P. (1996). Releases to watercourses from peat harvesting and their control. In *Peatlands in Finland* (ed. H. Vasander), pp 150–154. Helsinki: Finnish Peat Land Society.

Selin P. (1996). Many uses for peatland cutaway areas. In *Peatlands in Finland* (ed. H. Vasander), pp 150–154. Helsinki: Finnish Peatland Society. pp 128–129.

Biographical Sketch

State geologist **Dr. Eino Lappalainen** was born on 9 November 1939. He graduated in geology and paleontology in 1965 at the university of Helsinki, PhD in 1970 at the university of Turku. He was appointed Guest Professor of the Changchun Institute of Geography, Chinese Academy of Sciences, in 1996.

From 1962-1997 Eino Lappalainen worked at the Geological Survey of Finland. For over 20 years he was in charge of peat geological surveys. His research was directed towards the survey, genesis, classification and utilization of peat resources. He has published about 150 scientific papers as well as investigations on the use of peat and peat lands, published in Finnish as well as in international bulletins and journals. His latest accomplishment is the book *Global Peat Resources*, released by the International Peat Society in 1996. Additionally, the author has been actively involved in national and international cooperation projects and act as member and chairman in numerous scientific and technical societies and committees. He has also worked as a consultant in Sweden, Brazil, China, USA, Canada, Sri Lanka, Indonesia, Estonia, and the former Soviet Union.