Geophysical Research Abstracts
Vol. 16, EGU2014-2583, 2014
EGU General Assembly 2014

Processes responding to restoration in forestry-drained peatlands

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Almost one third, nearly 100 000 km2, of the total land area is covered by peatlands in Finland, which is a higher relative cover than in any other country in the world. Over a half of the peatland area has been drained for forestry, and many invaluable wetland habitat types are severely degraded. Restoration of forestry-drained peatlands is a relatively new measure, and long term results are still relatively scarce. Reinstating the ecological function with its feedback cycles can be a slow and gradual process. Nevertheless, since forestry-drained peatlands are not destroyed habitats in terms of their ecosystem functions, they can be expected to be reinstated through the returning of the crucial element, the high water-table level and its natural variability. To evaluate the development of peatland function and structure after restoration, indicators which respond at different speed to restoration are therefore useful.

Vegetation indicators are commonly assessed to indicate restoration progress, but they can be slow to respond. Changes in the mineralization and decomposition rates may indicate sooner, if processes typical for undrained peatlands are initiating after restoration. However, despite the increasing amount of information on the vegetation structure after restoring forestry-drained peatlands, there is no sufficient information on the ecological processes, which may be reasons behind the existing difference between restored and pristine peatlands. Information on the ecological processes and the speed of their recovery helps to evaluate whether the restored peatlands have turned their development towards natural situation, despite that the structure does not yet show sufficient recovery.

We studied how restoration affects the hydrology, peat forming processes, and vegetation in boreal fen type of peatlands. Fens drained for forestry 30 – 40 year earlier were restored in northern Finland in 2007 by harvesting trees and by damming and filling ditches. After restoration, the raise of water level was immediate. Mineralization and decomposition rates, which were initially higher in forestry-drained fens, had usually slowed down to the level of undrained fens two years after restoration in 2009. Little changes occurred in the vegetation in two years. Five years after restoration in 2012, moss species typical for hollows were found in the filled ditches of restored fens, which indicates restoration-driven plant succession. The results show a sequence of changes in ecological processes after restoration, whereby hydrology recovers first, mineralization and decomposition rates thereafter, and the plant succession is the last process to change.