

HYDROLOGICAL IMPACTS

Drainage

Problem

Drainage of agricultural land using surface ditches or sub-surface tile drains modifies hydrological flow paths and flow rates

Impact

Concentration of flow via agricultural drainage may lead to accelerated runoff rates. This in turn may cause an increased risk of flooding.

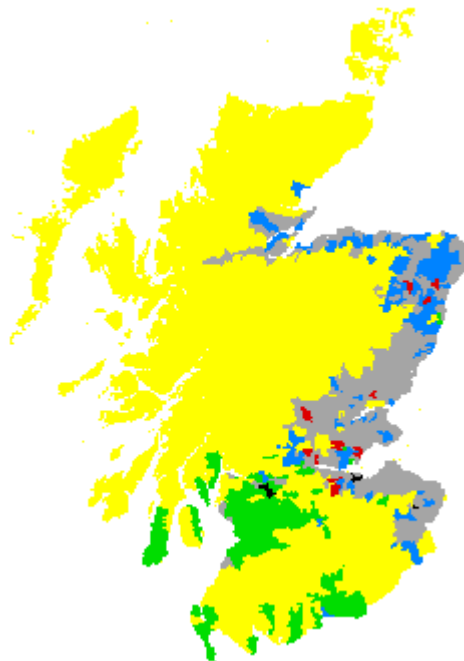
Conversely, a general lowering of the water-table can increase soil infiltration capacity which will tend to reduce the frequency of storm runoff. Occasionally, reductions in peak flows have been observed following drainage activities.

Changes to the hydrological flow paths have a secondary impact on water quality through changes in the transport of nutrients such as N and P.

Areas at Risk

Some 50% of productive agricultural land in Scotland is estimated to be covered by networks of artificial drainage (Green, 1979). In particular, areas where there are gleyed soils have been under-drained to improve the land for agriculture. All systems that have been drained will have a modified hydrological regime compared with a natural system. However, there may be environmental benefits as well as negative impacts of drainage, making it hard to generalise about where systems are particularly at risk.

Systems that are in close proximity to the natural stream network are more likely to cause a direct impact on runoff rates.



Distribution of Main Farm Types

Farm Type	Areas at Risk		
	Localised	Regional	Universal
General Cropping			Drainage
Mixed			Drainage
Dairy			Drainage
Pigs and Poultry			
Cattle and Sheep	Drainage		

Practical Actions

The negative environmental impacts of agricultural drainage can be minimised through appropriate design of the systems, including measures such as:

- removing the direct linkage between drainage systems and streams to provide buffer zones / flood plains
- use of transverse collector drains to slow the flow of water from down-slope drainage networks
- the use of controlled drainage where the height of a riser in the drain outlet can be varied to modify the degree of drainage, in response to hydrological conditions



Research Gaps

Further study into the changes in runoff patterns caused by agricultural drainage under different physical conditions.

Research into the relationship between nutrient export and agricultural drainage.

Studies into the effectiveness of controlled drainage technology

Contact Dr S Dunn, Macaulay Institute, Craigiebuckler, Aberdeen, AB15 8QH.