

# H<sub>2</sub>O: HEURISTICS FOR HYDROLOGIC OBSERVATION AT THE LUNAN WATER

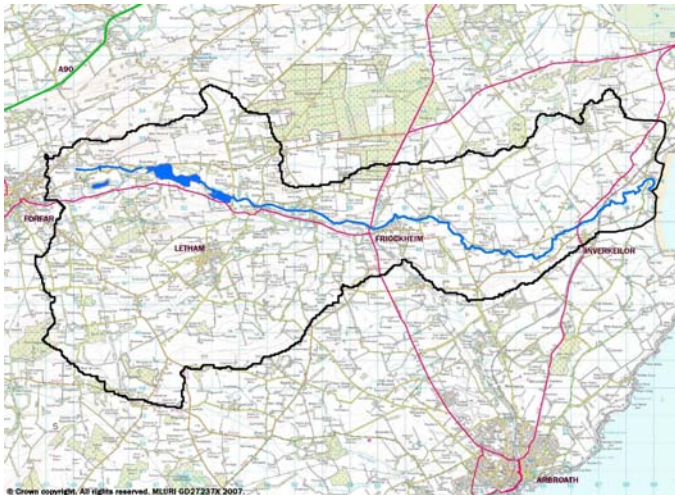
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## HEURISTICS

A "heuristic" can be "a replicable method or approach for directing one's attention in learning, discovery, or problem-solving"; it may also mean a "rule of thumb" or "'fag-packet' calculation". The question is can Heuristics be used as a tool for knowledge exchange.

## EUTROPHICATION AND SOURCE APPORTIONMENT

Eutrophication of inland and coastal waters caused by excessive inputs of nutrients from point and diffuse sources a serious problem in Scotland. Phosphorus (P) causes eutrophication in lochs and nitrogen (N) causes eutrophication of coastal waters. Eutrophication is partly a legacy issue. More P is coming out of some Scottish lochs than is going in and N in groundwater may be a result of historical patterns of land management. Understanding the relative contributions of current and historical farm and off-farm sources to surface water eutrophication is needed for a sustainable Scotland.



## THE LUNAN WATER CATCHMENT

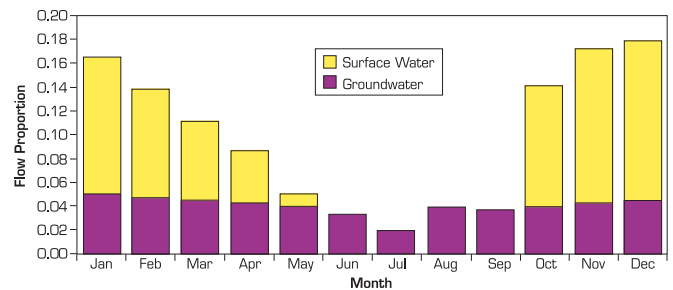
The Lunan Water is a small (~140 km<sup>2</sup>), predominantly agricultural, priority monitored catchment in Eastern Scotland. It is within a NVZ and is the site of a SAC Environmental Focus Farm. Lochs in the upper parts of the catchment are subject to periodic algal blooms. There are ~800 septic systems and 5 sewage treatment works (STW) in the catchment.

## CONCLUSIONS

- Heuristics can be used as a tool for knowledge exchange.
- There are large uncertainties in the Lunan Water nutrient budget.
- Much of the P entering surface waters in the Lunan Water may originate from septic systems.
- Alternate loch management strategies are needed to reduce P release from the sediment.
- More information is needed about groundwater chemistry and hydrology in the catchment.
- The high cost of nitrogen being lost from the land to the marine environment is worthy of further attention.

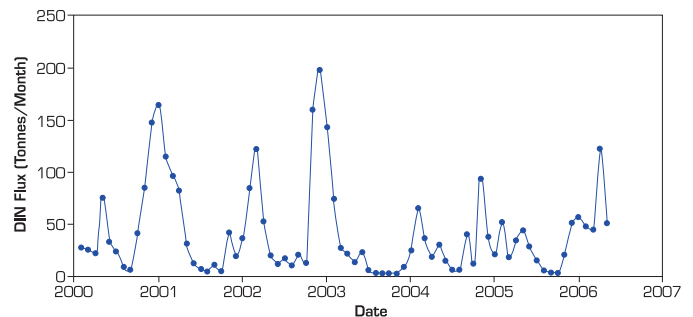
## FLOW

Close to 50% of the flow in the Lunan Water is derived from groundwater. This has important ramifications for the residence time of pollutants in the catchment.



## NITROGEN

Close to 500 tonnes N/yr is exported from the Lunan Water to the sea, the majority as NO<sub>3</sub>. Putting this into perspective, inorganic N fertilizer currently costs ~ £270 tonne in the UK and is 34.5%N by weight. This means almost £400,000 worth of N is lost from the Lunan Water catchment every year.



## PHOSPHORUS

Every year, ~2500 kg P is exported from the Lunan Water to the sea. This P comes from septic systems (10-40%), STW's (?), loch sediments (15%), birds and fish (?) and agriculture (45-75%). Any successful strategy for P abatement must address both agricultural and non-agricultural sources.

