

# UNDERSTANDING CHANGE IN UPLAND ECOSYSTEMS: MONITORING IN THE ALLT A'MHARCAIDH CATCHMENT

Environmental monitoring in a relatively undisturbed water catchment allows us to map where nutrients and pollutants come from, and how they then move through the upland environment.

By integrating experimental data from other projects, this information is used to predict the progress of these nutrients in response to possible future scenarios of pollution and climate change.



*Field work in the midst of winter*

## STUDY SYSTEM

The Allt a'Mharcaidh is a tributary of the River Spey and is located in the western Cairngorms. There is a wealth of background data available for the catchment, with records beginning in 1988.

In 2004, a new study was established in a sub-catchment of the Mharcaidh to investigate nutrient dynamics between soil, vegetation communities and a stream spanning an altitudinal gradient from 500m to 900m.

Soil water samplers, moisture and temperature sensors have been installed within the organic and mineral layers of the soil, and atmospheric samplers collect rain and cloud water.



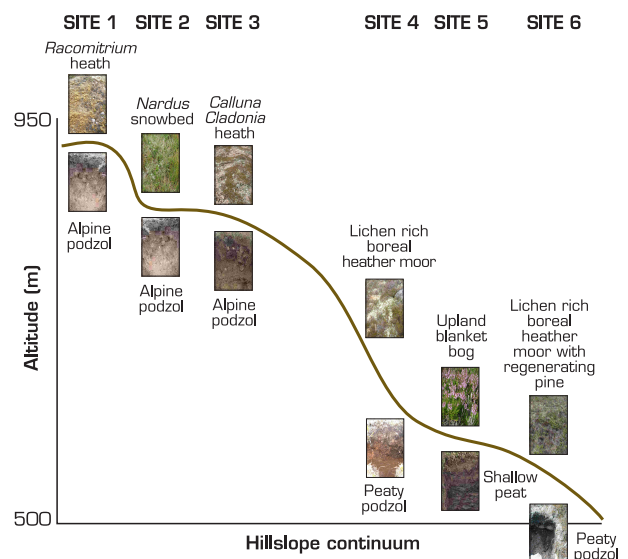
## MEASUREMENTS

- Stream water, soil solution, snow, rain and cloud water samples are collected throughout the year
- Soil temperature and moisture content is continuously recorded
- Full chemical analyses of water samples are carried out
- Regular vegetation surveys are carried out
- Root growth is filmed during the growing season

## FINDINGS TO DATE

Results indicate significant differences between the concentration and form of nitrogen at different altitudes, and between the organic and mineral horizons, with implications for the ecology of upland habitats and streams.

- Most nitrogen is retained by the vegetation and soil.
- Any nitrogen entering the stream quickly returns to the atmosphere and stream concentrations are generally low in summer.
- Pulses of nitrogen are observed in the stream during winter storm and snow melt events.
- In future we plan to upscale our observations to predict nutrient cycling for the whole catchment.



*Idealised cross-section of the Mharcaidh hillslope showing how the vegetation and soils change with altitude*