

CENTRE FOR ECOLOGY & HYDROLOGY
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**DEFRA Terrestrial Umbrella
Annual Report
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EXECUTIVE SUMMARY

This report details activities and progress in Year 1 of the Terrestrial Umbrella: Eutrophication and Acidification of Terrestrial Ecosystems. The Work Plan is structured into two work packages and eight tasks. Progress towards each task is provided in sections supplied by the individual groups. A summary of the progress within each workpackage is presented below:

Work package 1: Critical loads and Dynamic Modelling

Task 1: Support of the UK Critical Loads Programme

A revision of empirical critical load values is in progress. A meeting for October has been planned to enable discussion of new proposed values by key researchers in the field. Revision of empirical mass balance parameters is also in progress. Milestones have been met.

Task 2: Evaluation and development of dynamic models

A review of available dynamic models has been carried out and a subset of models identified which will be of use for specific purposes. Meetings with modellers from the Netherlands and the USA have occurred and have significantly enhanced our understanding of assumptions and capabilities of the models they have developed. Meetings with researchers from manipulation sites are in progress to identify data gaps. Species probability distributions are under development and data is looking promising. Milestones have been met.

Task 3: Provision of data sets for the testing and application of models

Provision of input data for the testing has been evaluated for all the Forest Health Monitoring Sites. Assessment of data gaps at the manipulation sites is in progress and collection of required data is due to start September. This task is behind schedule in initiating data collection but this is now in progress.

Task 4 Application of dynamic models at the regional scale

Two meetings of the Dynamic Modelling Steering Committee have been held. Most activities within this task are due to start in Year 2. Milestones have been met.

Workpackage 2: Impacts, recovery and controlling processes

Task 5: Long term impacts of enhanced and reduced nitrogen deposition

Manipulation experiments have continued. In some cases this has involved cessation of nitrogen treatments to monitor the dynamics of recovery. Initial results suggest that soil processes are not quickly reversible. A wide range of results are reported from across the manipulation sites and some highlights include; nitrogen-induced reductions of carbon allocation below-ground; a potential role for bryophytes in determining the success of grass invasion; the key role of soil in controlling retention rates of incoming nitrogen; the potential positive effects of nitrogen in reducing bare ground in heathlands following management and thus a reduced risk of invasion by other species. Milestones have mostly been met.

Task 6: Processes controlling uptake and storage of N and the effects of N on upland vegetation

Differential species responses to N additions have been quantified. An assessment of the use of amino acids as an indicator of impacts has been evaluated and rejected. Milestones have been met

Task 7: Assessment of the long term effects of enhanced and reduced S and N deposition on UK forest ecosystems

Treatment modification to include a recovery element to the experiment has been successfully completed. Monitoring has continued and has identified a fast response by soil solution and foliar chemistry. Other biological indicators have not been so fast to respond (e.g. ectomycorrhizal fruiting bodies). Milestones have been met.

Task 8: Characterisation and quantification of key processes controlling the response of soil-plant systems to enhanced N deposition and the leaching of nitrate to surface waters.

An initial survey of stream sampling within two catchments with variable nitrate leaching has been completed. The importance of both biological and physico-chemical processes in controlling ammonium leaching has been identified. A ^{15}N isotope method for identifying the internal rates of soil nitrogen transformations by soil microbes has been successfully tested at a nitrogen addition manipulation site. Results indicate nitrate immobilisation may be suppressed by elevated ammonium availability. Milestones have been met.

Annual meeting:

An annual meeting of all members of the consortium was organised for the 3-4th July 2002. It was attended by over 30 researchers and was a valuable forum for discussion and an exchange of ideas. This was followed by the second meeting of the Dynamic Modelling Steering Committee which was attended by a much wider group than the first meeting including representatives from DTI.

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