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Indicators of Air Pollution Effects in Ecosystems for Monitoring under the EU National Emission Reduction Commitments Directive

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What did this research aim to address?

The NEC Indicators project aimed to review those indicators used to detect effects of air pollution in sensitive ecosystems such as bogs and semi-natural grasslands. Air pollutants of concern for sensitive ecosystems are ammonia, the main source of which is agriculture, and ozone, which is formed following chemical reactions with other air pollutants, including emissions from industrial and transport activities. The priority effects considered were change in characteristic plant communities with nitrogen inputs, and the risk of direct harm to vegetation from ozone exposure.

What did this research find?

The research found that ozone concentrations are highest near the Atlantic coast of Ireland, and decrease inland, due to deposition onto foliage. They further decrease in urban areas, through reaction with nitrogen dioxide from traffic. Ozone concentrations were assessed using metrics based on concentration and on plant susceptibility through opening of leaf stomatal pores. With open pores, typical of high humidity levels in Ireland, ozone has more access to sensitive leaf cells and can do damage.

Plant communities were studied through an extensive survey of plots. Community change responses to nitrogen deposition level were assessed, using the Threshold Indicator Taxa Analysis (TITAN) method, which identifies the N input where most plant species change abundance, either decreasing or increasing with N input. Overall, the indications are that the plant community changes even at quite low N inputs.

How can the research findings be used?

Findings from this research can be used to review and, where appropriate, modify monitoring methods that are being implemented in the National Ecosystems Monitoring Network. Recommendations include analysing foliar nutrient ratios; matching ammonia monitoring with ozone samplers; developing a soil solid survey compatible with the forthcoming EU Soil Monitoring Law; initiating soil pore water monitoring; and developing data-checking structures within a new data platform, while also having regard to the National Emission reduction Commitments Directive requirement that monitoring is representative, cost-effective and risk based. Further development of structures and communication within the monitoring community is encouraged.

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