

## **Ecological vulnerability analysis as new conceptual technique in risk assessment**

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### **SUMMARY**

Ecological risk assessment of environmental stressors is still in need of methods to predict effects at the ecosystem level. Current methods are largely based on toxicity threshold testing in a limited set of test species. Particularly for wildlife, toxicity data are scarce, and extrapolation from laboratory testing has limitations. Since species do not only differ in toxicological sensitivity, but also in ecological traits that determine their exposure to a contaminant and recovery after an effect, the concept of 'ecological vulnerability' may be more useful in ecological risk assessment. This approach was followed in the development of the ecological vulnerability analysis, where data on 19 ecological traits for 144 individual wildlife species were used to estimate the ecological vulnerability to six different types of soil contaminants.

Results showed that ecological vulnerability to essential metals copper and zinc was correlated with soil and sediment habitat preference. Vulnerability to bioaccumulating substances cadmium and DDT was correlated with higher positioning in the food web and with lifespan. Vulnerability to chlorpyrifos and ivermectin was determined by preference for soil habitats. Species vulnerability scores were then grouped into food chains or habitats, and statistically analyzed. This showed that the earthworm food chain was the most vulnerable. Mammals were generally more vulnerable than birds because of lower population resilience. Vulnerability in species at lower trophic levels differed between habitats, whereas vulnerability in higher trophic species was less dependent on habitats.

Our research shows that ecological traits of wildlife species can be used to estimate vulnerability of species, and this can be extrapolated to food chains and habitats. Results are ecologically meaningful, as actual wildlife species are involved, not laboratory fauna. In our opinion, it is a useful and ecologically relevant addition to existing approaches in ecological risk assessment.