



A brief review of hydrogen isotope applications in ecology: the promise and pitfalls.

Leonard I. Wassenaar (1) and David Soto (2)

(1) University of Saskatchewan, Saskatoon, Canada (len.wassenaar@usask.ca), (2) KU Leuven, Leuven, Belgium (david.soto@kuleuven.be)

The application of H stable isotopes (d_2H) in terrestrial ecology has risen dramatically over the past decade, particularly in the area of wildlife migration, but also in forensics, food authenticity and trade. The close relationship of H isotopes in ecological substrates (all natural organic matter) to predictable spatio-temporal patterns in Earth's hydrosphere opened new and powerful avenues to study, for example, migration and movement, disease vectors, species recruitment, and trade, which have generated relevant data for conservation efforts. However, despite the great promise and potential, the past decade of research uncovered serious and unforeseen pitfalls in H isotope measurements and interpretations that required additional precautions. The analytical pitfalls include dealing effectively with the problems of exchangeable-H, residual moisture, lack of primary reference materials, and the interpretational challenges associated with the sampling and incorporation of uncertainties in geostatistical methods for obtaining accurate predictions and models of provenance. These H isotope challenges are being overcome through active research and development. In parallel to the technological and software advances that led terrestrial ecologists to some spectacular outcomes, new H isotope research is showing the power of H isotopes to better track fish provenance and unravel nutrient transfer and fluxes in aquatic ecosystems that cannot be obtained from other isotopic tracers.