How hydrological descriptors from SWAT model may help to understand recent shifts in the distribution of the semi-aquatic mammal species Galemys pyrenaicus?

CHARBONNEL A.1,2,3, LAFFAILLE P.2,4, BIFFI M.2,3, BLANC F.1, MAIRE A.2,3, NÉMOZ M.1, SÁNCHEZ-PÉREZ J.-M.2,4, SAUVAGE S.2,4*, BUISSON L.2,3

Context and objectives

The Pyrenean Desman (Galemys pyrenaicus) is an endangered small semi-aquatic mammal restricted to the Iberian Peninsula. The aim of this study is to understand the influence of recent hydrological and climate change on the distribution shifts of the Pyrenean desman in the French Pyrenees.

Study area and data

Historical (1985-1992) and current (2011-2013) distribution of the Pyrenean Desman

Modelling stream flow

Input data
- Land use (25 km resolution, Corine Land Cover)
- Soil (1 km resolution, Food and Agriculture Organization)
- Topography (25 m resolution, French National Geographic Institute)
- Climate (SARRAN, 8 km resolution, Meteo France)

Results: flow simulations

Results: calibration and validation

Mean evaluation statistics for the validation period

Current period (2002-2011)

- Rho = 0.83 (± 0.18)
- R² = 0.67 (± 0.24)
- NSE = 0.36 (± 0.56)

Results: Pyrenean Desman distribution and flow influence

Species distribution modelling

Conclusions

- Substantial hydrological changes have occurred in the French Pyrenees over the last 25 years
- Hydrology strongly influences the distribution of the Pyrenean Desman
- Climatic and hydrological changes alone are not sufficient to explain the strong range contraction of the Pyrenean desman

Influence of environmental variables on the distribution of the Pyrenean Desman