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# FLORA SPECIES AS A SURROGATE TO UNDERSTAND DITCHES HYDROLOGY

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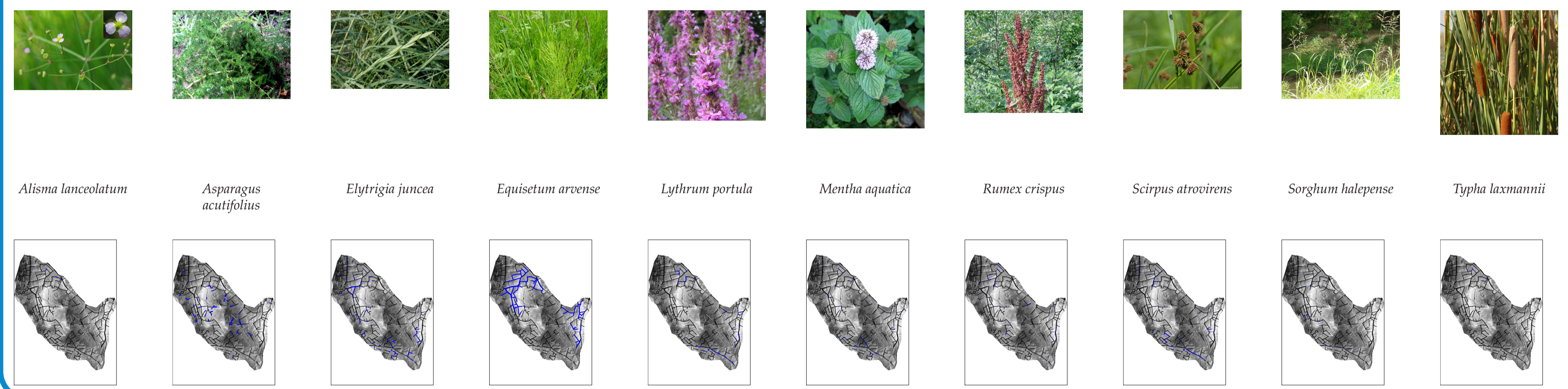
## PROBLEM

Hydrological functioning of watersheds is assessed using process-based approaches. These approaches necessitate a large sampling effort for parameterization, this effort increasing with the scale considered. Therefore, it is necessary to find sampling methods that are adapted to landscape scale where the ecosystem services occur. We presented here how the sampling of flora species can help hydrologists to parameterize their models, by addressing two questions :

1. Is the spatial distribution of flora species related to geomorphology ?
2. Is it possible to infer parameters for hydrological models on the basis of flora species distribution ?

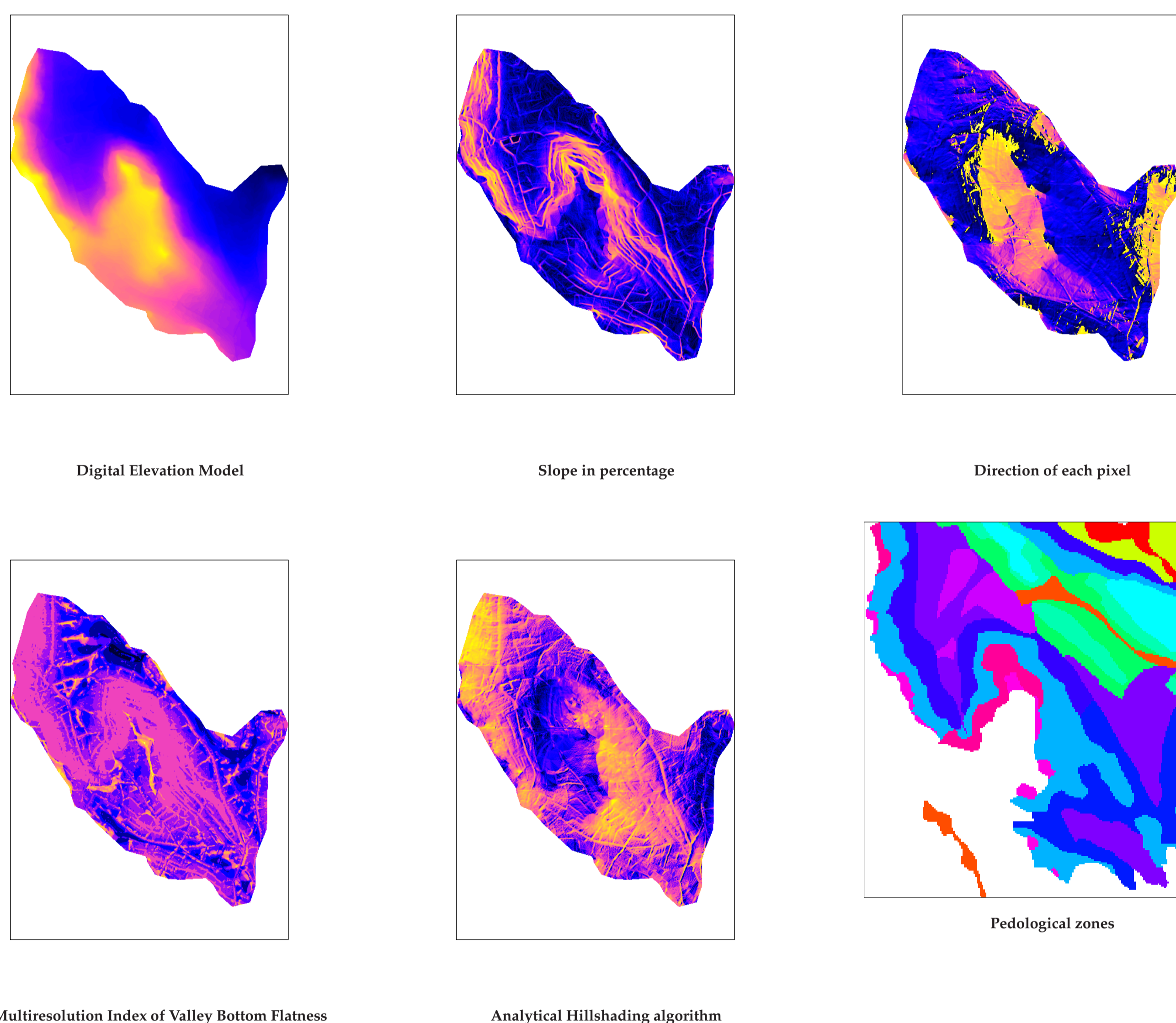
## SAMPLING PROTOCOL

The experimentation has been conducted in august 2012, on twelve species, selected for their visual facilities. An exhaustive sampling of the occurrence of each species along the ditch network have been assessed for a large watershed.



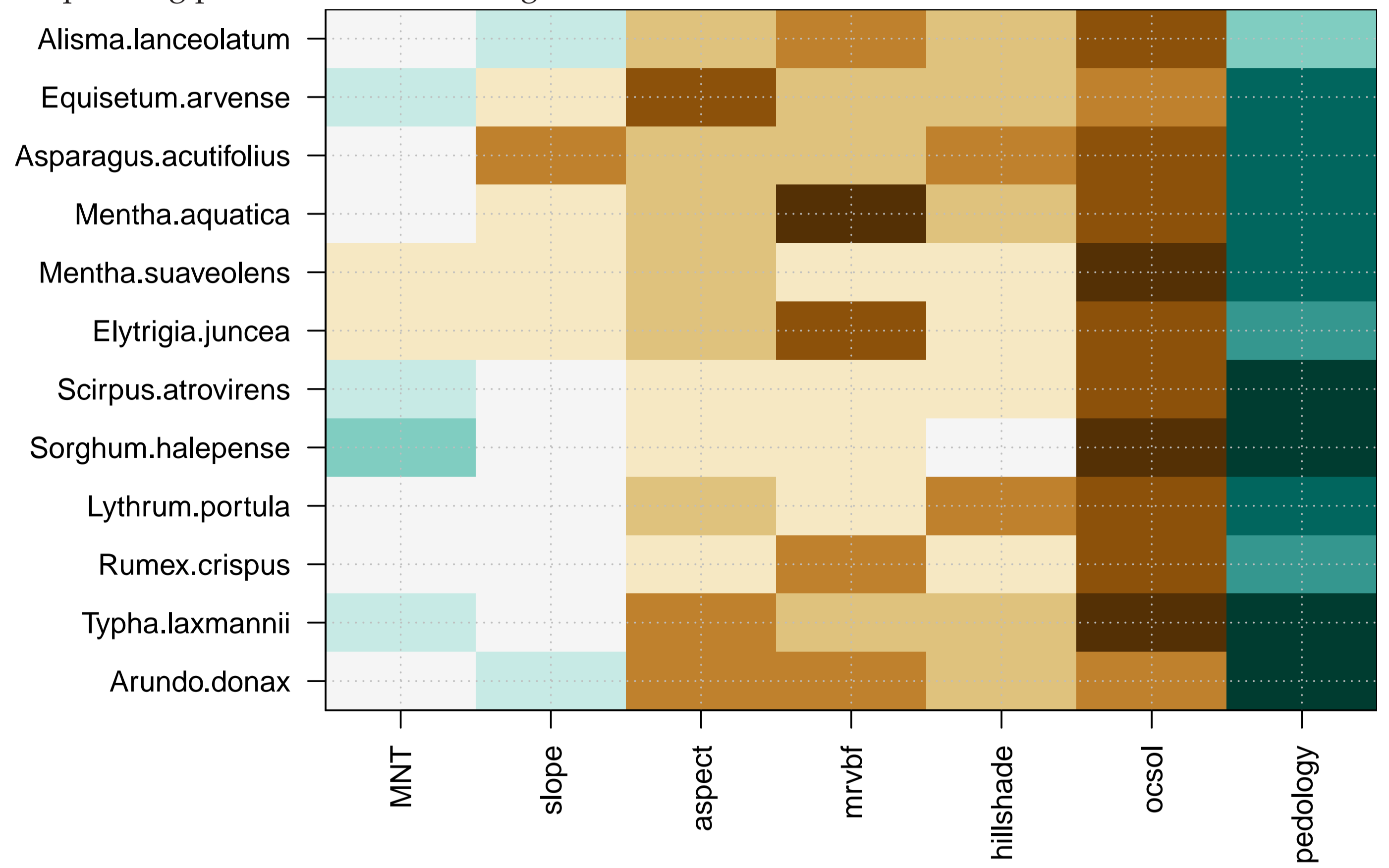
## GEOMORPHOLOGICAL AND PEDOLOGICAL VARIABLES

Geomorphological variables have been calculated on the basis of a Digital Elevation Model at a 5-meters resolution. Pedological zones are issued from an exhaustive survey of the zone.



We applied a Random Forest Model on each of the given collected species. The variable to explain is the occurrence of each species on a 5m x 5m grid raster. The explaining variables are the environmental variables described above.

For each species, we selected the value of the coefficient for each explaining variable only if the corresponding p-value of the test is significative,



The most influential variables are the pedological zones and the land uses around the ditches. Some variables, such as the MRVBF (Multiresolution Index of Valley Bottom Flatness) help differentiate species.

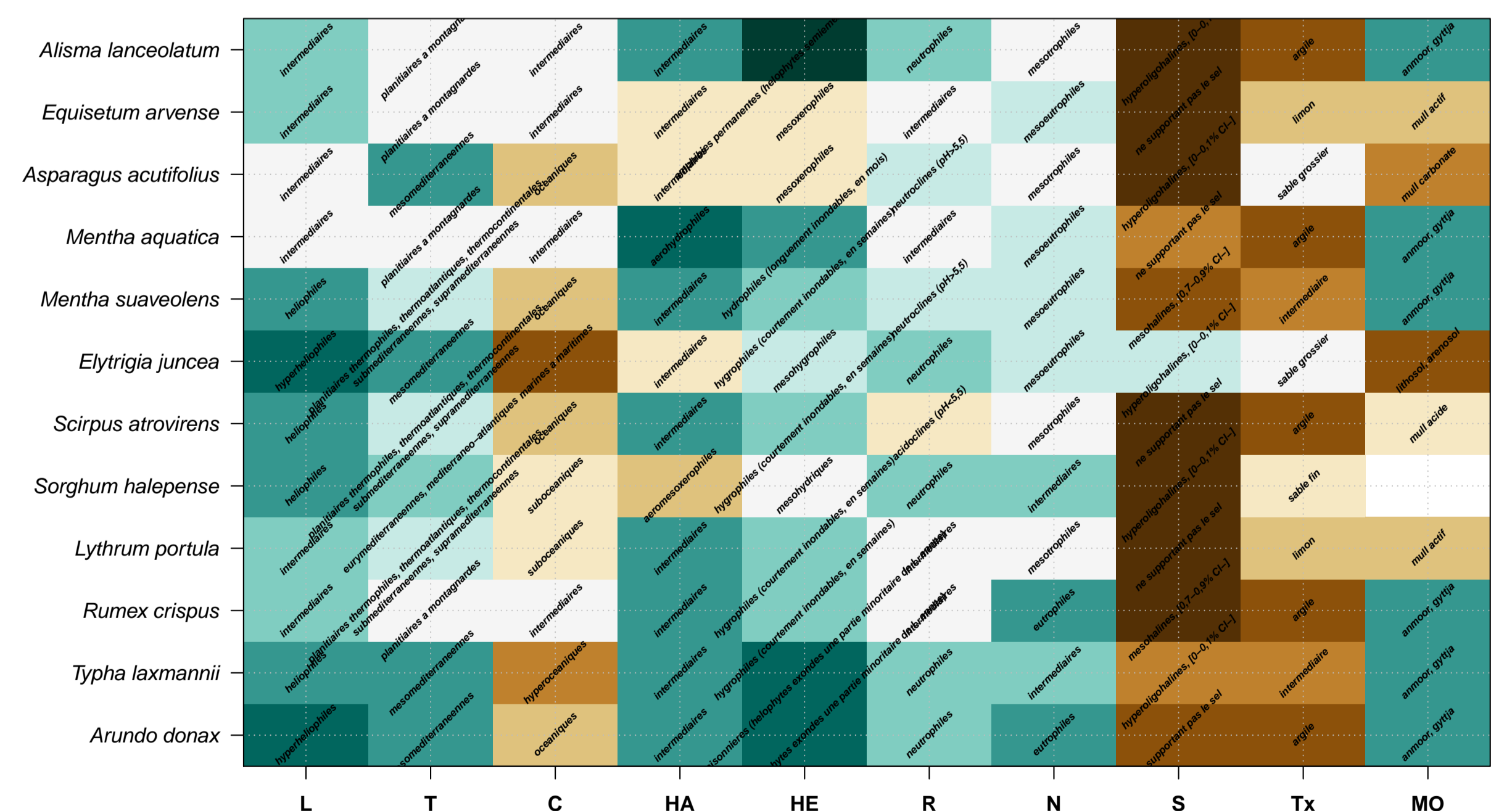
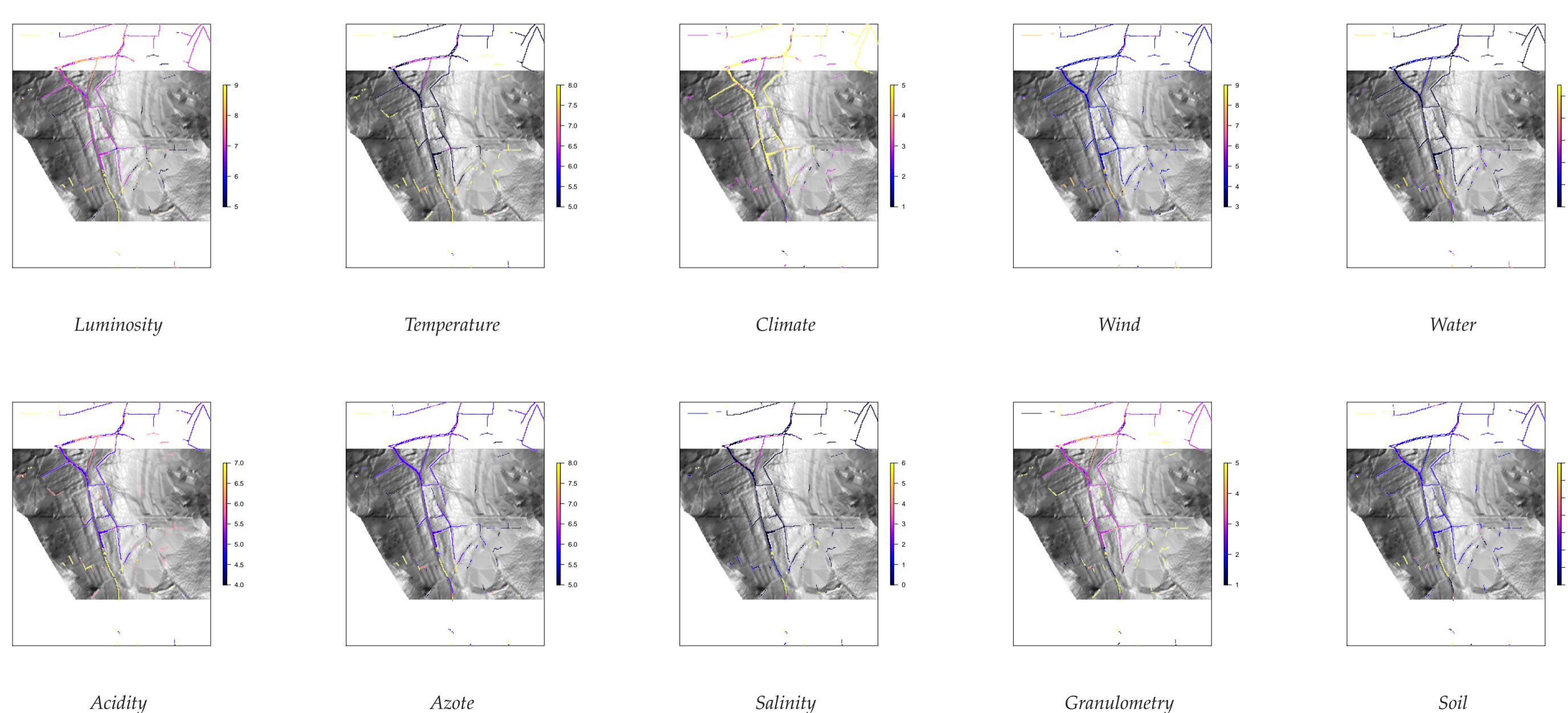
## ECOLOGICAL NICHES

The fundamental niche is an n-dimensional hypervolume, where the dimensions are environmental conditions and the resources that define the requirements of an individual or a species to practise "its" way of life. We make the hypothesis here that the realized niche, i.e. the occurrence of species on the ditch network is the same as the fundamental niche.

The ecological preferences of each species in terms of:

- L Luminosity
- T Temperature
- C Climate
- HA Wind
- HE Water
- R Acidity
- N Azote
- S Salinity
- Tx Granulometry
- MO Soil

is illustrated by:



We observed a spatial variability of the environmental conditions along the ditches. This variability needs to be studied in comparison with observation data to confirm that the niche hypothesis is validated for these species.

## FUTURE PROSPECTS

Future prospects of the study would be:

1. automatised of the sampling protocol of flora species using a mobile smartphone coupled to a GPS
2. measuring the local environmental conditions using a moisture and a solar sensor
3. modelling the dispersal of hydrochorous species and compare their occurrence probabilities using with the observed data