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ResNatSeed: A tool for the assessment of the REStoration potential of NATive SEEDs based on topographic factors in Piedmont Region, Italy.

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Introduction: Native seeds are increasingly recognized as the best material for Restoration Ecology. However, it is challenging to understand the level of suitability of a mixture harvested from a donor grassland for a certain restoration site. The methods of assessment usually used are expert-based and focus on the similarity between the climatic and topographic factors of the two sites. Moreover, the vegetation survey of the donor site provides a useful overview of the expected seed mixture composition. The aim of the work was the development of a tool in R environment (R Core Team, 2019) to assess the potential suitability of a seed mixture to the receiving site, starting from some easily measurable topographic factors: elevation, slope and aspect.

Materials and methods: An algorithm was developed to model with Generalized Additive Models (GAM) the potential maximum abundance for each species of the donor site. The complete algorithm workflow is reported in Figure 1. The modelling process uses a database with 3839 surveys performed to classify the alpine pastures of the Piedmont Region (Cavallero et al., 2007), containing a complete list of species, their abundance and the values of elevation, slope and southness. The three topographic variables were divided into classes and for each species and class the survey with the maximum abundance of that species was selected. This allows to assess the potential maximum abundance that the species can reach for that specific class. All the selected surveys were merged excluding duplicates from the three topographic factors. The obtained dataset is used to predict the maximum abundance and the expected abundance for each species at the restoration site.

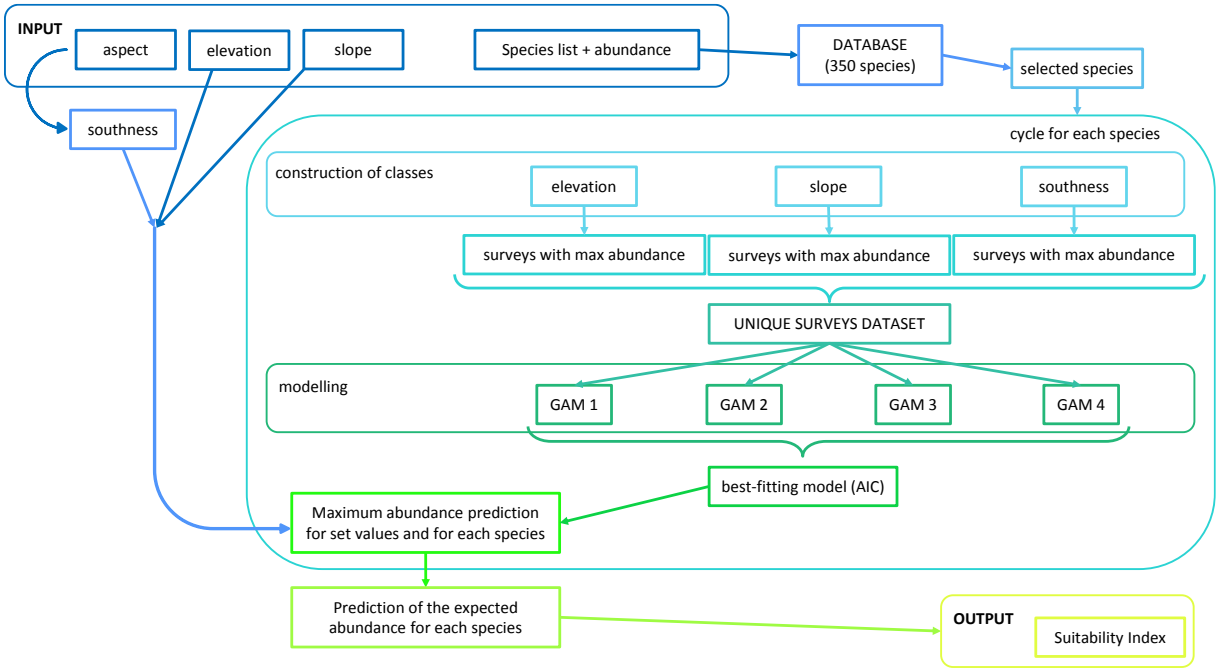

Figure 1. Workflow of the algorithm.

Results: The input of the seed mixture composition (or that of the donor site) and of the topographic factors of the restoration site, allow to calculate the Suitability Index, dividing the predicted expected abundance by the abundance in the mixture. The index ranges from 0, not suitable, to 1, perfectly suitable.

Conclusion: This method can be applied to every geographic area where a large number of surveys is available for a reliable modelling. The system uses the software R, but can be implemented on easier to use interfaces to allow also non-experts of the software R to use the algorithm for restoration purposes. This method is based on existing vegetation data, and its reliability still needs to be validated in the field.

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