Distribution and habitat suitability maps of revised EUNIS grassland types

Habitat suitability modelling

For the habitat suitability modelling, the widely used software Maxent for maximum entropy modelling of species’ geographic distributions was used. Maxent is a general-purpose machine-learning method with a simple and precise mathematical formulation, and has a number of aspects that make it well-suited for species distribution modelling when only presence (occurrence) data but not absence data are available (Philips et al. 2006). Because EUNIS habitats have a particular species composition, they are assumed to respond to specific ecological requirements, allowing us to generate correlative estimates of geographic distributions. Modelling habitats that have been floristically defined is a well-known procedure for ecological modelling at local scales, and a promising technique to be applied also at the continental level.

The Maxent method considers presence data (known observations of a given entity) and the so-called background data. Background data comprise a set of points used to describe the environmental variation of the study area according to the available environmental layers. It is assumed that these layers represent well the most important ecological gradients on a European scale. These layers were selected from meaningful environmental predictors commonly used for modelling non-tropical plant and vegetation diversity, and are not mutually strongly correlated.

As environmental predictors (and their sources) the following climate and soil layers have been used:

- Potential Evapotranspiration
  http://www.cgd.ucar.edu/cas/catalog/datasets/global-aridity-and-pet-database
- Solar radiation
  http://www.worldclim.org/bioclim
- Temperature Seasonality (standard deviation *100)
  http://www.worldclim.org/bioclim
- Mean Temperature of Wettest Quarter
  http://www.worldclim.org/bioclim
- Annual Precipitation
  http://www.worldclim.org/bioclim
- Precipitation Seasonality (Coefficient of Variation)
  http://www.worldclim.org/bioclim
- Precipitation of Warmest Quarter
  http://www.worldclim.org/bioclim
• Distance to water (rivers, lakes, sea) derived from the shapefile 'Inland_Waters.shp'

• Bulk density of the soil (kg/m³) Hengl et al. 2014

• Cation Exchange Capacity of the soil Hengl et al. 2014

• Weight in % of clay particles (<0.0002 mm) Hengl et al. 2014

• Volume % of coarse fragments (> 2 mm) Hengl et al. 2014

• Weight in % of silt particles (0.0002 - 0.05 mm) Hengl et al. 2014

• Weight in % of sand particles (0.05 - 2 mm) Hengl et al. 2014

Compared with the habitat suitability models set up for the EUNIS forest types (Schaminée et al. 2014) we now applied 8 recently published soil parameters (Hengl et al. 2014), instead of only one (soil pH). The same set has also been applied for the heath, scrub and tundra habitat types.

Maxent is expected to perform well for estimating the geographic distribution of EUNIS habitats in Europe. However, as with any other modelling techniques this method is sensitive to sampling bias, i.e. when the spatial distribution of presence data is reflecting an unequal sampling effort in different geographic regions. In Maxent, it has been proposed that the best way to account for sampling bias (when bias is known or expected to occur) is to generate background data reflecting the same bias of the presence data. When a complete set of presence data is available, a general recommendation is to generate background points from the occurrences of other species/communities that were sampled in a similar way (Elith et al. 2011).

Two different approaches have therefore been followed for the selection of a maximum of 10,000 locations for the background data, assuming biased and non-biased presence data. For the first approach, 10,000 locations were randomly selected by Maxent from the study area, whereas the second approach concerns a random stratified (one sample per 1x1 km grid) selection of 10,000 background locations of plots present in the EVA database. Concerning the observed occurrences of the EUNIS types also a random stratified selection has been applied with a maximum of 5000 observations.

In Appendix A the results of the analysis are presented. The two modelling approaches (assuming biased and non-biased data) were evaluated for each of the EUNIS habitat types in order to estimate which assumption is more likely. This evaluation was based on the expert knowledge of the team members of the distribution of grassland types by assessing (i) the distribution of the available presence data as an estimate of geographic bias, (ii) the realism of the habitat suitability maps to reflect known distribution of grasslands, and (iii) the environmental predictors that contribute most substantially to the models. The best performing model was then selected by consensus of the expert team for each habitat type. In the overview of EUNIS types on the first page of the Appendix, the preference for one of the two outputs is indicated in the column 'Background data pool'.
For 3 EUNIS types (E1.5e, E.1F, E5.2) insufficient data was available to create a model. For each EUNIS grassland type the following data are presented:

- A distribution map showing the location of the relevés that have been assigned to the EUNIS type concerned and therefore used as presence data.
- A habitat suitability map with colours varying from grey, through green to red, indicating increasingly favourable ecological conditions for the type (expressing the logistic output of the model between 0 and 1).
- AUC, or the Area Under the Curve, as a general estimate of model performance. This is the probability that the classifier correctly orders two points (a random positive example and a random negative example). In general, AUC values in the range 0.5-0.7 were considered low, 0.7-0.9 were moderate and >0.9 were high, suggesting poor, good and very good model performances, respectively. We provide two estimates of the AUC as calculated by Maxent. ‘AUC training’ reflects the internal fit between observed and predicted occurrences in the computed model. ‘AUC test’ provides the mean AUC obtained from a 10-fold cross-validation procedure in which ten different models were computed with a random selection of 90% of data (calibration data set) and 10% for testing the model (validation data set).
- Contribution variables to the Maxent model (%). Indicates to what extent the environmental variables contribute to the model.
- Remarks of a few experts on the suitability map. These remarks should be taken into account when further processing the suitability maps.
- The distribution map as is prepared for the Red List project (Janssen et al. 2016). This map is included to tighten the discussion to where a habitat type is expected to occur.

**Discussion**

It is clear that a suitability map is not a distribution map, but ideally it should cover well the distribution range of a habitat type. From the expert comments it can be concluded that this is not always the case. In some cases a map shows that a habitat is underrepresented or not represented at all in some parts of Europe. In other cases it is just the opposite; in some parts the Europe the habitat type is overrepresented. The suitability maps are the result of a modelling process with all the potential shortcoming associated with it. On the basis of a limited set of predictors (climate and soil parameters), and a selection of in situ observations a probability is calculated for each grid cell. This process contains a number of uncertainties:

- The assignment of a plot observation to a EUNIS habitat type is based on expert rules. These rules may need further refinement, which could lead to different results.
- The number of plot observations may be too small to deliver an accountable model, although in most cases this doesn’t seem to be a problem in the present study.
- The degree of detail in the predictor maps could be too limited, in other words the maps with a grid size of 1x1km could be too coarse. Plants, that form the basis of a habitat type operate on a much smaller scale then 1x1km. And in the field micro climate and soil parameter may differ significantly over short distances.
- Climate and soil parameters may be well represented in the set of predictors, but there are more factors that determine the suitability of a habitat type. For example chemical soil parameters are very important, but are simply not captured in a map on the European scale.
The habitat **suitability** maps will probably be further reviewed and processed in a next year's ETC/BD task, in which the maps will be downscaled to the actual land cover situation, resulting in **probability** maps.

**References**


Appendix A: Distribution and suitability maps of the revised EUNIS grassland types

<table>
<thead>
<tr>
<th>EUNIS-L3 code</th>
<th>Total # of plots</th>
<th>Description</th>
<th>Background data pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1.4a</td>
<td>3550</td>
<td>Atlantic and Baltic coastal dune grassland (grey dune)</td>
<td>Study area</td>
</tr>
<tr>
<td>B1.4b</td>
<td>5241</td>
<td>Mediterranean and Macaronesian coastal dune grassland (grey dune)</td>
<td>EVA database</td>
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<td>B1.4c</td>
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<td>Black Sea coastal dune grassland (grey dune)</td>
<td>EVA database</td>
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<tr>
<td>E1.1a</td>
<td>790</td>
<td>Pannonian and Pontic sandy steppe</td>
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<td>E1.1b</td>
<td>1180</td>
<td>Cryptogam- and annual-dominated vegetation on siliceous rock outcrops</td>
<td>Study area</td>
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<tr>
<td>E1.1d</td>
<td>1922</td>
<td>Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops</td>
<td>EVA database</td>
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<td>Perennial rocky grassland of the Italian Peninsula</td>
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<td>Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops</td>
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<td>E1.2b</td>
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<td>Mediterranean annual-rich dry grassland</td>
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<td>E1.F</td>
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<td>2146</td>
<td>Mountain hay meadow</td>
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<td>E2.4</td>
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<td>Iberian summer pasture (vallicar)</td>
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<td>Mediterranean tall humid inland grassland</td>
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<td>Mediterranean short moist grassland of lowlands</td>
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<td>E5.2b</td>
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<td>Thermophilous woodland fringe of acidic soils</td>
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<td>E6.3</td>
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<td>E6.5</td>
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<td>E6.6</td>
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<td>E6.7</td>
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</tbody>
</table>
B1.4a - Atlantic and Baltic coastal dune grassland (grey dune)

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data
Restricted to coastal areas

Maxent modelling statistics

AUC training (0-1) 0.986
AUC test (0-1) 0.9752

Contribution variables to the Maxent model (%)
- Weight in % of sand particles (0.05-2 mm) 38.0277
- Temperature seasonality (stdev * 100) 28.5855
- pH (water) 8.9767
- Weight in % of silt particles (0.0002-0.05 mm) 7.5388
- Bulk density (kg/m³) 3.9191
- Soil organic carbon content (%) 3.3623
- Mean temperature of wettest quarter 2.4307
- Distance to water 1.9423
- Volume % of coarse fragments (> 2 mm) 1.9395
- Weight in % of clay particles (<0.0002 mm) 1.3438
- Solar radiation 0.4298
- Cation Exchange Capacity 0.4215
- Precipitation seasonality (coef. of var.) 0.4032
- Precipitation of warmest quarter 0.2881
- Annual precipitation 0.26
- Potential evapotranspiration 0.2438

Remarks
Chytrý: All the inland predictions must be set to zero.

Distribution map from Red List project (Janssen et al., 2016)
B1.4b - Mediterranean and Macaronesian coastal dune grassland (grey dune)

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
**Geographic restriction distribution data**
Restricted to coastal areas

**Maxent modelling statistics**
- **AUC training (0-1)**: 0.9928
- **AUC test (0-1)**: 0.9891

**Contribution variables to the Maxent model (%)**
- Precipitation of warmest quarter: 36.5503
- Weight in % of sand particles (0.05-2 mm): 28.4271
- Potential evapotranspiration: 11.1158
- Soil organic carbon content (%): 6.825
- Weight in % of clay particles (<0.0002 mm): 6.7828
- Temperature seasonality (stdev * 100): 1.7337
- Precipitation seasonality (coef. of var.): 1.6873
- Volume % of coarse fragments (> 2 mm): 1.6238
- Bulk density (kg/m³): 1.3599
- Mean temperature of wettest quarter: 1.2938
- Solar radiation: 0.7039
- Weight in % of silt particles (0.0002-0.05 mm): 0.6597
- pH (water): 0.6493
- Distance to water: 0.3804
- Annual precipitation: 0.3302
- Cation Exchange Capacity: 0.282

**Remarks**
Chytrý: All the inland predictions must be set to zero.

*Distribution map from Red List project (Janssen et al., 2016)*
B1.4c - Black Sea coastal dune grassland (grey dune)

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data
Restricted to coastal areas

Maxent modelling statistics

AUC training (0-1) 0.9956
AUC test (0-1) 0.9967

Contribution variables to the Maxent model (%)

- Annual precipitation 23.6455
- Potential evapotranspiration 23.1895
- Temperature seasonality (stdev * 100) 12.9169
- Precipitation of warmest quarter 12.5852
- Precipitation seasonality (coef. of var.) 9.612
- Soil organic carbon content (%) 6.2813
- Mean temperature of wettest quarter 4.0225
- Weight in % of sand particles (0.05-2 mm) 3.3569
- Weight in % of clay particles (<0.0002 mm) 2.111
- pH (water) 1.165
- Volume % of coarse fragments (> 2 mm) 0.9045
- Distance to water 0.0754
- Solar radiation 0.0225
- Cation Exchange Capacity 0.0215
- Bulk density (kg/m³) 0.0089
- Weight in % of silt particles (0.0002-0.05 mm) 0.0072

Remarks
Chytrý: All the inland predictions must be set to zero.

Distribution map from Red List project (Janssen et al., 2016)
E1.1a - Pannonian and Pontic sandy steppe

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
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<tr>
<th>AUC training (0-1)</th>
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<td>AUC test (0-1)</td>
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</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stddev * 100) 28.3647
- Mean temperature of wettest quarter 24.9701
- Annual precipitation 15.4847
- Precipitation of warmest quarter 12.1144
- Volume % of coarse fragments (> 2 mm) 5.3955
- Weight in % of sand particles (0.05-2 mm) 5.3777
- Solar radiation 3.0565
- Soil organic carbon content (%) 1.7732
- Precipitation seasonality (coef. of var.) 1.4943
- pH (water) 1.49
- Weight in % of clay particles (<0.0002 mm) 1.2226
- Distance to water 0.797
- Potential evapotranspiration 0.6335
- Weight in % of silt particles (0.0002-0.05 mm) 0.4864
- Bulk density (kg/m³) 0.2123
- Cation Exchange Capacity 0.0782

Remarks

Chytrý: Underestimation in the Baltics.
Evans: Really existing in Latvia? Red List map seems more realistic.

Distribution map from Red List project (Janssen et al., 2016)
E1.1b - Cryptogam- and annual-dominated vegetation on siliceous rock outcrops

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

acidic

Maxent modelling statistics

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</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 25.4029
- Cation Exchange Capacity 19.7934
- Soil organic carbon content (%) 12.3843
- Precipitation of warmest quarter 9.2374
- Bulk density (kg/m³) 8.2839
- Distance to water 5.1226
- Solar radiation 4.6906
- Annual precipitation 4.5057
- Weight in % of clay particles (<0.0002 mm) 4.3628
- Volume % of coarse fragments (> 2 mm) 3.4231
- Weight in % of silt particles (0.0002-0.05 mm) 3.0464
- Potential evapotranspiration 1.9764
- Mean temperature of wettest quarter 1.1271
- pH (water) 0.6226
- Precipitation seasonality (coef. of var.) 0.3564
- Weight in % of sand particles (0.05-2 mm) 0.1156

Remarks

Chytrý: Underestimation in Central-Alps and Fennoscandia.
Evans: Distribution in UK odd, suggest more common on south (basic) and rarer in north (acidic). Predicted large areas in Ukrain which seems unlikely.
E1.1d - Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

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<td>AUC test (0-1)</td>
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</table>

Contribution variables to the Maxent model (%)

- Soil organic carbon content (‰): 30.4325
- Potential evapotranspiration: 24.473
- Volume % of coarse fragments (> 2 mm): 12.7108
- Precipitation of warmest quarter: 10.1542
- Annual precipitation: 7.7092
- Solar radiation: 6.9156
- Temperature seasonality (stdev * 100): 6.8156
- Weight in % of sand particles (0.05-2 mm): 1.454
- Precipitation seasonality (coef. of var.): 1.355
- Weight in % of clay particles (<0.0002 mm): 1.3095
- Bulk density (kg/m³): 0.9473
- Mean temperature of wettest quarter: 0.9335
- Weight in % of silt particles (0.0002-0.05 mm): 0.599
- Distance to water: 0.341
- pH (water): 0.25
- Cation Exchange Capacity: 0.1886

Remarks

Chytrý: Not predicted for Baltic islands where the unit occurs.
Evans: Major differences in Turkey and Caucasus.
E1.1e - Perennial rocky grassland of the Italian Peninsula

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data
Not only restricted to Italy according to Flavia Landucci

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
<th>0.986</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC test (0-1)</td>
<td>0.9828</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Precipitation of warmest quarter: 21.6722
- Temperature seasonality (stdev * 100): 15.8283
- Cation Exchange Capacity: 15.6006
- Weight in % of clay particles (<0.0002 mm): 11.5413
- Annual precipitation: 10.267
- Volume % of coarse fragments (> 2 mm): 7.612
- Potential evapotranspiration: 7.0217
- Weight in % of sand particles (0.05-2 mm): 6.7761
- Solar radiation: 3.418
- Mean temperature of wettest quarter: 1.7552
- Precipitation seasonality (coef. of var.): 0.6297
- Soil organic carbon content (%): 0.6235
- Distance to water: 0.4283
- Bulk density (kg/m³): 0.1666
- Weight in % of silt particles (0.0002-0.05 mm): 0.0481
- pH (water): 0.0049

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E1.1f - Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
<th>AUC test (0-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9982</td>
<td>0.9967</td>
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</table>

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
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<tbody>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>86.8037</td>
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<tr>
<td>Potential evapotranspiration</td>
<td>6.9343</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>2.0328</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>1.4564</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>0.9023</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>0.4449</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>0.333</td>
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<td>Distance to water</td>
<td>0.2641</td>
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<tr>
<td>pH (water)</td>
<td>0.1887</td>
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<tr>
<td>Soil organic carbon content (%)</td>
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<td>Weight in % of sand particles (0.05-2 mm)</td>
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<td>Solar radiation</td>
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<td>Bulk density (kg/m³)</td>
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<td>Volume % of coarse fragments (&gt; 2 mm)</td>
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</table>

Remarks
Evans: Geological layer probably needed here.
E1.1g - Perennial rocky grassland of Central Europe and the Carpathians

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>AUC training (0-1)</th>
<th>AUC test (0-1)</th>
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<tbody>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
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<td></td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>8.4827</td>
<td></td>
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<tr>
<td>Solar radiation</td>
<td>7.1783</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
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<tr>
<td>Soil organic carbon content (%)</td>
<td>4.9805</td>
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<td>Precipitation seasonality (coef. of var.)</td>
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<td>Annual precipitation</td>
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<tr>
<td>pH (water)</td>
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<tr>
<td>Precipitation of warmest quarter</td>
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<td>Bulk density (kg/m³)</td>
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<td>Weight in % of sand particles (0.05-2 mm)</td>
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<td>Cation Exchange Capacity</td>
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<td>Potential evapotranspiration</td>
<td>0.373</td>
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<td>Mean temperature of wettest quarter</td>
<td>0.2064</td>
<td></td>
</tr>
<tr>
<td>Distance to water</td>
<td>0.1068</td>
<td></td>
</tr>
</tbody>
</table>

Remarks
Evans: Distribution to the east seems doubtful.
E1.1h - Heavy-metal dry grassland of the Balkans

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9926</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9891</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 26.1041
- Precipitation seasonality (coef. of var.) 21.0444
- Annual precipitation 14.9855
- Solar radiation 12.7279
- Weight in % of clay particles (<0.0002 mm) 9.2661
- Precipitation of warmest quarter 8.8266
- Volume % of coarse fragments (> 2 mm) 7.5506
- Potential evapotranspiration 6.0858
- Cation Exchange Capacity 2.9506
- Weight in % of sand particles (0.05-2 mm) 1.9993
- Distance to water 0.5355
- pH (water) 0.473
- Soil organic carbon content (%) 0.0871
- Weight in % of silt particles (0.0002-0.05 mm) 0.0054
- Mean temperature of wettest quarter 0.0017
- Bulk density (kg/m³) 0.0021

Remarks
Evans: Much of the predicted area does not have suitable soil types (also not Balkan). Defined as endemic for the Balkans & Cyprus.

Distribution map from Red List project (Janssen et al., 2016)
E1.1i - Perennial rocky calcareous grassland of subatlantic-submediterranean Europe

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9094</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.8896</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Volume % of coarse fragments (> 2 mm): 29.4351
- Potential evapotranspiration: 23.5624
- Precipitation seasonality (coef. of var.): 16.7096
- Soil organic carbon content (%): 7.4953
- pH (water): 6.746
- Weight in % of clay particles (<0.0002 mm): 5.4064
- Precipitation of warmest quarter: 3.9895
- Weight in % of sand particles (0.05-2 mm): 2.4885
- Temperature seasonality (stdev * 100): 2.07
- Bulk density (kg/m³): 0.9143
- Weight in % of silt particles (0.0002-0.05 mm): 0.6345
- Cation Exchange Capacity: 0.2298
- Mean temperature of wettest quarter: 0.0826
- Solar radiation: 0.0593
- Distance to water: 0.0295
- Annual precipitation: 0.0163

Remarks

Evans: Plots show a distribution different to the Red List map.

Distribution map from Red List project (Janssen et al., 2016)
E1.1j - Dry steppic, submediterranean pasture of South-Eastern Europe

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9792</td>
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<tr>
<td>AUC test (0-1)</td>
<td>0.9701</td>
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</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 19.9845
- Weight in % of clay particles (<0.0002 mm) 18.4968
- Potential evapotranspiration 16.4946
- Weight in % of sand particles (0.05-2 mm) 8.7663
- Solar radiation 8.6328
- Precipitation seasonality (coef. of var.) 7.7252
- pH (water) 6.3639
- Mean temperature of wettest quarter 5.7499
- Cation Exchange Capacity 4.2047
- Precipitation of warmest quarter 3.7274
- Annual precipitation 2.7237
- Weight in % of silt particles (0.0002-0.05 mm) 2.5178
- Bulk density (kg/m³) 1.4773
- Volume % of coarse fragments (> 2 mm) 1.3044
- Soil organic carbon content (%) 0.1142
- Distance to water 0.0688

Remarks
Evans: Described as only occurring around the Adriatic sea.

Distribution map from Red List project (Janssen et al., 2016)
E1.2a - Semi-dry perennial calcareous grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1) 0.7112
- AUC test (0-1) 0.7091

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (water)</td>
<td>36.0198</td>
</tr>
<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>15.3935</td>
</tr>
<tr>
<td>Potential evapotranspiration</td>
<td>12.0768</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>9.6737</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>8.632</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>5.4526</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>3.415</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>3.3487</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>2.8482</td>
</tr>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>2.5833</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>2.4834</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>1.8246</td>
</tr>
<tr>
<td>Soil organic carbon content (‰)</td>
<td>1.2424</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>0.3317</td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>0.0549</td>
</tr>
<tr>
<td>Distance to water</td>
<td>0</td>
</tr>
</tbody>
</table>

Remarks

Evans: Suitability map seems overestimating compared to the Red List map.
E1.2b - Continental dry steppe

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.8827
AUC test (0-1) 0.8885

Contribution variables to the Maxent model (%)

Temperature seasonality (stddev * 100) 46.4386
Potential evapotranspiration 22.3175
Solar radiation 13.5901
Annual precipitation 8.2352
Weight in % of clay particles (<0.0002 mm) 7.8519
Precipitation of warmest quarter 2.9676
Volume % of coarse fragments (> 2 mm) 2.8011
Bulk density (kg/m³) 2.6915
Mean temperature of wettest quarter 2.1935
Precipitation seasonality (coef. of var.) 1.7112
Soil organic carbon content (%) 0.988
Cation Exchange Capacity 0.6845
Weight in % of silt particles (0.0002-0.05 mm) 0.6477
Weight in % of sand particles (0.05-2 mm) 0.292
pH (water) 0.0817
Distance to water 0.0303

Remarks
Chytrý: The unit does not occur in Spain, the Po valley of Italy, Sweden and the Baltic states.
Evans: Assuming the habitat is present and widespread in Steppic zone of eastern Europe.

Distribution map from Red List project (Janssen et al., 2016)
E1.3a - Mediterranean closely grazed dry grassland

**Distribution map** based on vegetation relevés

**Suitability map.** Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1): 0.9708
- AUC test (0-1): 0.9537

Contribution variables to the Maxent model (%)

- Precipitation of warmest quarter: 36.3878
- Temperature seasonality (stdev * 100): 23.224
- Soil organic carbon content (%): 12.485
- Precipitation seasonality (coef. of var.): 6.9798
- Bulk density (kg/m³): 5.1733
- Weight in % of silt particles (0.0002-0.05 mm): 5.1113
- Potential evapotranspiration: 3.6452
- Mean temperature of wettest quarter: 1.5582
- Solar radiation: 1.5095
- pH (water): 1.1205
- Annual precipitation: 0.9529
- Volume % of coarse fragments (> 2 mm): 0.4269
- Cation Exchange Capacity: 0.1973
- Weight in % of clay particles (<0.0002 mm): 0.0865
- Weight in % of sand particles (0.05-2 mm): 0.0846
- Distance to water: 0

Remarks
Evans: Really in northern FR and southern UK? The map overestimates the occurrence in Turkey where (according to the Red List) the habitat does not occur.

Distribution map from Red List project (Janssen et al., 2016)
E1.3b - Mediterranean tall perennial dry grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.9674
AUC test (0-1) 0.9346

Contribution variables to the Maxent model (%)

- Precipitation of warmest quarter 65.2332
- Soil organic carbon content (%) 16.3498
- Potential evapotranspiration 5.7444
- Temperature seasonality (stdev * 100) 4.8155
- Bulk density (kg/m³) 2.7384
- Volume % of coarse fragments (> 2 mm) 1.9953
- Precipitation seasonality (coef. of var.) 0.9465
- Distance to water 0.6344
- pH (water) 0.5459
- Weight in % of silt particles (0.0002-0.05 mm) 0.3104
- Weight in % of clay particles (<0.0002 mm) 0.2398
- Solar radiation 0.169
- Weight in % of sand particles (0.05-2 mm) 0.1592
- Annual precipitation 0.0589
- Cation Exchange Capacity 0.0497
- Mean temperature of wettest quarter 0.0225

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E1.3c - Mediterranean annual-rich dry grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9632</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9639</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Soil organic carbon content (‰) 50.489
- Precipitation of warmest quarter 29.4739
- Temperature seasonality (stdev * 100) 4.9851
- Volume % of coarse fragments (> 2 mm) 3.3452
- Precipitation seasonality (coef. of var.) 3.2291
- Weight in % of sand particles (0.05-2 mm) 2.7049
- Bulk density (kg/m³) 1.875
- Potential evapotranspiration 1.2382
- pH (water) 0.8863
- Weight in % of silt particles (0.0002-0.05 mm) 0.6081
- Solar radiation 0.5644
- Weight in % of clay particles (<0.0002 mm) 0.4372
- Mean temperature of wettest quarter 0.3727
- Distance to water 0.1366
- Annual precipitation 0.1286
- Cation Exchange Capacity 0.0615

Remarks

Evans: Unlikely to occur in eastern Turkey.

Distribution map from Red List project (Janssen et al., 2016)
E1.5a - Iberian oromediterranean siliceous dry grassland

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1): 0.9891
- AUC test (0-1): 0.9895

Contribution variables to the Maxent model (%)
- Weight in % of sand particles (0.05-2 mm): 36.0772
- Volume % of coarse fragments (> 2 mm): 24.1609
- Temperature seasonality (stdev * 100): 21.9434
- Precipitation of warmest quarter: 6.0866
- Bulk density (kg/m³): 5.4977
- Soil organic carbon content (%): 2.6886
- Solar radiation: 1.1558
- Weight in % of silt particles (0.0002-0.05 mm): 1.0985
- Precipitation seasonality (coef. of var.): 0.5951
- Potential evapotranspiration: 0.5923
- Annual precipitation: 0.2819
- Mean temperature of wettest quarter: 0.1484
- Weight in % of clay particles (<0.0002 mm): 0.1427
- Cation Exchange Capacity: 0.0911
- Distance to water: 0.0778
- pH (water): 0.0494

Remarks
Chytrý: Predictions outside the Iberian Peninsula should be set to zero probability.
Evans: Can only occur on mountains in Spain and Portugal.

Distribution map from Red List project (Janssen et al., 2016)
E1.5b - Iberian oromediterranean basophilous dry grassland

**Distribution map** based on vegetation relevés

**Suitability map.** Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.9807
AUC test (0-1) 0.9809

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
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</thead>
<tbody>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
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<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
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</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>11.9886</td>
</tr>
<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>6.8908</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>3.5557</td>
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<tr>
<td>Precipitation of warmest quarter</td>
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<tr>
<td>Potential evapotranspiration</td>
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<tr>
<td>Mean temperature of wettest quarter</td>
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<tr>
<td>Cation Exchange Capacity</td>
<td>1.7205</td>
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<tr>
<td>Bulk density (kg/m³)</td>
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<tr>
<td>Soil organic carbon content (‰)</td>
<td>1.2099</td>
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<tr>
<td>pH (water)</td>
<td>0.5763</td>
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<tr>
<td>Solar radiation</td>
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<td>Annual precipitation</td>
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<td>Distance to water</td>
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<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>0.0461</td>
</tr>
</tbody>
</table>

Remarks

Chytrý: Predictions outside the Iberian Peninsula should be set to zero probability.
Evans: Despite name also occurs in France and Italy.
E1.5c - Cyno-Sardean-oromediterranean siliceous dry grassland

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
### Geographic restriction distribution data

#### Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9991</td>
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<tr>
<td>AUC test (0-1)</td>
<td>0.997</td>
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#### Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>21.9638</td>
</tr>
<tr>
<td>Soil organic carbon content (‰)</td>
<td>17.3859</td>
</tr>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>15.2144</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>13.1249</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>12.0942</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>8.477</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>7.3064</td>
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<tr>
<td>Mean temperature of wettest quarter</td>
<td>3.8978</td>
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<tr>
<td>Cation Exchange Capacity</td>
<td>0.3635</td>
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<tr>
<td>Potential evapotranspiration</td>
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<tr>
<td>Bulk density (kg/m³)</td>
<td>0.0228</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
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<td>Distance to water</td>
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<tr>
<td>Solar radiation</td>
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</tr>
<tr>
<td>pH (water)</td>
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</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
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</tr>
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</table>

#### Remarks

_Distribution map from Red List project (Janssen et al., 2016)_
E1.5d - Greek and Anatolian oromediterranean siliceous dry grassland

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area.
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1): 0.9957
- AUC test (0-1): 0.9956

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>40.3685</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>10.0098</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>8.7248</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>7.5332</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>7.2631</td>
</tr>
<tr>
<td>Soil organic carbon content (%)</td>
<td>7.1284</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>6.804</td>
</tr>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>5.8362</td>
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<tr>
<td>Bulk density (kg/m³)</td>
<td>1.7697</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>0.8119</td>
</tr>
<tr>
<td>Potential evapotranspiration</td>
<td>0.105</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>0.0666</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>0.0544</td>
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<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>0.0313</td>
</tr>
<tr>
<td>Distance to water</td>
<td>0</td>
</tr>
<tr>
<td>pH (water)</td>
<td>0</td>
</tr>
</tbody>
</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E1.7 - Lowland to submontane, dry to mesic Nardus grassland

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database.
Geographic restriction distribution data

Maxent modelling statistics
AUC training (0-1) 0.8179
AUC test (0-1) 0.8087

Contribution variables to the Maxent model (%)
- Potential evapotranspiration 29.486
- Precipitation of warmest quarter 16.9105
- Weight in % of sand particles (0.05-2 mm) 16.2914
- Bulk density (kg/m³) 12.3766
- Solar radiation 6.714
- Annual precipitation 5.5269
- Mean temperature of wettest quarter 4.1752
- Soil organic carbon content (‰) 3.9597
- Temperature seasonality (stdev * 100) 2.7783
- Weight in % of silt particles (0.0002-0.05 mm) 1.8905
- Weight in % of clay particles (<0.0002 mm) 1.7845
- Precipitation seasonality (coef. of var.) 1.1122
- Volume % of coarse fragments (> 2 mm) 0.791
- Distance to water 0.2625
- pH (water) 0.2044
- Cation Exchange Capacity 0.1438

Remarks
Evans: Probably underestimated in Finland and Sweden.

Distribution map from Red List project (Janssen et al., 2016)
E1.8 - Open Iberian supra-mediterranean dry acid and neutral grassland

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>AUC training (0-1)</th>
<th>AUC test (0-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.9882</td>
<td>0.9936</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
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<tbody>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>29.8423</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>18.137</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>14.2018</td>
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<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>12.9304</td>
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<tr>
<td>Solar radiation</td>
<td>11.739</td>
</tr>
<tr>
<td>Soil organic carbon content (%)</td>
<td>10.8555</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>4.6359</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>2.6726</td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>2.3549</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>1.23</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>0.5137</td>
</tr>
<tr>
<td>Potential evapotranspiration</td>
<td>0.511</td>
</tr>
<tr>
<td>pH (water)</td>
<td>0.4929</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>0.3065</td>
</tr>
<tr>
<td>Distance to water</td>
<td>0.3036</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>0.1006</td>
</tr>
</tbody>
</table>

Remarks

Evans: Unlikely to occur outside Iberia.

*Distribution map from Red List project (Janssen et al., 2016)*
E1.9a - Oceanic to subcontinental inland sand grassland on dry acid and neutral soils

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
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<td>AUC test (0-1)</td>
<td>0.8703</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
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</thead>
<tbody>
<tr>
<td>Cation Exchange Capacity</td>
<td>40.4447</td>
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<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>14.6727</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>14.1592</td>
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<tr>
<td>Precipitation of warmest quarter</td>
<td>13.5749</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>6.8064</td>
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<tr>
<td>Annual precipitation</td>
<td>5.6045</td>
</tr>
<tr>
<td>Soil organic carbon content (%)</td>
<td>4.1521</td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>2.0676</td>
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<tr>
<td>Potential evapotranspiration</td>
<td>2.0466</td>
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<tr>
<td>Distance to water</td>
<td>1.0201</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>0.8982</td>
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<td>Weight in % of clay particles (%&lt;0.0002 mm)</td>
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<tr>
<td>Precipitation seasonality (coef. of var.)</td>
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<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>0.1977</td>
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<tr>
<td>pH (water)</td>
<td>0.1319</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>0.1113</td>
</tr>
</tbody>
</table>

Remarks

Chytrý: The unit also occurs in the big river valleys of Ukraine and Belarus.
Evans: Seems overestimated in the United Kingdom and northern France.

Distribution map from Red List project (Janssen et al., 2016)
E1.9b - Inland sanddrift and dune with siliceous grassland

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>AUC training (0-1)</th>
<th>AUC test (0-1)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>0.8948</td>
<td>0.8965</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Weight in % of silt particles (0.0002-0.05 mm)</th>
<th>56.1884</th>
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</thead>
<tbody>
<tr>
<td>Soil organic carbon content (%)</td>
<td>14.9233</td>
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<tr>
<td>Annual precipitation</td>
<td>8.4433</td>
<td></td>
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<tr>
<td>Solar radiation</td>
<td>7.2006</td>
<td></td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>3.9437</td>
<td></td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>3.0313</td>
<td></td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>2.9629</td>
<td></td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>2.1151</td>
<td></td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>2.0988</td>
<td></td>
</tr>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>1.3745</td>
<td></td>
</tr>
<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>1.2957</td>
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<tr>
<td>Distance to water</td>
<td>1.1901</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>0.7634</td>
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<tr>
<td>pH (water)</td>
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<td>Precipitation seasonality (coef. of var.)</td>
<td>0.4879</td>
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<tr>
<td>Potential evapotranspiration</td>
<td>0.4356</td>
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</tbody>
</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E1.A - Mediterranean to Atlantic open, dry, acid and neutral grassland

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.945</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9429</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100): 38.007
- Precipitation of warmest quarter: 22.313
- Soil organic carbon content (%): 17.0229
- Weight in % of silt particles (0.0002-0.05 mm): 9.1852
- Precipitation seasonality (coef. of var.): 2.9246
- Potential evapotranspiration: 2.0933
- pH (water): 1.9836
- Solar radiation: 1.7906
- Mean temperature of wettest quarter: 1.0239
- Weight in % of clay particles (<0.0002 mm): 0.9997
- Volume % of coarse fragments (> 2 mm): 0.9366
- Annual precipitation: 0.8025
- Bulk density (kg/m³): 0.7373
- Cation Exchange Capacity: 0.6487
- Weight in % of sand particles (0.05-2 mm): 0.2219
- Distance to water: 0.0436

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E1.B - Heavy-metal grassland in Western and Central Europe

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9773</td>
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<tr>
<td>AUC test (0-1)</td>
<td>0.9343</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Contribution</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (water)</td>
<td>45.2944</td>
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<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>22.6051</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>6.5266</td>
</tr>
<tr>
<td>Soil organic carbon content (%)</td>
<td>6.3377</td>
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<tr>
<td>Cation Exchange Capacity</td>
<td>6.0345</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>5.523</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>3.641</td>
</tr>
<tr>
<td>Distance to water</td>
<td>2.7563</td>
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<tr>
<td>Potential evapotranspiration</td>
<td>1.8468</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>1.324</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
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<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
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<td>Annual precipitation</td>
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<td>Bulk density (kg/m³)</td>
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<td>Temperature seasonality (stdev * 100)</td>
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</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E2.1 - Mesic permanent pasture of lowlands and mountains

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
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</thead>
<tbody>
<tr>
<td>AUC test (0-1)</td>
<td>0.6557</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100): 41.6154
- Soil organic carbon content (%): 21.8113
- Precipitation of warmest quarter: 10.8749
- Potential evapotranspiration: 8.5896
- Volume % of coarse fragments (> 2 mm): 5.8015
- Precipitation seasonality (coef. of var.): 4.3407
- Solar radiation: 2.3516
- Annual precipitation: 2.3192
- Bulk density (kg/m³): 1.5719
- Weight in % of sand particles (0.05-2 mm): 0.6822
- Cation Exchange Capacity: 0.5408
- pH (water): 0.4719
- Mean temperature of wettest quarter: 0.3511
- Weight in % of clay particles (<0.0002 mm): 0.3173
- Distance to water: 0.2154
- Weight in % of silt particles (0.0002-0.05 mm): 0.1651

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E2.2 - Low and medium altitude hay meadow

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>AUC training (0-1)</td>
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</tr>
<tr>
<td></td>
<td>AUC test (0-1)</td>
<td>0.7935</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 50.0253
- Soil organic carbon content (%) 22.473
- Precipitation of warmest quarter 19.4339
- Solar radiation 3.2257
- Bulk density (kg/m³) 1.9914
- Potential evapotranspiration 1.1445
- pH (water) 0.5317
- Weight in % of silt particles (0.0002-0.05 mm) 0.5195
- Annual precipitation 0.5188
- Precipitation seasonality (coef. of var.) 0.516
- Distance to water 0.4587
- Weight in % of clay particles (<0.0002 mm) 0.4476
- Mean temperature of wettest quarter 0.3523
- Weight in % of sand particles (0.05-2 mm) 0.3478
- Volume % of coarse fragments (> 2 mm) 0.1765
- Cation Exchange Capacity 0.0279

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E2.3 - Mountain hay meadow

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics
- AUC training (0-1) 0.9449
- AUC test (0-1) 0.9474

Contribution variables to the Maxent model (%)
- Precipitation of warmest quarter 44.8523
- Volume % of coarse fragments (> 2 mm) 18.4588
- Annual precipitation 12.216
- Temperature seasonality (stdev * 100) 8.1701
- Solar radiation 5.539
- Soil organic carbon content (%) 5.4466
- Bulk density (kg/m³) 4.2435
- Weight in % of clay particles (<0.0002 mm) 1.6752
- Precipitation seasonality (coef. of var.) 1.2969
- pH (water) 0.5795
- Potential evapotranspiration 0.4647
- Weight in % of sand particles (0.05-2 mm) 0.3934
- Mean temperature of wettest quarter 0.3428
- Cation Exchange Capacity 0.2176
- Weight in % of silt particles (0.0002-0.05 mm) 0.1821
- Distance to water 0.0402

Remarks
Evans: Not predicted in the United Kingdom and Sweden.

Distribution map from Red List project (Janssen et al., 2016)
E2.4 - Iberian summer pasture (vallicar)

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

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<th>Value</th>
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<td>AUC training (0-1)</td>
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<tr>
<td>AUC test (0-1)</td>
<td>0.9928</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>33.1329</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>21.4373</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>15.4899</td>
</tr>
<tr>
<td>Annual precipitation</td>
<td>11.2214</td>
</tr>
<tr>
<td>Soil organic carbon content (%)</td>
<td>8.1669</td>
</tr>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>5.8117</td>
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<tr>
<td>Solar radiation</td>
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</tr>
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<td>Precipitation seasonality (coef. of var.)</td>
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</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>1.0037</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>0.9184</td>
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<tr>
<td>Potential evapotranspiration</td>
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<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>0.2533</td>
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<tr>
<td>Cation Exchange Capacity</td>
<td>0.2119</td>
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<td>Distance to water</td>
<td>0.0273</td>
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<tr>
<td>Mean temperature of wettest quarter</td>
<td>0.0084</td>
</tr>
<tr>
<td>pH (water)</td>
<td>0</td>
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</tbody>
</table>

Remarks

Chytrý: Any predictions outside the Iberian Peninsula should be set to zero probability.

Distribution map from Red List project (Janssen et al., 2016)
E3.1a - Mediterranean tall humid inland grassland

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.9708
AUC test (0-1) 0.9637

Contribution variables to the Maxent model (%)
- Temperature seasonality (stdev * 100) 52.6136
- Soil organic carbon content (%) 19.2328
- Potential evapotranspiration 7.2496
- Precipitation seasonality (coef. of var.) 6.0633
- Solar radiation 2.906
- Weight in % of clay particles (<0.0002 mm) 2.2076
- Volume % of coarse fragments (> 2 mm) 1.9274
- Cation Exchange Capacity 1.6047
- pH (water) 1.4898
- Bulk density (kg/m³) 1.4408
- Weight in % of sand particles (0.05-2 mm) 1.3808
- Precipitation of warmest quarter 1.3682
- Distance to water 0.8006
- Annual precipitation 0.6886
- Mean temperature of wettest quarter 0.6622
- Weight in % of silt particles (0.0002-0.05 mm) 0.4333

Remarks
Evans: Some releves seem coastal, really existing in northern France?.

Distribution map from Red List project (Janssen et al., 2016)
E3.2a - Mediterranean short moist grassland of lowlands

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area.
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
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</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9878</td>
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</table>

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>28.6551</td>
</tr>
<tr>
<td>Soil organic carbon content (‰)</td>
<td>20.6956</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>18.0647</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>14.2506</td>
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<tr>
<td>Annual precipitation</td>
<td>10.9316</td>
</tr>
<tr>
<td>Potential evapotranspiration</td>
<td>9.7653</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>5.7789</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>2.5715</td>
</tr>
<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>1.7214</td>
</tr>
<tr>
<td>pH (water)</td>
<td>1.6667</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>1.5513</td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>1.08</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>0.7187</td>
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<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>0.1761</td>
</tr>
<tr>
<td>Distance to water</td>
<td>0.0219</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E3.2b - Mediterranean short moist grassland of mountains

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
<th>0.9817</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC test (0-1)</td>
<td>0.9806</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Weight in % of sand particles (0.05-2 mm) 27.3891
- Temperature seasonality (stdev * 100) 25.7913
- Volume % of coarse fragments (> 2 mm) 13.1899
- Weight in % of silt particles (0.0002-0.05 mm) 11.7419
- Precipitation of warmest quarter 11.3227
- Solar radiation 4.2143
- Mean temperature of wettest quarter 3.0999
- Soil organic carbon content (%) 2.8538
- Bulk density (kg/m³) 2.1587
- Potential evapotranspiration 0.7105
- Cation Exchange Capacity 0.5347
- Distance to water 0.4112
- Precipitation seasonality (coef. of var.) 0.4005
- Annual precipitation 0.2202
- Weight in % of clay particles (<0.0002 mm) 0.0119
- pH (water) 0.0019

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E3.3 - Submediterranean moist meadow

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9647</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9527</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
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</thead>
<tbody>
<tr>
<td>Soil organic carbon content (‰)</td>
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<tr>
<td>Temperature seasonality (stdev * 100)</td>
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<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>15.0961</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>14.5251</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>4.807</td>
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<tr>
<td>Annual precipitation</td>
<td>4.0373</td>
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<tr>
<td>Solar radiation</td>
<td>2.5139</td>
</tr>
<tr>
<td>pH (water)</td>
<td>2.4316</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
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<td>Weight in % of silt particles (0.0002-0.05 m)</td>
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<tr>
<td>Distance to water</td>
<td>0.9239</td>
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<tr>
<td>Bulk density (kg/m³)</td>
<td>0.8138</td>
</tr>
<tr>
<td>Potential evapotranspiration</td>
<td>0.4261</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>0.2489</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>0.1272</td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>0.0639</td>
</tr>
</tbody>
</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E3.4a - Moist or wet mesotrophic to eutrophic hay meadow

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics
- AUC training (0-1): 0.6877
- AUC test (0-1): 0.67

Contribution variables to the Maxent model (%)
- Soil organic carbon content (‰): 26.8859
- Temperature seasonality (stdev * 100): 16.7979
- Precipitation of warmest quarter: 16.1536
- Volume % of coarse fragments (> 2 mm): 9.8416
- Potential evapotranspiration: 9.0846
- Weight in % of clay particles (<0.0002 mm): 5.5056
- Solar radiation: 4.3696
- Weight in % of sand particles (0.05-2 mm): 4.1039
- Annual precipitation: 2.4557
- Mean temperature of wettest quarter: 2.2003
- Bulk density (kg/m³): 2.1403
- Distance to water: 2.0029
- Precipitation seasonality (coef. of var.): 0.5912
- pH (water): 0.4495
- Weight in % of silt particles (0.0002-0.05 mm): 0.1452
- Cation Exchange Capacity: 0.1445

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E3.4b - Moist or wet mesotrophic to eutrophic pasture

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1) 0.7085
- AUC test (0-1) 0.7053

Contribution variables to the Maxent model (%)

- Potential evapotranspiration 30.3743
- Volume % of coarse fragments (> 2 mm) 22.9422
- Temperature seasonality (stdev * 100) 13.6791
- Precipitation of warmest quarter 7.7519
- Weight in % of sand particles (0.05-2 mm) 6.9318
- Soil organic carbon content (%) 5.3326
- Mean temperature of wettest quarter 2.2857
- Precipitation seasonality (coef. of var.) 2.2365
- Distance to water 1.7452
- Solar radiation 1.6997
- pH (water) 1.3881
- Bulk density (kg/m³) 0.9459
- Annual precipitation 0.9363
- Cation Exchange Capacity 0.1415
- Weight in % of clay particles (<0.0002 mm) 0.0562
- Weight in % of silt particles (0.0002-0.05 mm) 0

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E3.5 - Temperate and boreal moist or wet oligotrophic grassland

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>statistic</th>
<th>value</th>
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</thead>
<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.7371</td>
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<tr>
<td>AUC test (0-1)</td>
<td>0.7075</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Precipitation of warmest quarter: 24.5629%
- Temperature seasonality (stdev * 100): 24.5343%
- Soil organic carbon content (‰): 23.978%
- Volume % of coarse fragments (> 2 mm): 9.8181%
- Potential evapotranspiration: 7.6192%
- Solar radiation: 2.4294%
- Weight in % of sand particles (0.05-2 mm): 2.2702%
- Weight in % of silt particles (0.0002-0.05 mm): 1.9697%
- Mean temperature of wettest quarter: 1.3122%
- Annual precipitation: 1.2117%
- Precipitation seasonality (coef. of var.): 1.1055%
- Bulk density (kg/m³): 0.5017
- Distance to water: 0.4476
- pH (water): 0.4113
- Weight in % of clay particles (<0.0002 mm): 0.1534
- Cation Exchange Capacity: 0.0427

Remarks
Evans: Underestimated in boreal zone?

Distribution map from Red List project (Janssen et al., 2016)
E4.1 - Vegetated snow-patch

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from EVA database.
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9647</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9532</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Soil organic carbon content (%): 43.9819
- Weight in % of sand particles (0.05-2 mm): 32.7563
- Cation Exchange Capacity: 6.549
- Annual precipitation: 4.7292
- Volume % of coarse fragments (> 2 mm): 3.4604
- Weight in % of silt particles (0.0002-0.05 mm): 2.8524
- Mean temperature of wettest quarter: 2.4339
- Solar radiation: 2.309
- pH (water): 1.0057
- Temperature seasonality (stdev * 100): 0.8192
- Bulk density (kg/m³): 0.4006
- Potential evapotranspiration: 0.3384
- Precipitation of warmest quarter: 0.2795
- Precipitation seasonality (coef. of var.): 0.252
- Weight in % of clay particles (<0.0002 mm): 0.1262
- Distance to water: 0

Remarks
Evans: Massif Central, Carpathians, Apeninnes?

Distribution map from Red List project (Janssen et al., 2016)
E4.3a - Boreal and arctic acidophilous alpine grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.9913
AUC test (0-1) 0.993

Contribution variables to the Maxent model (%)
- Soil organic carbon content (%o) 81.7964
- Solar radiation 11.5211
- Mean temperature of wettest quarter 6.366
- Annual precipitation 5.4934
- Temperature seasonality (stdev * 100) 3.275
- pH (water) 1.4376
- Precipitation of warmest quarter 0.842
- Weight in % of sand particles (0.05-2 mm) 0.4648
- Potential evapotranspiration 0.3161
- Volume % of coarse fragments (> 2 mm) 0.0088
- Weight in % of silt particles (0.0002-0.05 mm) 0
- Precipitation seasonality (coef. of var.) 0
- Bulk density (kg/m³) 0
- Cation Exchange Capacity 0
- Distance to water 0
- Weight in % of clay particles (<0.0002 mm) 0

Remarks
Evans: Scotland?.
E4.3b - Temperate acidophilous alpine grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th></th>
<th>AUC training (0-1)</th>
<th>AUC test (0-1)</th>
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<tr>
<td><strong>Contribution variables to the Maxent model (%)</strong></td>
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<td></td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>42.1476</td>
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<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>24.6527</td>
<td></td>
</tr>
<tr>
<td>Soil organic carbon content (‰)</td>
<td>9.0568</td>
<td></td>
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<tr>
<td>Annual precipitation</td>
<td>7.0488</td>
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<tr>
<td>Solar radiation</td>
<td>6.7601</td>
<td></td>
</tr>
<tr>
<td>Mean temperature of wettest quarter</td>
<td>6.676</td>
<td></td>
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<tr>
<td>Temperature seasonality (stdev * 100)</td>
<td>1.9529</td>
<td></td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>1.6554</td>
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<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
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<tr>
<td>pH (water)</td>
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<tr>
<td>Bulk density (kg/m³)</td>
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<tr>
<td>Potential evapotranspiration</td>
<td>0.2841</td>
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<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>0.2843</td>
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<tr>
<td>Precipitation of warmest quarter</td>
<td>0.2108</td>
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<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>0.0505</td>
<td></td>
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<tr>
<td>Distance to water</td>
<td>0.0394</td>
<td></td>
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</tbody>
</table>

Remarks
Evans: Occurs locally in UK, especially Scotland, also in Norway and Sweden.

Distribution map from Red List project (Janssen et al., 2016)
E4.4a - Arctic-alpine calcareous grassland

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
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<tbody>
<tr>
<td>AUC test (0-1)</td>
<td>0.9152</td>
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</table>

Contribution variables to the Maxent model (%)

- Annual precipitation 35.7854
- Volume % of coarse fragments (> 2 mm) 29.8612
- Solar radiation 29.8184
- Weight in % of sand particles (0.05-2 mm) 12.7099
- Cation Exchange Capacity 5.4759
- Precipitation of warmest quarter 3.5568
- Potential evapotranspiration 2.9631
- pH (water) 2.6677
- Temperature seasonality (stdev * 100) 2.1662
- Weight in % of clay particles (<0.0002 mm) 2.0438
- Soil organic carbon content (%) 0.7156
- Mean temperature of wettest quarter 0.5263
- Distance to water 0.4602
- Weight in % of silt particles (0.0002-0.05 mm) 0.3194
- Precipitation seasonality (coef. of var.) 0.0454
- Bulk density (kg/m³) 0.0415

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E4.4b - Alpine and subalpine calcareous grassland of the Balkan and Apennines

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9875</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.9777</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Weight in % of sand particles (0.05-2 mm): 41.7658
- Temperature seasonality (stdev * 100): 24.3501
- Annual precipitation: 6.8205
- Precipitation seasonality (coef. of var.): 6.4027
- Precipitation of warmest quarter: 6.177
- Mean temperature of wettest quarter: 4.1608
- Soil organic carbon content (%): 2.7005
- Weight in % of clay particles (<0.0002 mm): 2.6955
- Cation Exchange Capacity: 1.9837
- Potential evapotranspiration: 1.445
- Solar radiation: 1.0485
- Volume % of coarse fragments (> 2 mm): 0.6552
- Distance to water: 0.1592
- Bulk density (kg/m^3): 0.1
- pH (water): 0.0271
- Weight in % of silt particles (0.0002-0.05 mm): 0.0268

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E5.2a - Thermophilous woodland fringe of base-rich soils

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>AUC training (0-1)</td>
<td>0.9219</td>
</tr>
<tr>
<td>AUC test (0-1)</td>
<td>0.8986</td>
</tr>
</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 41.2579
- Soil organic carbon content (%) 17.826
- Precipitation of warmest quarter 11.9411
- Volume % of coarse fragments (> 2 mm) 7.4051
- Solar radiation 5.4131
- Potential evapotranspiration 4.9534
- Precipitation seasonality (coef. of var.) 4.0683
- Annual precipitation 3.7261
- Distance to water 1.6008
- Weight in % of clay particles (<0.0002 mm) 1.259
- Mean temperature of wettest quarter 0.9223
- Weight in % of sand particles (0.05-2 mm) 0.8767
- pH (water) 0.633
- Cation Exchange Capacity 0.6286
- Weight in % of silt particles (0.0002-0.05 mm) 0.1477
- Bulk density (kg/m³) 0.0974

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E5.2b - Thermophilous woodland fringe of acidic soils

*Distribution map* based on vegetation relevés

*Suitability map*. Background data for model randomly selected from study area
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>AUC training (0-1)</th>
<th>0.9687</th>
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<tbody>
<tr>
<td>AUC test (0-1)</td>
<td>0.9402</td>
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</tbody>
</table>

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100) 33.763
- Precipitation seasonality (coef. of var.) 12.5963
- Cation Exchange Capacity 11.2902
- Potential evapotranspiration 10.539
- Soil organic carbon content (‰) 10.4926
- Annual precipitation 7.0181
- Volume % of coarse fragments (> 2 mm) 3.0836
- Bulk density (kg/m³) 2.4558
- Precipitation of warmest quarter 2.0742
- Solar radiation 1.9251
- pH (water) 1.4747
- Distance to water 1.4008
- Mean temperature of wettest quarter 1.2011
- Weight in % of clay particles (<0.0002 mm) 0.9678
- Weight in % of sand particles (0.05-2 mm) 0.4906
- Weight in % of silt particles (0.0002-0.05 mm) 0.3401

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E5.4 - Lowland moist or wet tall-herb and fern fringe

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1): 0.6753
- AUC test (0-1): 0.6711

Contribution variables to the Maxent model (%)

- Temperature seasonality (stdev * 100): 27.5335
- Soil organic carbon content (‰): 16.5976
- Precipitation of warmest quarter: 10.9385
- Distance to water: 9.9648
- Mean temperature of wettest quarter: 5.8267
- Weight in % of clay particles (<0.0002 mm): 5.7685
- Precipitation seasonality (coef. of var.): 5.0201
- Weight in % of sand particles (0.05-2 mm): 4.416
- Solar radiation: 3.5445
- Annual precipitation: 2.3146
- pH (water): 1.7895
- Weight in % of silt particles (0.0002-0.05 mm): 0.5182
- Volume % of coarse fragments (> 2 mm): 0.3017
- Potential evapotranspiration: 0.2537
- Cation Exchange Capacity: 0.1542
- Bulk density (kg/m³): 0.0561

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E5.5 - Subalpine moist or wet tall-herb and fern fringe

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

AUC training (0-1) 0.9503
AUC test (0-1) 0.9372

Contribution variables to the Maxent model (%)

- Weight in % of sand particles (0.05-2 mm) 29.0212
- Volume % of coarse fragments (> 2 mm) 18.5313
- Annual precipitation 13.4782
- Solar radiation 11.3717
- Cation Exchange Capacity 9.6654
- Soil organic carbon content (%) 5.9674
- Temperature seasonality (stdev * 100) 3.8304
- Weight in % of silt particles (0.0002-0.05 mm) 2.656
- Precipitation seasonality (coef. of var.) 0.6654
- Weight in % of clay particles (<0.0002 mm) 0.5895
- Precipitation of warmest quarter 0.407
- Potential evapotranspiration 0.3925
- Bulk density (kg/m³) 0.3808
- Mean temperature of wettest quarter 0.3017
- pH (water) 0.1676
- Distance to water 0.1189

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E6.1 - Mediterranean inland salt steppe

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
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<tr>
<td>AUC test (0-1)</td>
<td>0.9877</td>
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</table>

Contribution variables to the Maxent model (%)

- Potential evapotranspiration: 41.8064
- Soil organic carbon content (%): 26.9091
- Precipitation of warmest quarter: 20.3345
- Solar radiation: 2.8033
- Bulk density (kg/m³): 2.116
- pH (water): 1.9746
- Weight in % of sand particles (0.05-2 mm): 1.3214
- Weight in % of clay particles (<0.0002 mm): 1.0688
- Temperature seasonality (stdev * 100): 1.0299
- Precipitation seasonality (coef. of var.): 0.8254
- Volume % of coarse fragments (> 2 mm): 0.7899
- Annual precipitation: 0.5257
- Cation Exchange Capacity: 0.3933
- Distance to water: 0.2633
- Mean temperature of wettest quarter: 0.0974
- Weight in % of silt particles (0.0002-0.05 mm): 0.0393

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E6.2 - Continental inland salt steppe

**Distribution map** based on vegetation relevés

**Suitability map**. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
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<tr>
<td>AUC test (0-1)</td>
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Contribution variables to the Maxent model (%)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
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<tbody>
<tr>
<td>Mean temperature of wettest quarter</td>
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<tr>
<td>Temperature seasonality (stdev * 100)</td>
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<tr>
<td>Solar radiation</td>
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<tr>
<td>Potential evapotranspiration</td>
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<tr>
<td>Soil organic carbon content (%)</td>
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<tr>
<td>Annual precipitation</td>
<td>5.4406</td>
</tr>
<tr>
<td>Precipitation of warmest quarter</td>
<td>3.7118</td>
</tr>
<tr>
<td>Weight in % of silt particles (0.0002-0.05 mm)</td>
<td>1.6985</td>
</tr>
<tr>
<td>Volume % of coarse fragments (&gt; 2 mm)</td>
<td>1.1285</td>
</tr>
<tr>
<td>pH (water)</td>
<td>0.8965</td>
</tr>
<tr>
<td>Weight in % of sand particles (0.05-2 mm)</td>
<td>0.8132</td>
</tr>
<tr>
<td>Weight in % of clay particles (&lt;0.0002 mm)</td>
<td>0.4755</td>
</tr>
<tr>
<td>Cation Exchange Capacity</td>
<td>0.2685</td>
</tr>
<tr>
<td>Precipitation seasonality (coef. of var.)</td>
<td>0.1684</td>
</tr>
<tr>
<td>Bulk density (kg/m³)</td>
<td>0.1056</td>
</tr>
<tr>
<td>Distance to water</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Remarks

Distribution map from Red List project (Janssen et al., 2016)
E6.3 - Temperate inland salt marsh

Distribution map based on vegetation relevés

Suitability map. Background data for model randomly selected from EVA database
Geographic restriction distribution data

Maxent modelling statistics

- AUC training (0-1): 0.9446
- AUC test (0-1): 0.9229

Contribution variables to the Maxent model (%)

- Potential evapotranspiration: 41.5817
- Solar radiation: 15.7341
- Mean temperature of wettest quarter: 11.7343
- Temperature seasonality (stdev * 100): 8.507
- Weight in % of sand particles (0.05-2 mm): 7.9667
- Annual precipitation: 6.9583
- Precipitation of warmest quarter: 6.3342
- Volume % of coarse fragments (> 2 mm): 6.1287
- Soil organic carbon content (%): 5.31
- Weight in % of silt particles (0.0002-0.05 mm): 2.0329
- Precipitation seasonality (coef. of var.): 1.1504
- Cation Exchange Capacity: 0.6519
- Bulk density (kg/m³): 0.5249
- pH (water): 0.363
- Weight in % of clay particles (<0.0002 mm): 0.3416
- Distance to water: 0.2394

Remarks

Distribution map from Red List project (Janssen et al., 2016)