Catchy title

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Manual
Species distribution model ensemble tool
(beta version, Oct 2017)

1. Introduction

[Karin to write, based on original proposal]

1.1. Why create ensemble models?

[Karin to write, based on original proposal]

1.2. Structure of Manual

[Do this last]

1.3. Supported import file types

.CSV files

- [describe format]

Raster files

[describe format]

.SHP files

[describe format]

.Geodata files

[describe format]

1.4. Supported export file types

CSV files

[describe format]

.SHP files

[describe format]

KML files

[describe format]

1.5. Supported image download file types

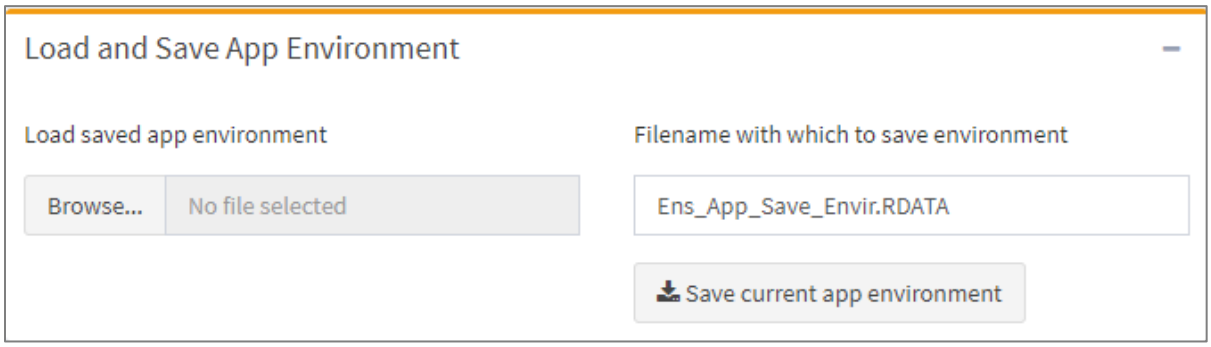
.JPG files
[describe format]

.PDF files
[describe format]

.PNG files
[describe format]

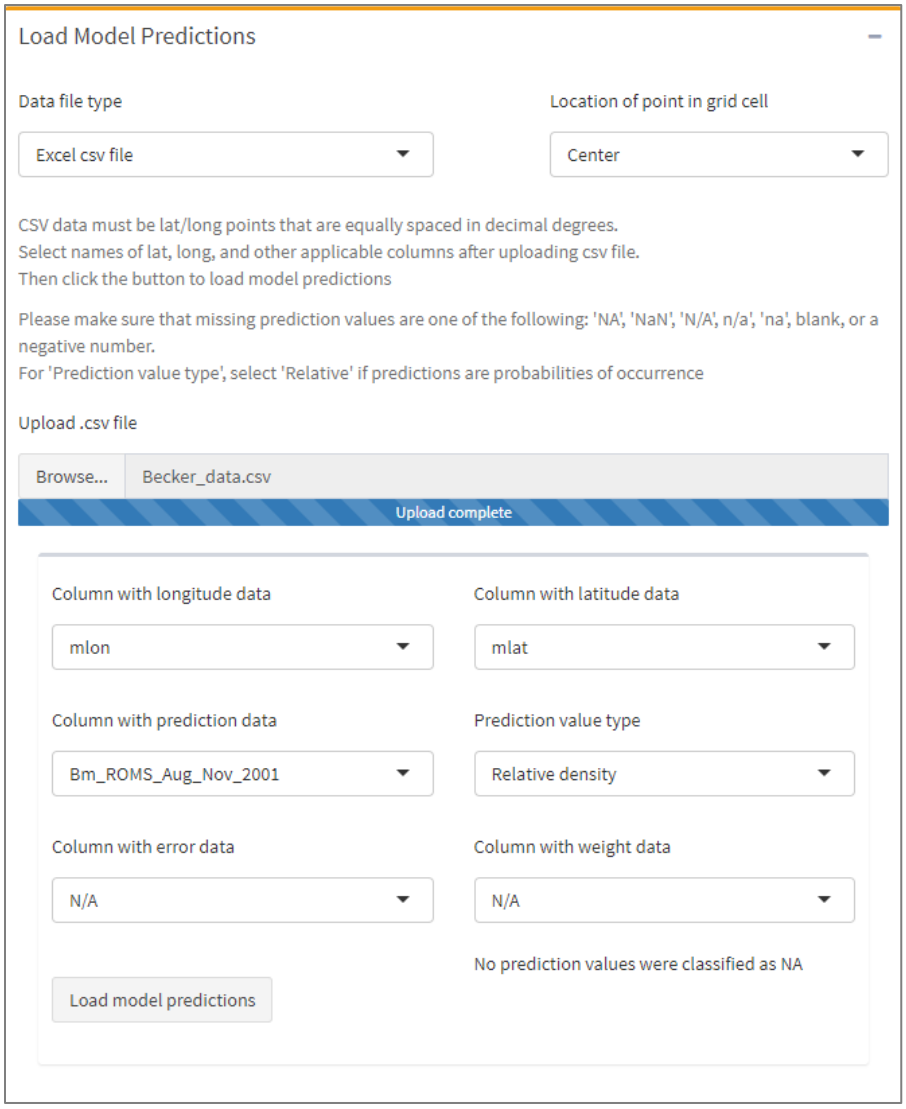
2. Load Model Predictions Tab

2.1. Load and Save App Environment



- *Load saved app environment*
  - Browse to .RDATA file created using tool.
- *Filename with which to save environment*
  - Name of .RDATA file that will be downloaded if the user clicks 'Save current app environment'.
- *Save current app environment*
  - Click to download an .RDATA file that stores files loaded in the current session of the ensemble modeling tool.
  - This file can be loaded using the 'Load saved app environment' and thus the user can functionally pick up where they left off in their last session.
  - Aspects of the app that are saved include but are not limited to: original model predictions, study area polygon, land polygon, overlaid model predictions, ensemble predictions, validation data, and calculated evaluation metrics.

2.2. Load Model Predictions



- *Data file type*: "Excel csv file"
    - *Location of point in grid cell*:
        - Specifies whether the longitude and latitude coordinates in the file represent the center, top right, top left, bottom left, or bottom right of each grid cell
    - *Upload .csv file*
        - Browse to and select the .csv file that contains the model prediction data you want to load into the app
        - This file must have headers
        - An error message will appear if you select a file that is not a .csv file
    - *Column with longitude data*
        - Select the name of the column with the longitude data
    - *Column with latitude data*
        - Select the name of the column with the latitude data
    - *Column with prediction data*
        - Select the name of the column with the prediction data

- *Prediction value type*
  - Select “Absolute density” if the model predictions have had all necessary correction factors applied for the applicable study area, and thus can provide a true prediction of density
  - Select “Relative density” if the model prediction have **not** had all necessary correction factors applied for the applicable study area, and thus only accurately predict the density relative to the other model predictions
- *Column with error data*
  - Select the name of the column with the prediction data
  - If you do not have error data for these model predictions, then select “N/A”
  - If you want to use error values as pixel-level spatial weights in a weighted ensemble, then use the ‘Column with weight data’ input
  - Currently there is no place within the app that this error data can be used, but a potential future use is creating maps of the error data
- *Column with weight data*
  - Select the name of the column with the prediction data
  - If you do not have weight data for these model predictions, then select “N/A”
  - Weight data can be used as pixel-level spatial weights in a weighted ensemble in the “Create Ensemble Predictions” tab
- *NA prediction values message*
  - A message detailing how many of the provided prediction values will be classified as NA
  - A prediction value will be classified as NA if the provided data is one of the following: 'NA', 'NaN', 'N/A', ‘n/a', 'na', blank, or a negative number
- *Load model predictions*
  - Click to load model predictions from the loaded .csv file with the specified data into the app

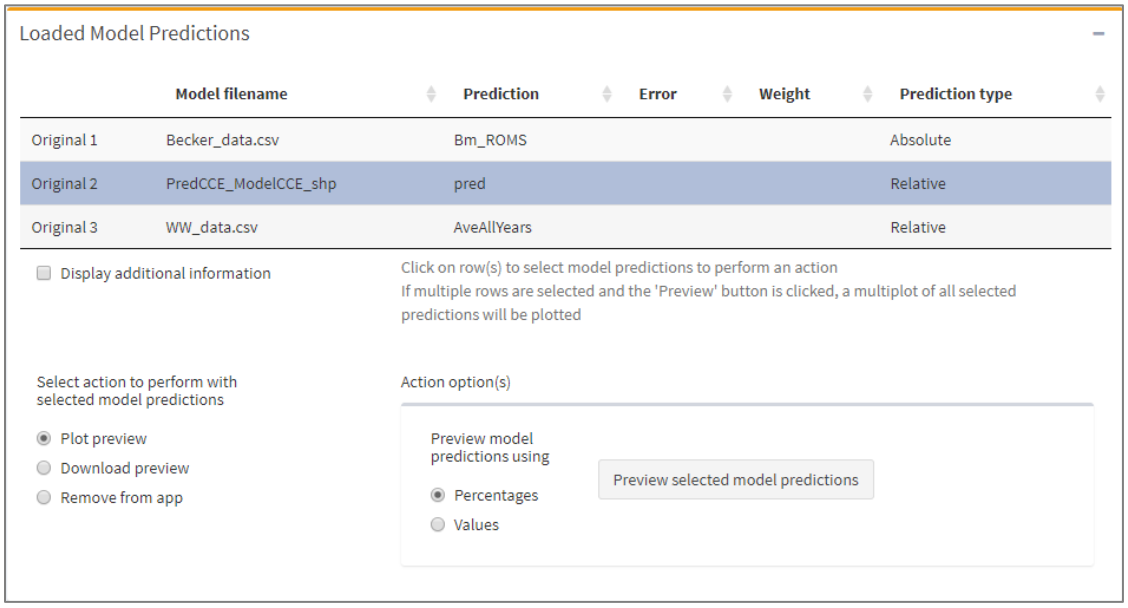
- *Data file type:* “GIS raster”
  - *Band number of prediction data*
    - The band number of the prediction data within the loaded raster .tif file
  - *Upload raster .tif file*
    - Browse to and select the .tif file for the raster that contains the model prediction data you want to load into the app
    - An error message will appear if you select a file that is not a .tif file or if the selected raster does not have data at the provided band number
  - *Prediction value type*
    - See here
    - See *Prediction value type*
    - Select “Absolute density” if the model predictions have had all necessary correction factors applied for the applicable study area, and thus can provide a true prediction of density
    - Select “Relative density” if the model prediction have **not** had all necessary correction factors applied for the applicable study area, and thus only accurately predict the density relative to the other model predictions

    - *NA prediction values message*
        - A detailing how many of the provided prediction values will be classified as NA
        - A prediction value will be classified as NA if the provided data is one of the following: 'NA', 'NaN', 'N/A', ‘n/a', 'na', blank, or a negative number
    - *Load model predictions*
        - Click to load model predictions from the loaded .tif file with the specified data into the app
- *Data file type:* “GIS shapefile”
    - *Upload GIS shapefile files*
        - Browse to the folder that contains the shapefile you want to load, and then select all files that pertain to that shapefile
        - Although they will have different file extensions, these files will all have the same file name (this will be the name of the shapefile in ArcCatalog)
        - An error message will appear if not all of the files of the desired shapefile are selected, or if extraneous files are selected
    - *Column with prediction data*
        - Select the name of the column with the prediction data
    - *Prediction value type*
        - See here
        - See *Prediction value type*
        - Select “Absolute density” if the model predictions have had all necessary correction factors applied for the applicable study area, and thus can provide a true prediction of density
        - Select “Relative density” if the model prediction have **not** had all necessary correction factors applied for the applicable study area, and thus only accurately predict the density relative to the other model predictions
    - *Column with error data*
        - Select the name of the column with the prediction data
        - If you do not have error data for these model predictions, then select “N/A”
        - If you want to use error values as pixel-level spatial weights in a weighted ensemble, then use the ‘Column with weight data’ input
        - Currently there is no place within the app that this error data can be used, but a potential future use is creating maps of the error data
    - *Column with weight data*
        - Select the name of the column with the prediction data
        - If you do not have weight data for these model predictions, then select “N/A”
        - Weight data can be used as pixel-level spatial weights in a weighted ensemble in the “Create Ensemble Predictions” tab
    - *NA prediction values message*
        - A message detailing how many of the provided prediction values will be classified as NA
        - A prediction value will be classified as NA if the provided data is one of the following: 'NA', 'NaN', 'N/A', ‘n/a', 'na', blank, or a negative number

    - *Load model predictions*
        - Click to load model predictions from the data columns specified in the loaded shapefile files into the app
- *Data file type:* "GIS file geodatabase (.gdb) file"
    - *Path to .gdb folder*
        - Enter the full path up to and including the personal file geodatabase, which will have a '.gdb' extension
        - Do not put anything more text, such as a '/', after the folder name
        - On a Windows machine, you can copy and paste the file path from the top bar of the Windows Explorer
        - You can also copy and paste the file path from the top bar of ArcCatalog after navigating to the desired file
    - *Filename within .gdb folder*
        - Enter the filename of the file you wish to load
        - This filename can be found in ArcCatalog
        - In ArcCatalog, the file will be listed as a 'File Geodatabase Feature Class'
    - *Load file from specified path*
        - Click to load the specified file from the specified path
        - An error message will appear if the app does not find a file with the specified name at the specified path
    - *Column with prediction data*
        - Select the name of the column with the prediction data
    - *Prediction value type*
        - See here
        - See *Prediction value type*
        - Select "Absolute density" if the model predictions have had all necessary correction factors applied for the applicable study area, and thus can provide a true prediction of density
        - Select "Relative density" if the model prediction have **not** had all necessary correction factors applied for the applicable study area, and thus only accurately predict the density relative to the other model predictions
    - *Column with error data*
        - Select the name of the column with the prediction data
        - If you do not have error data for these model predictions, then select "N/A"
        - If you want to use error values as pixel-level spatial weights in a weighted ensemble, then use the 'Column with weight data' input
        - Currently there is no place within the app that this error data can be used, but a potential future use is creating maps of the error data
    - *Column with weight data*
        - Select the name of the column with the prediction data
        - If you do not have weight data for these model predictions, then select "N/A"
        - Weight data can be used as pixel-level spatial weights in a weighted ensemble in the "Create Ensemble Predictions" tab
    - *NA prediction values message*

        - A message detailing how many of the provided prediction values will be classified as NA
        - A prediction value will be classified as NA if the provided data is one of the following: 'NA', 'NaN', 'N/A', ‘n/a', 'na', blank, or a negative number
    - *Load model predictions*
        - Click to load model predictions from the data columns specified in the loaded .gdb object into the app

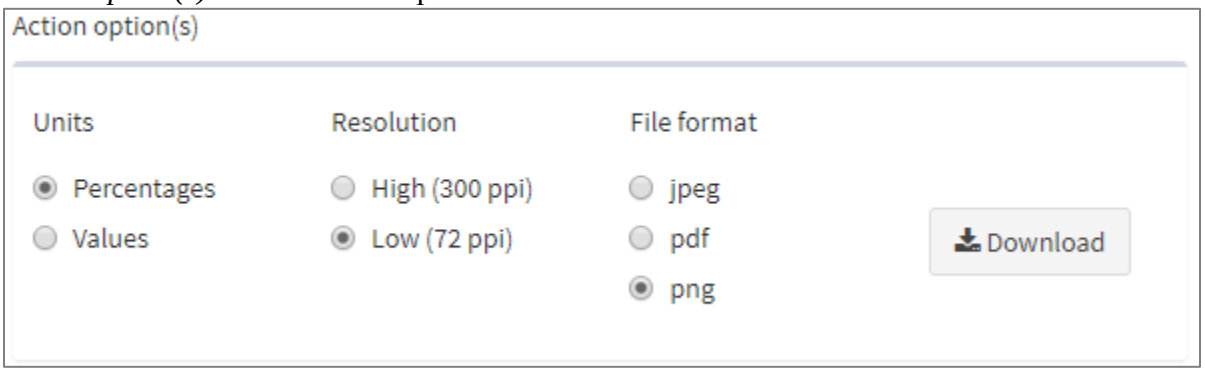
2.3. Loaded Model Predictions



- Table of loaded model predictions
    - Select or deselect a set of model predictions by clicking on the row of that set of model predictions in the table. Multiple sets of model predictions can be selected at one time. A row is highlighted grey-blue if it is selected.
    - The first table (displayed above) is shown when *Display additional information* is unchecked and reports information specified when the model predictions were being loaded in. This information consists of: the name of the file that was loaded, the names of columns from which prediction, error, and weight data were loaded, and the specified prediction type. The ‘Error’ and ‘Weight’ columns are left blank if “N/A” was specified for those columns.
    - The second table is shown when *Display additional information* is checked and reports information about the loaded model predictions. This information consists of: the resolution of the predictions (see below for more details), the number of cells in the grid of model predictions, the count of the non-NA predictions, the predicted abundance (if the predictions are absolute densities), and the range of the model predictions.
        - ‘Resolution’ column: When model predictions are loaded into the app, the app attempts to determine the resolution at which the predictions were made, meaning the distance between the centroids of adjacent grid cells.

The app only attempts to calculate the resolution in the native projection of the loaded model predictions, so if model predictions were generated on an equal area grid but were loaded into the app via a shapefile in WGS 84 geographic coordinates, then the app will not be able to calculate the resolution. This functionality is still in its infancy, so please check the reported resolution if you know the resolution of the loaded predictions.

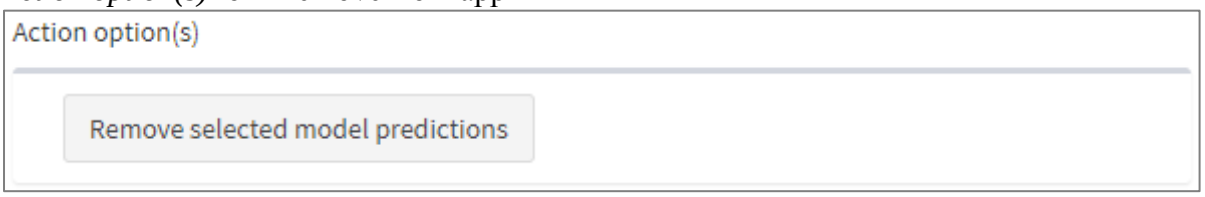
- *Action to perform with selected model predictions*
    - Select the what you wish to do with the set(s) of model predictions selected in the table above. The options in the *Action option(s)* box will change depending on what is selected here.
- *Action option(s)* for "Plot preview" (see image above)
    - *Preview model predictions using*
        - Select "Percentages" to have the scale of the previewed prediction values be the prediction value relative to the other prediction values in the set of model predictions. For instance, the color scheme will delineate, among other ranges, the top 2% of prediction values, the prediction values in the top 2% to 5%, and the prediction values in the top 5% to 10% of all of the prediction values.
        - Select "Values" to have the scale of previewed prediction values be based on the numerical values of the model predictions
    - *Preview selected model predictions*
        - Click to generate the preview in the "Preview" box. This can be a preview of a single set of model predictions or a multiplot of multiple sets of model predictions.
- *Action option(s)* for "Download preview"



    - *Units*
        - See *Preview model predictions using* under '*Action option(s)* for "Plot preview"'
        - Select "Percentages" to have the scale of the previewed prediction values be the prediction value relative to the other prediction values in the set of model predictions. For instance, the color scheme will delineate, among other ranges, the top 2% of prediction values, the prediction values in the top 2% to 5%, and the prediction values in the top 5% to 10% of all of the prediction values.
        - Select "Values" to have the scale of previewed prediction values be based on the numerical values of the model predictions

- *Resolution*
  - The resolution in which the preview will be downloaded. It is recommended to use the "High" resolution for multiplot previews.
- *File format*
  - The file format in which the preview will be downloaded.
- *Filename*
  - The filename of the download of the preview of selected set(s) of model predictions. This filename is reset to the default every time one of the options in the *Action option(s)* box is changed.
- *Download*
  - Click to download preview of selected set(s) of model predictions with the preview parameters and filename specified in the *Action option(s)* box.

- *Action option(s)* for "Remove from app"



  - *Remove selected model predictions*
    - Click to remove selected model predictions from the app.

3. Overlay Model Predictions Tab

3.1. Load Study Area Polygon

Insert text and screen shots here

3.2. Load Land Polygon

Insert text and screen shots here

3.3. Loaded Model Predictions

Insert text and screen shots here

3.4. Overlay Model Predictions

Insert text and screen shots here

4. Create Ensemble Predictions Tab

4.1. Overlaid Model Predictions

4.2. Create Ensemble Predictions

4.3. Created Ensemble Predictions

5. Evaluation Metrics Tab

5.1. Select Predictions to Evaluate

5.2. Load Validation Data

5.3. Calculate Metrics

5.4. Metrics

5.5. Metric Descriptions and References

6. High Quality Maps Tab

6.1. Select Predictions to Plot

6.2. Plot Parameters

6.2.1. Map range

6.2.2. Title and axis labels

6.2.3. Tick marks and tick labels

6.2.4. Color scheme of predictions

7. Export Predictions Tab

7.1. Select Predictions to Export

7.2. Export Predictions

8. Manual Tab

- Contains this manual

9. Submit Feedback Tab

- Fill out this Google form to:
    - Report errors in the tool. Please provide as much detail as possible
    - Describe functionality you would like to see in future releases
    - Comment on any facet of the tool