# MARS Kruger National Park

## Clone repsository and do basic setup

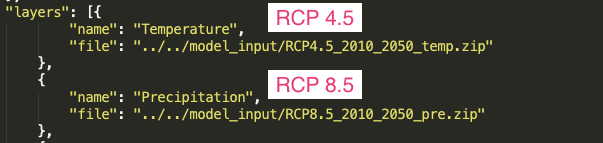
1. Pull the “model-kruger-national-park“ repository
2. Change into the freshly cloned repository
3. Open a Terminal there and execute the „setupSubmodules.sh“ script  
   (sh setupSubmodules.sh). This will set up the submodules and switch them to the correct branches

## Configure model

All configuration is done in the “config.json” file, located in the repositories root folder. Once these changes have been made, make sure you save the file.

### Switch between RCP 8.5 and 4.5 scenarios

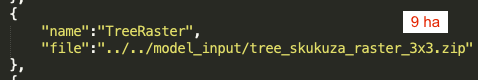
In the layers section of the config, there are two sections where you have to change the input files. The layers in question are “Temperature” and “Precipitation”. Both receive an input file that has either RCP4.5 or RCP8.5 in the name. Change the name according to your scenario and the correct file will automatically be loaded during model initialization.



In the agents section, under the configurartion for the tree agent there is a parameter called “IsScenario45not85” that has to be set as well. If the scenario shuld be for RCP 4.5 this parameters value must be set to “true”, otherwise to “false”.

### Increase/ decrease simulated area

The model can be run in a variety of spatial extents. Input files for 1 ha and 9 ha are present in the input folder. To change the resolution the “TreeRaster” layer has to be configured in the config file. The input for this layer is a zip file with a name ending in “…\_1x1.zip” or “…\_3x3.zip”. For scenarios with 1 ha use the “…\_1x1.zip” file. For 9 ha simulations use the other one.



Further down in the config file in the “agents” section, another change has to be made to the “tree”. As with the filenames above, the tree has a input file ending in “…\_1x1.csv” or “…\_3x3.csv”. If you want to run a 9 ha scenario you have to select the 3x3 file; otherwise you would use the 1x1 file for 1 ha scenarios.

As the amount of trees changes when the spatial extend increases, you have to adjust that as well. Inside the “tree” part of the config there is a field called “count”. Change its value to 9693 (amount of lines in the agent init file) for 9 ha and to 1077 for 1 ha scenarios.

### Herbivore pressure layer

This layer represents the pressure excercised through herbivores other than elephants. It has its own parameters that can be adjusted in the config file to tweak the tree growth over the time of the simulation. The following list describes each parameter.

* percentageOfTrees: once a year the herbivore pressure layer damages the trees in a manner that other herbivores would do over the course of a year. This parameter limits how many trees are affected (in percent).
* damageMultiplier: Multiplication factor for tree damage. If a tree species is to receive a 5% loss on its biomass, setting the multiplier to 2 increases this to 10%.
* juvenilesAdditionalDamage: Specifically targets juveniles and damages them. The value represents the percentage of juveniles that should be affected.
* caAdditionalDamage: Targets the CA tree species. The value is the percentage of trees that are to be damaged. Note that this targets all age groups.
* ttJuvenilesAddtitionalDamage: Add more damage to the juveniles of the generic tree species (tree tree). Only affects the juveniles in up to the specified percentage.
* caJuvenilesAdditionalDamage: Same as above, this time targeting the CA species.

### Run simulations

There is a script called “run.sh” located int the repositories root folder. This will start the model automatically for you.

### Analyze simulation results

Once a simulation has finished, or even during the simulation, the results can be analyzed with a combination of R scripts and Excel. Everything is located in the HAW Cloud inside the “Model\_Ulfia” -> “Analysis” folder.

Open the “Analysis.Rproj” project to bring up R Studio. In there the script “analysis.R” is responsible to go over the raw results from the “Tree.csv” file. Put your “Tree.csv” file from the simulation starter into the “00 input” folder in the HAW Cloud. Then you can run the script which creates new output in the “01 result” folder. At this point the R analysis is finished and you will proceed with Excel.

Open the file “analysis.xlsx”, select the AGB sheet and head to the tab labeled “Data”. In there you have to click on “Refresh All” which will bring up the finder. Navigate to the “01 result” folder and double click on the result files in the following order:

1. TreeABG.csv
2. TreeCounts.csv
3. TreeAge.csv
4. SB\_CountsPerAge.csv
5. CA\_CountsPerAge.csv
6. AN\_CountsPerAge.csv
7. TT\_CountsPerAge.csv
8. TreeDamageClasses.csv

Once all files have been updated you will most likely see updated diagrams in the Excel file. That might not be the case though. Make sure that you click on each diagram to see which columns and rows it references. Once you have selected the correct areas, you are looking at the final results.

## Commit model changes

Once you have added new code or changed something, you’ll have to commit these changes. Depending where they have been made, you will have to either do a commit in the main repository or one of the submodules. The procedure is the same in any case:

1. Inside the repository, go to the “model-mars-knp” submodule and check if there is something to commit. Should this be the case, commit it and push
2. Go to “model-savanna-trees” submodule and do the same as in step 1
3. Once you have made sure that you committed everything in the submodules, you can go back to the main repository and check if there a pending changes. Commit these and push them to gitlab.