# Transdisciplinary Nature Conservation: the IUCN Red List of Threatened Species from evaluation to practice

## Morning (9:00 - 12:30)

* Theoretical introduction
* Step by step SDM workflow tutorial with Wallace

### Introduction (9:00 - 9:30)

*Antoine*

* What are SDMs?
* What are SDMs used for?

### SDM workflow (9:30 - 10:30)

*Fede*

* Occurrence Data (Wallace component)
  + Data types (5 min)
    - Presence only; Presence/absence; Detection/non-detection <https://onlinelibrary.wiley.com/doi/10.1111/ecog.02445>
    - Biases (5 min)
    - Sampling
    - Detectability FR: is detectability « bias » ? Perhaps we should also give a second of info on bias and how we define it
    - Taxonomic biases
* Process Occurrence Data (Wallace component) (5 min)
  + Dealing with biases
    - Data filtering FR: isn’t « data filtering » the same as « spatial thinning » ?
    - Replicating bias in background locations
    - Model bias
    - Spatial Thinning (Wallace component)

## Morning break (10:30 11:00)

### SDM workflow (11:00 - 12:30)

*Luca*

* Environmental Data (Wallace component) (10 min)
  + Matching our rationale
  + Typical kinds of layers
    - Climate
  + Geology
  + Podology
  + Hydrology
  + Land use/cover
  + Distance to …  proxies of a process
  + Moving windows  landscape moderation of local ecological processes
  + WorldClim (Wallace component)
    - Alternatives: CHELSA, ESA-CCI-LC,...
* Process Environmental Data (Wallace component) (5 min)
  + Niche truncation
  + Variables correlation

*Fede*

* Partition Occurrence Data (Wallace component) (5 min) - Model validation - Spatial partition (Wallace component) (10 min)
  + Modelling algorithms
    - MaxEnt (Wallace component)
      * Feature classes (Wallace component)
    - Regularisation multipliers (Wallace component)
      * Classification performance (Wallace component)
    - ROC (Receiver Operating
    - AUC (Area Under the ROC Curve)
    - OR (Omission Rates)
    - AIC (Akaike Information Criterion)
    - TSS
    - Specificity and sensitivity

*Luca*

* Visualise (Wallace component) (10 min)
  + Response curves
  + Map predictions
    - Raw and Logistic outputs (Wallace component)
    - Binary output (Wallace component)
  + Project (Wallace component) (10 min)
    - New locations
    - Future environmental variables
    - Multivariate Environmental Similarity Surface (MESS) (Wallace component)
  + Extracting R code (Wallace component) (5 min)

*Fede*

* Defining our rationale (10 min)
  + What are you modeling, and why?
    - Predicting distribution (maps for present or future), inferring species-environment relationships
    - “Where are potential breeding sites?”
    - “Where are potential sighting locations?”
      * Mobile/sessile species
      * Home range sizes
  + “How will distribution change in the future?”
    - Examples of all of the above
  + Theory (10 min)
    - Niche theory <https://onlinelibrary.wiley.com/doi/10.1111/j.1461-0248.2007.01107.x>
    - BAM diagram <https://www.researchgate.net/publication/255722125_Variation_in_niche_and_distribution_model_performance_The_need_for_a_priori_assessment_of_key_causal_factors>
    - Implications of theory
  + Choosing appropriate resolution (10 min)
    - Temporal
    - Spatial
    - Thematic (<https://ace-lab.ca/assets_b/Riva-Nielsen2020_Article_SixKeyStepsForFunctionalLandsc.pdf>)

## Lunch break(12:30 - 14:00)

## Afternoon

* Theory on SDMs as Red List assessments tools
* Students to produce SDM for threatened species

## SDMs for Red List assessments (14:00 15:30)

### Theory

* Extent Of Occurrence (EOO)
* Area Of Occurrence (AOO, 2x2 km grid)
* SDMs as AOO

### Exercises

1. Redo SDM with one new species With R
2. EOO, AOO in R, compare with IUCN online
3. Area Of Habitat (AOH) for mountain tree (e.g. *Larix decidua*)
4. Compare SDM with IUCN AOO and EOO (and AOH if for *Larix decidua*)