**SoS Site Selection Meeting – 01/06/2018**

Attendees: James Lawson, Michelle Leishman, Rachael Gallagher

1. Update on actions since previous meeting
   * Investigated cluster analysis response to redundant variables
   * Investigated connectivity analysis
   * Wrote up timeline & milestones
   * Requested access to full NARCliM dataset
   * Revised histograms to include information about future climates
   * Revised entire codebase to use AOO/gridded locations instead of raw occurrence coordinates
   * Examined decision framework in detail and devised a strategy for implementing it in the app; discussed with Iadine Chades
   * Currently working on optimisation algorithm for autoselecting sites
2. Are some elements of the framework more important than others? (i.e. is future climate suitability more important than connectivity between sites?)
3. Which environmental variables should we use as default? How many?
4. Proposed timeline & milestones for remainder of project:
   * June 1st – 14h: complete initial rebuild of app, including site selection algorithm and full report output
   * June 18th- 21st: embed within OEH and get hands-on time with OEH staff, redesign elements if necessary
   * June 25st – 28th: complete app and deploy online
   * July – mid August: complete the gap analysis for all species, write report for OEH, begin manuscript preparation
   * Mid August – mid September: bring new human into world, take 1 month paternity leave
   * Mid September - ?: work on manuscript

Notes:  
*Connectivity / proximity analysis*

A full analysis of connectivity between locations using dispersal kernels and incorporating environmental barriers etc. was deemed too time consuming to complete within this project. Maximising connectivity between potential sites may or may not be an objective of site selection, depending on the species. We decided to incorporate an analysis of minimum geographic distance between sites, accompanied by information derived from land use spatial layers describing the proportions of major land uses along the path. This information will not be included in the site selection optimisation but may be of use to users of the tool.

*Site selection optimisation*

JL discussed the outcome of his meeting with Iadine Chades (CSIRO). Iadine thinks cluster analysis is not ideal for our purposes, and suggested a mathematical programming approach instead. We should explicitly define which variables we would like to be maximised or minimised in an optimal set of sites, and then write equations to achieve this. JL spent yesterday working on the maths and has found a way forward. The optimisation routine will consist of two stages.

In stage 1, potential sites will be ranked on ‘stability’ based on a linear combination of:

* Location within or outside of existing protected area network
* Future thermal suitability (2059-2069 NARCliM multimodel mean)
* Future rainfall suitability (2059-2069 NARCliM multimodel mean) [RG noted there may be some issues with model disagreement on rainfall predictions]

In stage 2, these rankings will be modified by the environmental representativeness of sets of *n* sites

* To do this, all possible combinations of *n* sites will be drawn from the set of potential sites, and a metric of environmental representativeness will be calculated for that set. The full set of potential sites may be truncated to only ‘stable’ sites, and/or by the app user, based on operational information.

There should be an option to enforce inclusion of existing SoS sites. If this option is selected, then further selected sites will represent the *optimal additions* to the current set of sites.

RG requested that JL begin a fresh codebase which no longer depends on Daisy’s codebase or git repository. JL agreed, given that that he will be largely rebuilding the app.

*Defining locations*

Locations will need to be defined in an automated fashion for the gap analysis. Including all occurrences within 1km of each other as a single site is a possibility, as is including all adjacent 1km grid cells. JL to discuss this value with James Brazill-Boast.

There could be some functionality in the app to either alter this 1km value, or to allow a user to group grid cells as part of a single location.

*User interface*

The workflow for the revised tool will be as follows:

* Load data, tool presents map with occurrences, existing sites etc.
* Run stability optimisation, tool presents table underneath map with information about optimally stable sites. Potential sites can be queried for information by clicking on map. Map will be interactive with table (combined highlighting etc.). Sites can be deselected and removed from the analysis using tickboxes next to each row of the table.
* Run environmental coverage optimisation. Tool shows optimal set of sites on map, perhaps as different colour to all other sites.
* Output ‘results’ tab

*Report to OEH & manuscript*

The report will consist of the auto-generated outputs describing the gap analysis for each of the ~433 species, plus a section summarising the results and providing some analytics.

RG is interested in looking at how expert-selected sites measure up when compared with site sets optimised for adaptive capacity. Comparison with randomly selected sets of sites might be a useful way to approach this.

*Proposed timeline & milestones*

JL mentioned that completion of the initial rebuild by June 14th may be optimistic in case the interactive map and table design proves challenging.