# Methods

## Paper elicitation

This review was focused only on papers which model occupancy across space and time using real data. To quality for inclusion, papers were required to fulfil each of these criteria:

* Multiple sites capable of exhibiting two or more occupancy states; including an occupied and unoccupied state.
* Multiple time-steps between which occupancy states can change, with transitions between states modelled as a Markovian process. These processes were usually, though not always, modelled as Colonisation and Extinction.
* Data must be collected from a natural system, not theorical or simulated. The data need not have been explicitly collected for the given paper.

Following internal discussions, four search terms[[1]](#footnote-1) were used to generate the initial pool of papers:

* Dynamic occupancy model
* Occupancy dynamics model
* Multi-season occupancy model
* Stochastic patch occupancy model

Each term was searched on Google Scholar (Appendix I), which presents papers based on an undisclosed algorithm for relevance to search term]\ [WE COMPARED WITH WEB OF SCIENCE]. The first 100 results (if available) for each term were considered for inclusions, although non-English papers, those clearly outside the field of ecology, or those not accessible via Google Scholar or the University of Melbourne library were immediately discarded. 287 papers remained for consideration at this stage.

## Preliminary and formal reviews

The pool of papers was stratified by search term and publication period[[2]](#footnote-2) and randomly ranked within their strata. Papers in the lowest 25% or lowest 5 (whichever was larger) were marked for inclusion in review. In cases where papers did not meet qualification criteria, they were replaced by the next lowest paper in their strata if available.

Authors developed a structured spreadsheet with categories for study metadata, objectives, taxa, location, survey methods, detection, covariates, modelling, and outputs. Findings were systematically noted as each paper was read; 75 papers were included at this stage.

Study questions were further refined after the preliminary review, and a revised spreadsheet with better articulated parameters was generated (Appendix II). The authors also determined that ‘Stochastic patch occupancy models’ represented a distinct model form from the other three search queries, with a unique history and distinct qualities. Therefore, we decided to exclude these papers (n = 21) from the formal review.

For the formal review, all remaining papers were re-read and their results logged in the spreadsheet. The final count of qualified papers was n = 54. All analyses were conducted in R.

1. Plus grammatic variation [↑](#footnote-ref-1)
2. 2000-2005, 2006-2010, 2010-2015, 2015-2021 [↑](#footnote-ref-2)