Ecological Knowledge System Regional Pilot State and Transition Models: Data Dictionary

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To cite individual models within this collection, please use the citation specified in the applicable model summary reports.

Summary

The data products provided as part of the 'Ecological Knowledge System: Regional Pilot State and Transition Models' DAP collection are described in this document.

This collection comprises two types of information: (1) comprehensive summary reports for state and transition models (STM) developed during the pilot phase of the Ecological Knowledge System project, (2) a JSON-formatted data files detailing the states, transitions, and disturbances for each model, and Excel files containing the same data in an easy-to-read format. These products were generated using the methods detailed in the Ecological Knowledge System Technical report (2025) and the Ecological Knowledge System Expert Elicitation Method report (being prepared for publication).

This document provides an overview of the collection's content, file storage structure and naming conventions. As new data is added to the collection, this document will be updated accordingly. Table 1 provides a summary of updates to the collection.

Table 1 Data dictionary document versions and updates

Collection Version	Date	Description
1.0	26/02/2025	Collection inception: STMs for the Burnett Mary region added to the collection
2.0	02/04/2025	Minor editorial changes
3.0	14/08/2025	Minor editorial changes
4	10/10/2025	STMs for the NCCMA region and Brigalow Belt added to the collection

Data dictionary

This collection comprises two key outputs from the Ecological Knowledge System (EKS):

- **Model summary reports (pdf):** Reports that summarise each STM developed by the EKS during the pilot phase.
- **STM data (JSON and Excel) files:** Details of states and transitions in the state and transition models in .JSON and Excel format. This data is the final output of developing a state and transition model. The data is identical between the two formats, though they have different purposes. The JSON format is widely used for data interchange between various computer systems and applications; for example, for transfer of STM information to the PLANR tool (https://planr.gov.au/). The Excel format is more convenient for people to read and use and is made available for that reason.

State and transition model summary reports

Each summary report provides comprehensive descriptions of the common modifications and restoration pathways for several ecosystem types in each pilot region. While the specific content of each report may vary, key information typically includes:

- report authorship
- contributing experts
- modified state names and attributes
- transition descriptions and probabilities (where elicited)

- alignment of states within the VAST-EKS modified state template
- STM diagrams
- maps and tables delineating the geographic areas and vegetation types, respectively, to which the STM applies.

Reports and data are grouped according to their pilot region and archetype model as described in the Australian Ecosystem Models Framework. The file name convention for each STM report is **region_archetype.pdf.** For example, the report describing the STM for eucalypt forests in the Burnett Mary region in Queensland is **BM_eucalypt_forests**.

STM data file structure

The Excel and JSON formatted data in this collection use the same field headings with the same data values but are structured differently. The Excel data is presented in sheets, whilst the JSON data contains a similarly named JSON object and is structured hierarchically. The names and descriptions for the Excel data sheets and JSON objects are described in Table 2.

Table 2 Excel sheet description

Sheetname	Description
metadata	The metadata that describes the model.
states	All states of the state and transition model.
transitions	Every combination of start and end states for each state and transition model with unique transition_id and binary indicator of plausible/implausible at two time-intervals.
causal_chain	A causal chain represents the sequence of interactions among drivers,abiotic factors, and hazards that collectively influence the likelihood, speed, and direction of a transition between ecosystem states. For each transition these factors are described.
driver_list	Master list of drivers with unique id.
vast_key	All overstorey-understorey classes that describe an ecosystem state are nested within the vast_class framework with unique id for vast and sub-states (developed for Ecological Knowledge System template). Contains vast-level expert elicited condition ranges.
eligible_start_states	Where a model has been aligned to a nature repair method, this contains the method eligible starting states.
eligible_end_states	Similar to above, this contains the method-eligible end states.
eligible_transitions	This section contains a list of method eligible transitions.
decision_tree	If a decision tree is necessary to identify the starting state, that information goes in this section.
contributing_experts	A list of experts who have contributed to the development of the state and transition model.

STM Datafile naming convention

The naming convention of the data files follows the definitions for the summary reports, as defined above. For example, for the eucalypt forests STM in the Burnett Mary region in Queensland, the Excel file will be **BM_eucalypt_forests.xlsx** and the JSON file differing in suffix is **BM_eucalypt_forests.json.**

Core STM data model

This section details the data model schema for the STM data (.JSON and Excel). The STM is modelled as a core model class with aggregations for states and transitions, as seen in the class diagram (Figure 1). The attributes of the entities are drawn from the EKS STM template.

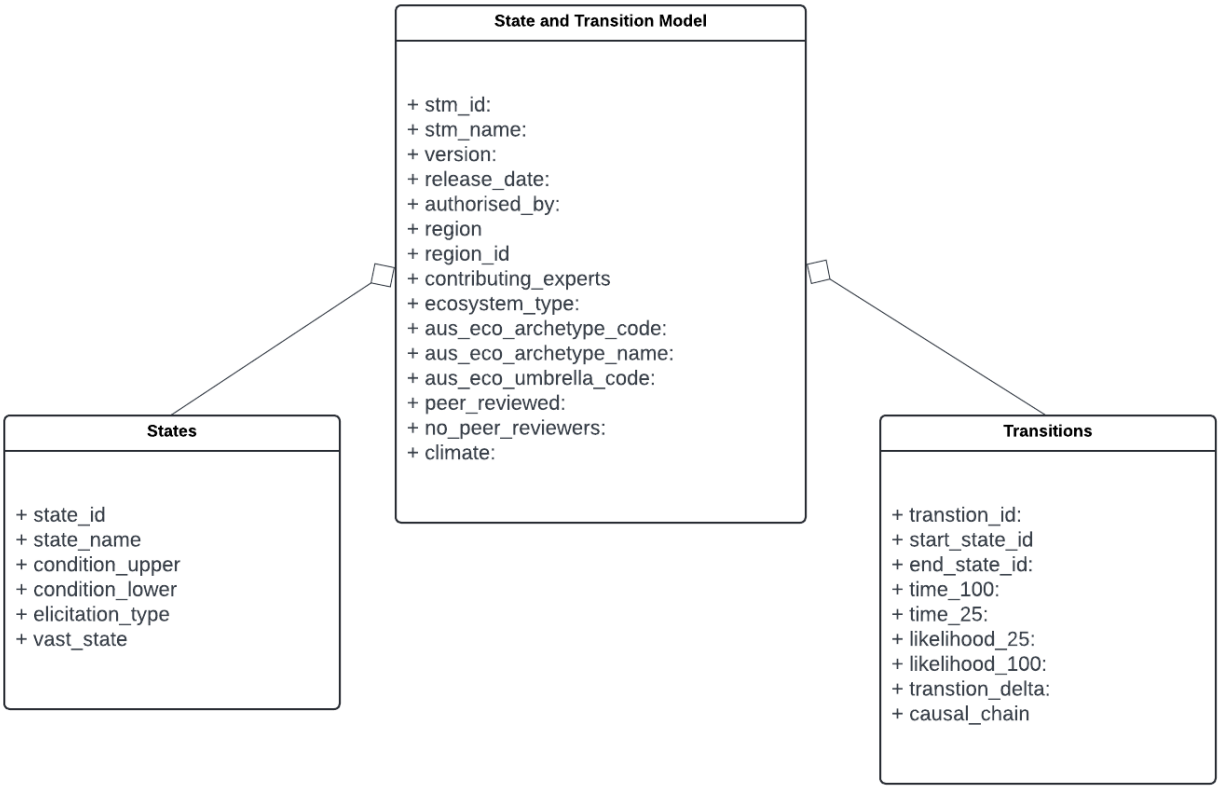

Figure 1 Data model schema for the STM data model

The specific meaning of the above attributes and data types (suitable for implementation as a data model) of the model entities are described in Table 3 to Table 9.

Data descriptions

This section contains a more detailed description of the entities and fields used in the JSON. Within the Excel spreadsheet, the data.

Table 3 State and transition model metadata model description ('metadata' sheet in the Excel spreadsheet)

Field	Data type	Description
stm_id	Number	Unique identifier for each state and transition model.
stm_name	Text	Name of the state-transition model (STM).
Version	Text	Release version of the model.
release_date	Text	Release date of the state and transition model.
authorised_by	Text	Model authorising person.
region	Text	Region of model applicability. This could be either an NRM region or IBRA sub-region.
region_id	Number	This index links to more descriptive information of the region, including the geometry.
ecosystem_type	Text	Ecosystem type of model.
aus_eco_archetype_code	Text	A link or pointer to the Australian Ecosystems Models Framework archetype for the model.
aus_eco_archetype_name	Text	The name of the archetype model.
aus_eco_umbrella_code	Number	The Australian Ecosystems Models Framework umbrella class code for the model.
peer_reviewed	Text	The state of peer review (yes or no).
no_peer_reviewers	Number	The number of peer reviewers who have reviewed this model.
Climate	Text	The climate of the region of applicability. This should be drawn from a controlled list.

Table 4 States data model description ('states' sheet in Excel spreadsheet)

Field	Data type	Description
state_id	Number	Unique identifier for each state
state_name	Text	Name of the state
vast_state	Object	A pointer to a definition of VAST class and eks_understorey and eks_overstory descriptions
eks_condition_estimate	Number	The single value estimate for the ecosystem condition.
condition_lower	Number	Lower bound for the state's condition
condition_upper	Number	Upper bound for the state's condition
ellicitation_type	Number	A pointer to a definition of VAST class and eks_understorey and eks _overstory descriptions
attributes	Text	A place holder for additional attributes that describe the state.

Table 5 Transitions data model description

Field	Data type	Description
transition_id	Number	Unique identifier for each transition also known as transition_id
start_state_id	Number	A reference to the starting state defined in the states table (start state).
end_state_id	Number	A reference to the end state defined in the states table (end state).
time_25	Boolean	A boolean value indicating if the direct transition is plausible within 25 years.
time_100	Boolean	A boolean value indicating if the direct transition is plausible within 100 years.
likelihood_25	Number	The probability that the transition will occur in 25 years.
likelihood_100	Number	The probability that the transition will occur in 100 years.
transition_delta	Number	The ecosystem condition change likely to be generated if this transition occurs
notes	Text	A place holder for additional notes related to this transition.
causal_chain	Object	A pointer to the causal for this transition.

Table 6 causal_chain data model description

Field	Data Type	Description
transition_id	Number	The id of the transition that this causal chain applies to.
start_state	Text	The name of the transition starting_state.
end_state	Text	The name of the transition end_state.
chain_part	Text	The category of the chain_part (management driver, favourable abiotic process, biotic process, hazard).
driver	Text	A description of the causal chain transition driver.
driver_index	Text	The index to the driver information that is in the driver-controlled list.
driver_group	Text	The category for the driver from a pre-defined list of driver groups.

Table 7 driver_list data model description

Field	Data Type	Description
driver_group	Text	The driver_group that this driver belongs to.
driver	Text	A description for the driver.
driver_id	Number	A numeric identifier for the driver.

Table 8 decision_tree model description

Field	Data Type	Description
transtion_id	Number	Foreign key or pointer referencing the generic model transition.
condition_gain	Number	Condition gain or change associated with the transition.
target_level	Text	The restoration target level for the transition.

Table 9 contributing_experts data model description

Field	Data Type	Description
transtion_id	Number	Foreign key or pointer referencing the generic model transition.
condition_gain	Number	Condition gain or change associated with the transition.
target_level	Text	The restoration target level for the transition.

Collection Data Products

Table 10 describes the currently available STM model reports and data.

Table 10 List of available Ecological Knowledge System Pilot STM summary reports

Filename	Description	Geographic area
BM_eucalypt_forests	Regionally specific STM for eucalypt forests of the Burnett Mary region in southern Queensland	The Burnett Mary region is located in south-eastern Queensland and includes the Baffle, Burnett, Kolan, Burrum and Mary River catchments
BM_rainforests	Regionally specific STM for rainforests and vine thickets of the Burnett Mary region in southern Queensland	The Burnett Mary region is located in south-eastern Queensland and includes the Baffle, Burnett, Kolan, Burrum and Mary River catchments
NCCMA_eucalypt_forests	Regionally specific STM for eucalypt forests of the North Central Catchment Authority region in Victoria	The North Central Catchment Authority region is located in Victoria and includes the four river catchments of the Campaspe, Loddon, Avoca and Avon-Richardson rivers.
NCCMA_eucalypt_woodlands	Regionally specific STM for eucalypt woodlands of the North Central Catchment Authority region in Victoria	The North Central Catchment Authority region is located in Victoria and includes the four river catchments of the Campaspe, Loddon, Avoca and Avon-Richardson rivers.
NCCMA_grassy_mallee	Regionally specific STM for grassy mallee woodlands of the North Central Catchment Authority region in Victoria	The North Central Catchment Authority region is located in Victoria and includes the four river

Filename	Description	Geographic area
		catchments of the Campaspe, Loddon, Avoca and Avon-Richardson rivers.
NCCMA_tussock_grasslands	Regionally specific STM for tussock grasslands of the North Central Catchment Authority region in Victoria	The North Central Catchment Authority region is located in Victoria and includes the four river catchments of the Campaspe, Loddon, Avoca and Avon-Richardson rivers.
BB_brigalow_woodlands	Regionally specific STM for brigalow woodlands of the Brigalow Belt	The Brigalow Belt is composed of two bioregions (North and South), which extend from north central NSW to the east coast of central QLD.
BB_eucalypt_woodlands	Regionally specific STM for eucalypt woodlands of the Brigalow Belt	The Brigalow Belt is composed of two bioregions (North and South), which extend from north central NSW to the east coast of central QLD.
BB_vine_thickets	Regionally specific STM for vine thickets of the Brigalow Belt	The Brigalow Belt is composed of two bioregions (North and South), which extend from north central NSW to the east coast of central QLD.

Storage Structure

Data in this collection are organised in the following folder structure.

- 🗀 Region [e.g. Burnett-Mary (QLD)]
  - 🗀 Archetype [e.g. Eucalypt Forests]
    - 🗀 Excel [e.g. BM_eucalypt_forests.xlsx]
    - 🗀 JSON [e.g. BM_eucalypt_forests.json]
    - 🗀 STM Summary report [e.g. BM_eucalypt_forests.pdf]