Modelling climate suitability for exotic plants in Australia under future climate

Final report on the potential impact of climate change on the distribution of national priority weeds in Australia

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Contents

Summary

Weeds and climate change are both significant threats to biodiversity and pose considerable challenges to managers of protected areas, such as national parks. Weeds are likely to respond to climate and atmospheric change (e.g. increased temperatures, changed rainfall patterns, and elevated CO_2 levels) in complex ways but knowledge as to the magnitude and direction of these responses is very limited.

Species distribution models (SDMs) based primarily on climate data provide a first-step tool for assessing potential changes in the geographic range of species under climate change. These models can play an integral part in developing proactive management strategies for current and emerging weed threats.

We produced SDMs for 107 terrestrial and aquatic non-native plant species in Australia which incorporates the 20 Weeds of National Significance (WoNS), the WoNS shortlist, the National Alert List, and four major invasive grass species using the MaxEnt modelling program. Species location data came primarily from publicly available herbarium records. We built our models on the baseline climate of the late 20th Century provided by the WorldClim data set, and projected these models onto averaged future climate in three decades centred on 2020, 2050 and 2080. The latest climate data from the Inter-governmental Panel on Climate Change (IPCC) repository for the IPCC Fourth Assessment Report (AR4) was used for models of future climate. We also developed several novel ways of presenting and interpreting the data generated.

The results suggest two broad patterns of change:

- Species with extensive current distributions in northern Australia are predicted to encounter increasingly favourable environmental conditions and are likely to extend their geographical range and/or become more abundant within existing locations.
- Most species in south-east Australia are predicted to encounter much less suitable climatic conditions and are likely to show a south-east geographic range shift and/or decrease in climatic suitability.

There are two important points to note. First, many of the modelled species have not yet reached their potential distribution under current climate conditions and therefore the distribution and abundance of species may continue to increase from current locations despite a predicted reduction in favourable conditions under future climate. Second, the 107 species modelled are a small proportion of the pool of more than 2,800 naturalised plants species present in Australia. At least 12 new species are added to this naturalised species pool each year. In order to manage protected areas for biodiversity conservation under future climates, it is critical to assess the threat from these potential future weed species in addition to the 107 nationally-recognized species modelled here.

The methods we have developed can be used to rapidly and efficiently screen this pool of naturalised exotic species to provide indications of emerging threats to biodiversity under climate change.

The initial modelling presented in this report can be used to:

- develop weed threat scenarios at a range of geographic levels and management areas (e.g. individual national parks, catchments or other areas of interest), and
- identify future “invasion hotspots” to help prioritise control and resources, as well as limit impacts.

Introduction

Invasive exotic plant species (weeds) represent a major threat to biodiversity, primary production and human health in Australia. For example, Coutts-Smith and Downey (2006) found that weeds threatened 45% of the 945 species listed as endangered under the NSW *Threatened Species Conservation Act 1995* and the *Fisheries Management Act 1994*. They also noted that the impact of weeds on threatened biodiversity was the second most important threat after land clearing.

The cost of addressing the weed threat to biodiversity is high. NSW National Parks and Wildlife Service currently spends approximately $10 million per year on weed control. This has the potential to increase significantly in the future as weed species respond to climate change. Current weed species may shift their distribution under climate change and many of the approximately 2,800 naturalised species that occur in Australia may become invasive under changed climatic conditions. Recent research has highlighted the complexity of mechanisms by which plants respond to increased average temperatures, changed rainfall patterns, and elevated CO_2 levels (e.g. Johnston & Reekie, 2008; Morgan *et al.*, 2007).

The combination of high management cost, broad impacts on biodiversity, agriculture and human health, as well as uncertainties about the nature of the impact of climate change on existing and emerging weed species in Australia, has led all levels of government to identify weed research with respect to climate change as a high priority (Natural Resource Management Ministerial Council, 2007). This focus has also led to Key Actions in climate change adaptation strategies (e.g. NSW DECC's *Climate Change & Biodiversity Adaptation Plan, Climate Change Impacts and Adaptation Research Program* and the draft *NSW Climate Change Action Plan*).

Thus, identification of emerging weed threats under climate change is an urgent task. It must also be dynamic, adapting to new data on species locations, or new environmental data such as improved future climate projections. A cost-effective monitoring or surveillance approach is needed that can produce useful guidance while research continues into mitigating impacts on biodiversity and prioritisation processes (e.g. Downey *et al.*, 2010).

Species distribution modelling (SDM), although applied to plant species for more than twenty years (Box, 1981; Busby, 1986) and constrained in a number of ways (Pearson & Dawson, 2003; Araújo & New, 2007; Heikkinen *et al.*, 2006), is now widely acknowledged as the most effective tool to use for initial assessment of species responses to climate change. Over the past decade these methods have been applied to invasive species in various parts of the world (Le Maitre *et al.*, 2008; Richardson & Thuiller, 2007; Peterson, 2003; Richardson & Rejmánek, 2004; Rouget *et al.*, 2004). With the exception of Scott *et al*. (2008) and Steel *et al*. (2008) most modelling of non-native plant species in Australia has been undertaken for relatively few weed species (Chejara *et al.*, 2010; Kriticos *et al.*, 2010; Kriticos *et al.*, 2009; Kriticos *et al.*, 2000; Kriticos *et al.*, 2003b; Kriticos *et al.*, 2003a; Kriticos *et al.*, 2011; Kriticos *et al.*, 2005; Potter *et al.*, 2009; Watt *et al.*, 2010; Beaumont *et al.*, 2009a), or on a regional basis (Kriticos *et al.*, 2010; Steel *et al.*, 2008). In this report we provide results from an Australia-wide bioclimatic modelling approach that provides a first-step assessment of potential changes in geographic distribution of key weed species in response to climate change.

We applied MaxEnt, a sophisticated species distribution modelling (SDM) tool (Phillips *et al.*, 2006; Phillips & Dudik, 2008), and the latest projections of future climate from the Fourth Assessment Report (AR4) of the Inter-governmental Panel on Climate Change (IPCC)

(Solomon *et al.*, 2007), to identify climatically suitable areas under current, 2020, 2050 and 2080 climate scenarios for terrestrial and aquatic exotic plant species in Australia from the full list of Weeds of National Significance (WoNS) and National Alert List, plus four major invasive grass species of significance.

In this report we briefly describe the methods we have developed, summarise the modelling results, and indicate how these results can be scaled-up to provide a better indication of current and emerging weed threats in Australia.

e present maps showing the potential distribution of the 107 weed species under current climate and predicted climate for 2020, 2050 and 2080. Aspects of this work have also appeared in a number of published works and manuscripts in preparation (see below). Important future steps in the modelling process will be to incorporate estimates of rates of spread, responses to changed CO_2 levels and land-use in order to improve model predictions.

Our work highlights the value of examining current weed priorities with respect to future climate conditions. However, there is also an emerging issue of recognising potential future threats of exotic plant species not currently recognised as WoNS or Alert species. The pool of 2,800 exotic naturalised species that occur in Australia represents a potential threat to biodiversity, agriculture and human health. Thus a pressing question is: Which species in the increasing pool of naturalised species are likely to respond positively to climate change and therefore become the next generation of weeds? Alternatively, which species are likely to respond negatively, and thus reduce the need for prioritized action? We recommend that the protocols developed for this project are extended to provide a rapid and efficient first assessment of risk posed by this large pool of naturalised exotic species.

Published outputs from species distribution modelling

Gallagher, R.V., Hughes, L., Leishman, M.R. & Wilson, P.D. (2010) Predicted impact of exotic vines on an endangered ecological community under future climate change. *Biological Invasions* 12:4049-4063.

Beaumont, L.J., Gallagher, R.V., Downey, P.O., Thuiller, W, Leishman, M.R. & Hughes, L. (2009) Modelling the impact of *Hieracium* species on protected areas in Australia under future climate. *Ecography* 32, 757-764.

Beaumont, L.J., Gallagher, R.V., Downey, P.O., Thuiller, W, Leishman, M.R. & Hughes, L. (2009) Climatic niche shifts among invasive species can lead to underestimations of current and future biological invasions. *Diversity and Distributions* 15:409-420.

Gallagher, R, Beaumont, L., Downey, P.O., Hughes, L., and Leishman, M.R. (2008) Projecting the impact of climate change on bitou bush and boneseed distributions in Australia. National Bitou Bush and Boneseed Forum Proceedings. *Plant Protection Quarterly* 23, 37.

Gallagher, R.V., Beaumont, L.J., Downey, P.O., Hughes, L. & Leishman, M.R. (2008) *Weeds in a warmer climate: a tool for assessing tolerance to changing temperatures.* 16th Annual Australian Weeds Conference - Cairns, Queensland, May 2008.

Downey, P.O., Gallagher, R.V., Beaumont, L., Leishman, M.R., & Hughes, L. (2007) Weeds and climate change: what do we know and where to from here. 14th NSW Weeds Conference, University of Wollongong 25-27 September 2007.

Gallagher, R., Beaumont, L., Downey, P.O., Hughes, L., and Leishman, M.R. (2006). Assessing the potential impacts of climate change on weeds in New South Wales: establishing priorities. Proceedings of the 15th Australian Weeds Conference, Adelaide.

Wilson, P.D., Downey, P.O., Leishman, M.R., Gallagher, R., Hughes, L. & O'Donnell, J. (2009) Weeds in a warmer world: predicting the impact of climate change on Australia's alien plant species using MaxEnt. *Plant Protection Quarterly* 24, 84-87.

Wilson, P.D. (2011) Distance-based methods for the analysis of maps produced by species distribution models. *Methods in Ecology and Evolution*. Article first published online: 2 JUN 2011 DOI: 10.1111/j.2041-210X.2011.00115.x

Manuscripts in preparation

Downey, P.O., Beaumont, L.J., Gallagher, R.V., Leishmam, M.R. and Hughes, L. (in prep.) Using climate change predictions to evaluate the effectiveness of banning the importation of alien plants: *Chrysanthemoides monilifera* a case study.

Downey, P.O., Wilson, P.D., O'Donnell, J., Leishman, M.R. and Hughes, L. (in prep.) Managing invasive alien plants in the advent of climate change: the need for triage.

Gallagher, R, Downey, P.O., Wilson, P.D., Hughes, L., & Leishman, M.R. (in prep.) Hotspots of invasion under climate change; a conservation approach.

O'Donnell, J., Gallagher, R.V., Wilson, P.D., Downey, P.O., Hughes, L. & Leishman, M.R. (In review). Current and future climate hotspots for invasive plants in Australia. *Global Change Biology*.

Wilson, P.D., Downey, P.O., O'Donnell, J., Leishman, M.R. & Hughes, L. (in prep.) Predicted distribution of exotic grasses in Australia under climate change.

Wilson, P.D., Downey, P.O., O'Donnell, J., Leishman, M.R. & Hughes, L. (in prep.) Predicted distribution of exotic trees and shrubs in Australia under climate change.

Methods

Selection of species for modelling

We used established lists of priority weed species in Australia to guide our modelling program. We selected all species and species aggregates from the full list of 72 declared and shortlist Weeds of National Significance (WoNS). In addition, we modelled all species on the National Alert List, as well as four additional perennial grass species. In total, 107 species were modelled (see full list below).

Species occurrence data

The primary sources of current distribution data for the 107 species were Australia's Virtual Herbarium (AVH, www.anbg.gov.au/avh) and the Global Biodiversity Facility (GBIF, www.gbif.org). A small number of supplementary records were added from published literature when insufficient data were available from these primary sources. A summary of the number of occurrence records for the modelled species is provided as part of the species accounts.

We considered it inappropriate to model sub-species because of the uncertainty of data at this taxonomic level obtained from public data repositories. Species nomenclature was standardized using the Australian Plant Name Index (APNI). Location data for each species was plotted using DIVA GIS (www.divagis.org) to identify records with obviously inaccurate latitude and longitude records.

Climate data

Baseline (or "current") climate was represented by the WorldClim current climate (www.worldclim.org). The WorldClim dataset is a high-resolution climate average for the period 1961 to 1990 covering the globe and spans the time over which the majority of occurrence records were collected. We used data at a grid cell size of 5 arc minutes (approximately 8km by 8 km at mid-latitudes in Australia) because this was a reasonable fit to the average latitude and longitude resolution of the occurrence coordinates.

Future climate was represented by the average of four general circulation models (GCMs) produced by a range of research groups as part of the Inter-governmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) (Solomon *et al.*, 2007). We used models by:

Bjerknes Center for Climate Research, Norway (BCCR)

The Institute of Numerical Mathematics, Moscow Climate Model 3 (INMCM3)

CSIRO Australia Mark 3.5 model (CSIRO3.5)

The Japanese consortium comprised of the Center for Climate System Research (University of Tokyo), National Institute for Environmental Studies, and Frontier Research Center for Global Change (MIROC3.2 medres)

Data for these GCMs were obtained from the Climate Model Inter-Comparison Project website (www.cmip.org). All four GCMs have been shown to model climate conditions for the Australian region over the 20th century (comparing model predictions to observed climate) with high skill (Suppiah *et al.*, 2007). In addition, only these four models out of the 23

produced for the IPCC AR4 provided monthly maximum and minimum temperature, and monthly precipitation for all months and years from 2000 to 2100. Other highly skilled GCMs only provide monthly data from 2046 to 2100 which severely limits their utility for medium-term species distribution modelling.

GCM output is provided at very coarse scales (between 1.875 degree squares but up to 4 by 5 degree grid cells) and requires numerical interpolation to create finer grids for species distribution modelling. We used bicubic spline interpolation (Press *et al.*, 2002) to interpolate all four GCMs to the same 5 arc minute grid as the WordClim current climate data. We then used the anomaly method to produce monthly mean temperature and rainfall surfaces for the decades centred on 2020, 2050 and 2080. That is, the decade climate average for 2020 is the average from 2016 to 2025.

Maximum and minimum temperature data and monthly precipitation data were used to compute the nineteen standard bioclimatic variables (Nix, 1986; Busby, 1986; Busby, 1991) from the interpolated GCM grids. These computed variables exhibit very high levels of inter-correlation (multi-collinearity) which can create instability in predictions and unclear relationships when used in many modelling methods (Morlini, 2006; Paris, 2001; Faraway, 2005). We therefore chose to limit the number of bioclimatic variables used in our models to Annual Mean Temperature, Driest Monthly Precipitation, Isothermality, Maximum Temperature, Mean Monthly Temperature Range, Minimum Temperature, Precipitation Seasonality, and Wettest Monthly Precipitation. This subset captures key biophysical limits to plant growth, survival and reproductive success by representing limiting temperature and precipitation conditions, and climate equitability (e.g. precipitation seasonality).

Species distribution models

Species distribution models (SDMs) quantify the relationship between environmental conditions and the observed occurrence of species.

Models are built using baseline climate data and then projected onto a range of climate 'futures' to track the occurrence of climatically suitable habitat. When using SDMs to predict the potential distribution of weed species, data from both the native and invaded range must be used as input to avoid underestimation of the extent of climatically suitable habitat (Beaumont *et al.*, 2009b; Broennimann *et al.*, 2007; Hierro *et al.*, 2005; Mau-Crimmins *et al.*, 2006). Therefore, we used all available species occurrence data (i.e. native and introduced ranges) to build our models and then projected the distribution models onto the three future times (2020, 2050 and 2080) to provide an indication of medium and long-term trends in favourable climate conditions. The geographical distribution of favourable climate provides an indication of maximum *potential* species distribution within Australia.

There are many methods for modelling the relationship between spatial distribution and the environmental envelope or realised niche of an organism. Elith *et al*. (2006) and Graham and Hijmans (2006) provide an extensive review and comparison of relative performance of many methods. For this preliminary set of models we chose to use MaxEnt (Phillips *et al.*, 2006), a very efficient machine-learning method with consistently high performance (Elith *et al.*, 2006; Graham & Hijmans, 2006).

MaxEnt models were fitted using default settings except that we used a new random number seed for each model and trained on a random selection of 90% of the data for each species, testing model fit on the remaining 10%. Ten cross-validation or replicate models were made for each species by randomly choosing the location records included in the training and test

sets. Averaged maps for the 10 runs were used in subsequent analyses to represent "current" climate suitability.

It is important to account for variation in SDM output due to differences in climate predictions produced by GCMs (Beaumont *et al.*, 2008). For each species, each replicate model fitted to current climate was projected onto climate data for each GCM at the three future times creating an ensemble of models. These future models were used to produce mean predicted climate suitability maps for 2020, 2050 and 2080 for each species. That is, the 2020 mean map was created by averaging predicted suitability in each grid cell for the forty maps (four GCMs and 10 projected replicate MaxEnt models for each GCM) for 2020. These mean maps indicate a consensus of probable conditions given the variation in predictions across the four GCMs, particularly for rainfall distribution. This is referred to here as the habitat suitability.

Additional analysis

Overall index of climate suitability:

For each mean map we computed a simple index of overall climate suitability for the Australian continent. This index is simply the sum of the MaxEnt suitability scores across each map and is related to measures of mean density or intensity in spatial point patterns (Diggle, 2003) or image brightness (Russ, 1995). It provides a method for comparing average suitability between times (Wilson, 2011). In the species accounts we present the relative change in overall climate suitability between current and 2050 climate conditions to provide an indication of the trend in climate suitability for each species. A negative percentage change indicates that the species is predicted to experience increasingly unfavourable climate conditions, while a positive value indicates an overall increase in favourable conditions.

Change in Centre of Mass of suitable climate:

The index of overall climate suitability is independent of spatial distribution of suitability values. That is, the same overall suitability score can exist for two maps with very different spatial distributions of values. We have therefore also calculated the Centre of Mass (CoM) of the spatial distribution of suitability (Woillez *et al.*, 2007; Yates *et al.*, 2010). The change in CoM between current and 2050 was calculated to provide a broad measure of the direction of spatial change for climate suitability. This is summarised in the Species Accounts to indicate 'Spatial Trend'.

Species accounts

Description and species lists

Each species account presents information about each species, maps showing the projected areas of climate suitability, and a summary of modelling outcomes. The maps represent predicted distribution of favourable climate at each of four times (i.e. Current, 2020, 2050 and 2080). They do not represent precise predictions of occurrence but show the potential distribution based on currently understood relationships between climate and species occurrence. The sequence of four maps for a species should be interpreted as indicating the potential for changes in geographical distribution under climate change.

Warmer colours (yellow to red hues) indicate highly favourable climate, and cool colours (shades of blue) indicate much less favourable conditions. Visual inspection focussing on the extent of warmer colours thus provides an indication of trends or patterns of change in climate suitability.

It is important to note that for invasive species these maps are not species distribution maps, but maps of favourable climatic conditions. Invasive species are still in the process of expanding to fill favourable environments and therefore the maps represent *potential distribution* based on our current understanding of the relationship between species occurrence and environment

In the tables below we provide a list of all modelled species, classified into the following four groups:

WoNS species, sub-divided into declared and short-listed species;

Alert list species; and,

Additional invasive grass species.

We have followed the latest taxonomic decision and used the names *Vachellia karroo* (Alert list) and *V. nilotica* (WoNS declared) in place of *Acacia karroo* and *A. nilotica* respectively. Note that *Bassia scoparia* is listed on both the WoNS shortlist and the Alert list.

WoNS declared

Species	Family	Common name(s)
Alternanthera philoxeroides	Amaranthaceae	Alligator weed
Annona glabra	Annonaceae	Pond apple
Asparagus asparagoides	Asparagaceae	Bridal veil, Bridal creeper, Bridal veil creeper, Baby smilax, Smilax
Cabomba caroliniana	Cabombaceae	Cabomba, Fanwort, Carolina watershield, Fish grass, Washington grass, Watershield
Chrysanthemoides monilifera	Asteraceae	Bitou bush, Boneseed
Cryptostegia grandiflora	Apocynaceae	Rubber vine

Hymenachne amplexicaulis	Poaceae	Hymenachne
Lantana camara	Verbenaceae	Lantana
Mimosa pigra	Fabaceae	Mimosa
Nassella neesiana	Poaceae	Chilean needle grass
Nassella trichotoma	Poaceae	Serrated tussock
Parkinsonia aculeata	Fabaceae	Parkinsonia
Parthenium hysterophorus	Asteraceae	Parthenium weed
Prosopis spp. [1]	Fabaceae	Mesquites
Rubus fruticosus agg. [2]	Rosaceae	Blackberry
Salix spp. [3]	Salicaceae	Willows
Salvinia molesta	Salviniaceae	Salvinia
Tamarix aphylla	Tamaricaceae	Tamarisk, Athel pine, Athel tree, Flowering cypress
Ulex europaeus	Fabaceae	Gorse, Furze, Whin
Vachellia nilotica	Mimosaceae	Prickly acacia

[1] Includes *Prosopis glandulosa*, *P. juliflora*, *P. pallida* and *P. velutina*.

[2] A species aggregate of some taxonomic complexity, we followed Evans *et al*. (2007) and included *Rubus anglocandicans*, *R. cissburiensis*, *R. echinatus*, *R. erythtrops*, *R. laciniatus*, *R. leightonii*, *R. leucostachys*, *R. phaeocarpus*, *R. polyanthemus*, *R. riddelsdellii*, *R. rubritinctus*, *R. ulmifolius*, and *R. vestitus*.

[3] Includes *Salix alba*, *S. atrocinerea*, *S. atrocinerea*, *S. babylonica*, *S. caprea*, *S. chilensis*, *S. fragilis*, *S. glaucophyloides*, *S. humdoltiana*, *S. matsudana*, *S. nigra*, *S. oleiofolia*, *S. pupurea*, *S. triandra*, *S. viminalis* and *S. vitellina* and hybrids between these taxa.

WoNS shortlist

Species name	Family	Common name(s)
Anredera cordifolia	Basellaceae	Madeira vine
Argemone ochroleuca	Papaveraceae	Mexican poppy
Asparagus declinatus	Asparagaceae	Bridal veil
Bassia scoparia	Chenopodiaceae	Kochia
Bryophyllum delagoense	Crassulaceae	Mother of millions
Calotropis procera	Apocynaceae	Calotrope
Celtis sinensis	Cannabaceae	Chinese elm, Japanese hackberry
Cortaderia selloana	Poaceae	Pampas grass
Cuscuta campestris	Convolvulaceae	Golden dodder
Cytisus scoparius	Fabaceae	Broom, Common broom, Scotch broom, English broom, Spanish broom
Echium plantagineum	Boraginaceae	Paterson's curse, Salvation Jane
Eichhornia crassipes	Pontederiaceae	Water hyacinth
Elephantopus mollis	Asteraceae	Tobacco weed
Eragrostis curvula	Poaceae	African Love Grass
Erica lusitanica	Ericaceae	Spanish heath
Euphorbia paralias	Euphorbiaceae	Sea spurge
Genista monspessulana	Fabaceae	Cape broom, Canary broom, Montpellier broom, common broom, soft broom, French broom
Gleditsia triacanthos	Fabaceae	Honey locust
Gomphocarpus fruticosus	Apocynaceae	Narrow-leaf cotton bush
Hydrocotyle ranunculoides	Apiaceae	Hydrocotyle, water pennywort
Hypericum perforatum	Hypericaceae	St Johns wort
Hyptis suaveolens	Lamiaceae	Hyptis

Jatropha gossypifolia	Euphorbiaceae	Bellyache bush
Lantana montevidensis	Verbenaceae	Creeping lantana
Ligustrum lucidum	Oleaceae	Broad-leaved privet
Ligustrum sinense	Oleaceae	Small-leaved privet
Lycium ferocissimum	Solanaceae	African Boxthorn
Macfadyena unguis-cati	Bignoniaceae	Cats claw creeper
Onopordum acanthium	Asteraceae	Onopordum thistle
Onopordum acaulon	Asteraceae	Stemless Thistle
Onopordum illyricum	Asteraceae	Illyrian Thistle
Orobanche minor	Orobanchaceae	Branched broomrape
Pennisetum polystachion	Poaceae	Mission grass
Phyla canescens	Verbenaceae	Lippia
Polygala myrtifolia	Polygalaceae	Myrtleleaf milkwort
Reseda luteola	Resedaceae	Wild mignonette, Weld
Schinus terebinthifolius	Anacardiaceae	Brazilian creeper, Broadleaf pepper tree
Senecio jacobaea	Asteraceae	Ragwort
Senecio madagascariensis	Asteraceae	Fireweed
Senna obtusifolia	Fabaceae	Sickelpod
Senna tora	Fabaceae	Sicklepod
Sida rhombifolia	Malvaceae	Paddys Lucerne
Solanum elaeagnifolium	Solanaceae	Silver leaf nightshade
Spartina anglica	Poaceae	Rice grass
Sporobolus africanus	Poaceae	Giant parramatta grass
Sporobolus natalensis	Poaceae	Giant rats tail grass
Sporobolus pyramidalis	Poaceae	Giant rats tail grass
Stachytarpheta jamaicensis	Verbenaceae	Snake weed
Stachytarpheta mutabilis	Verbenaceae	Snake weed
Themeda quadrivalvis	Poaceae	Grader grass
Thunbergia grandiflora	Acanthaceae	Blue thunbergia, Blue trumpet vine, Bengla clock vine, Blue skyflower, Blue trumpet vine, Clock vine, Sky flower, Sky vine
Watsonia spp. [1]	Iridaceae	Watsonia
Xanthium occidentale	Asteraceae	Noogoora burr
Xanthium spinosum	Asteraceae	Bathurst burr
Zantedeschia aethiopica	Araceae	Arum lily, calla lily
Ziziphus mauritiana	Rhamnaceae	Chinese apple, Indian jujube, Chinese date

[1] Includes *Watsonia marginata*, *W. meriana*, and *W. versfeldii*.

Alert list

Species name	Family	Common name(s)
Acacia catechu	Fabaceae	Prickly acacia
Asystasia gangetica	Acanthaceae	Chinese violet
Barleria prionitis	Acanthaceae	Barleria
Calluna vulgaris	Ericaceae	Heather
Chromolaena odorata	Asteraceae	Siam weed, Chromolaena
Cynoglossum creticum	Boraginaceae	Blue hound's tongue
Cyperus teneristolon	Cyperaceae	Cyperus
Cytisus multiflorus	Fabaceae	White Spanish broom
Dittrichia viscosa	Asteraceae	False yellowhead
Equisetum spp. [1]	Equisetaceae	Horsetails
Gymnocoronis spilanthoides	Asteraceae	Senegal tea plant

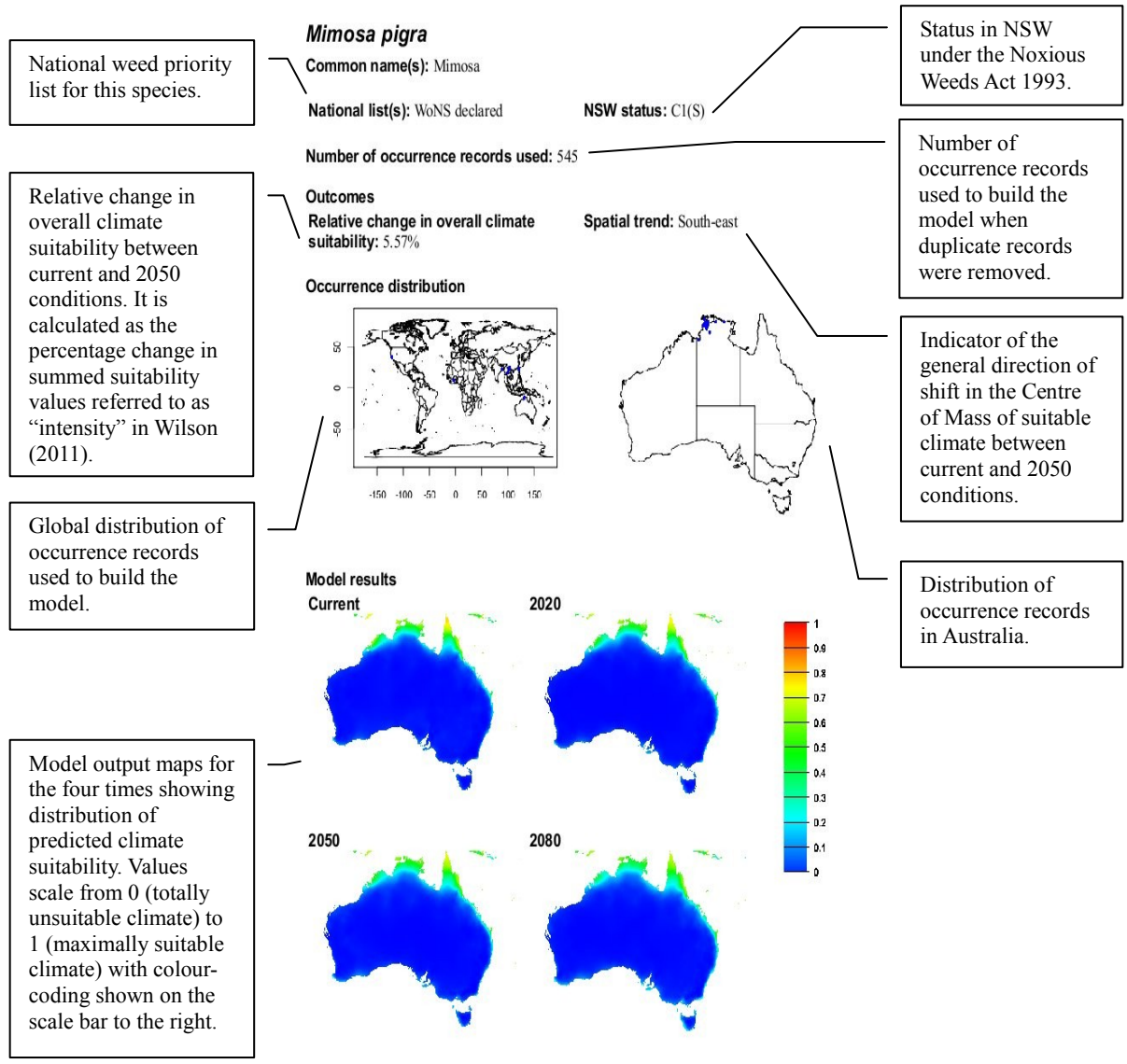
Hieracium aurantiacum	Asteraceae	Orange hawkweed
Koelreuteria elegans	Sapindaceae	Chinese rain tree
Lachenalia reflexa	Asparagaceae	Yellow soldier
Lagarosiphon major	Hydrocharitaceae	Lagarosiphon, Oxygen weed
Nassella charruana	Poaceae	Lobed needle grass
Nassella hyalina	Poaceae	Cane needle grass
Pelargonium alchemilloides	Geraniaceae	Garden geranium
Pereskia aculeata	Cactaceae	Leaf cactus
Piptochaetium montevidense	Poaceae	Uruguayan rice grass
Praxelis clematidea	Asteraceae	Praxelis
Retama raetam	Fabaceae	White weeping broom
Senecio glastifolius	Asteraceae	Holly-leaved senecio
Thunbergia laurifolia	Acanthaceae	Laurel clock vine
Tipuana tipu	Fabaceae	Rosewood, Pride of Bolivia
Trianoptiles solitaria	Cyperaceae	Subterranean Cape sedge
Vachellia karroo	Mimosaceae	Karroo thorn

[1] Includes *Equisetum arvense*, *E. hyemale* and *E. ramosissimum*.

Additional invasive grasses

Species name	**Family**	**Common name(s)**
Andropogon gayanus	Poaceae	Gamba grass
Cenchrus ciliaris	Poaceae	Buffel grass
Hyparrhenia hirta	Poaceae	Coolatai grass
Urochloa mutica	Poaceae	Para grass

Guide to species accounts



Acacia catechu

Fabaceae

Common name(s): Prickly acacia

National list(s): Alert list

NSW status: Not listed

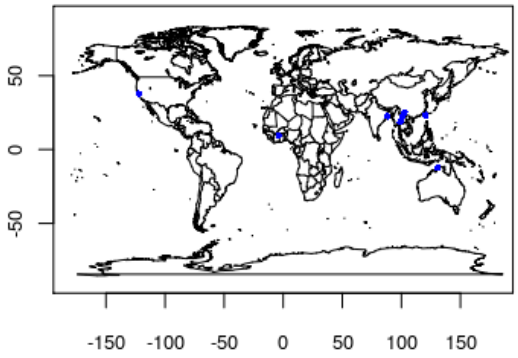
Number of occurrence records used: 7

Outcomes

Relative change in overall climate suitability: -9.26%

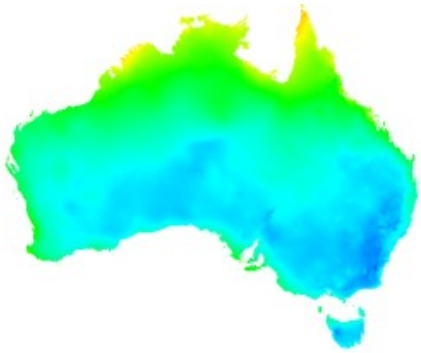
Spatial trend: South-east

Occurrence distribution

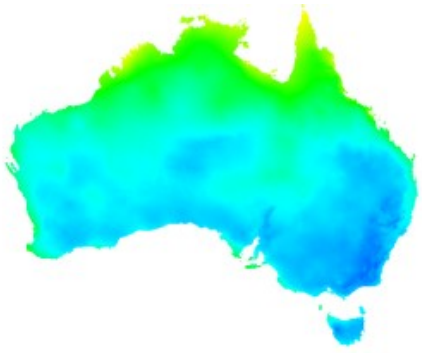


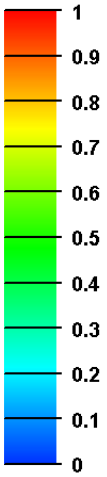
Model results

Current

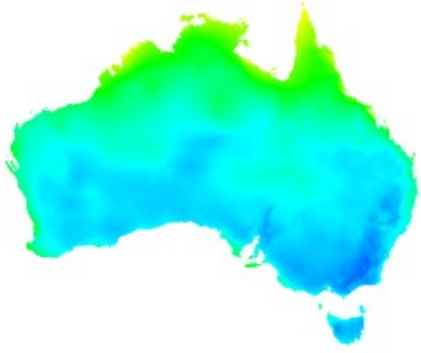


2020

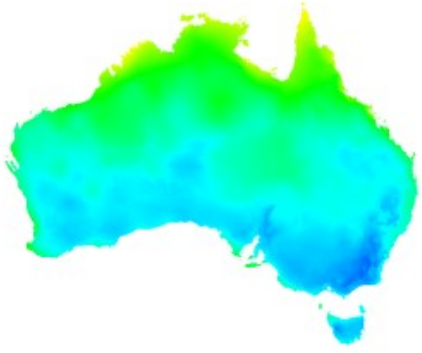




2050



2080



Alternanthera philoxeroides

Amaranthaceae

Common name(s): Alligator weed

National list(s): WoNS declared

NSW status: C2(85)/C3(43)

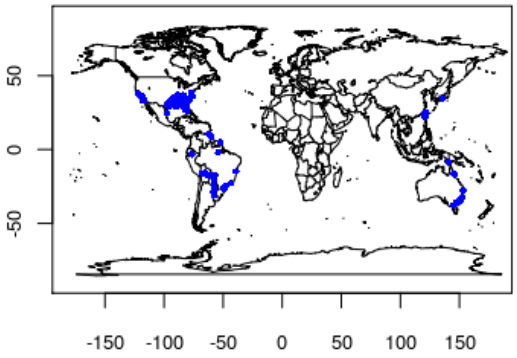
Number of occurrence records used: 372

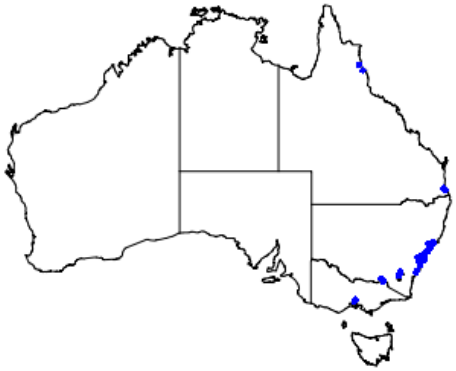
Outcomes

Relative change in overall climate suitability: -51.53%

Spatial trend: South-east

Occurrence distribution

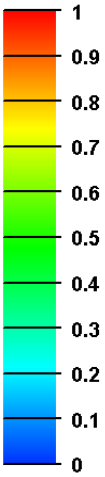




Model results

Current

2020



Andropogon gayanus

Poaceae

Common name(s): Gamba grass

National list(s): Not listed

NSW status: Not listed

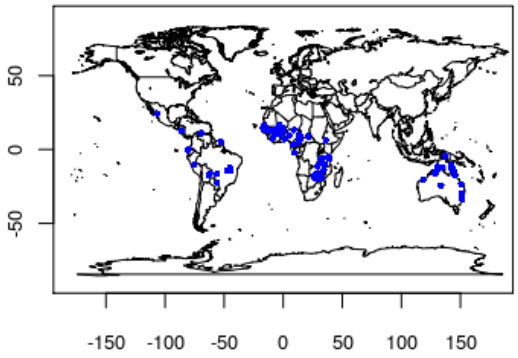
Number of occurrence records used: 309

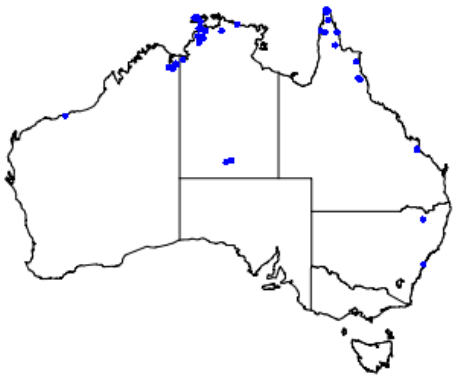
Outcomes

Relative change in overall climate suitability: -13.68%

Spatial trend: South-east

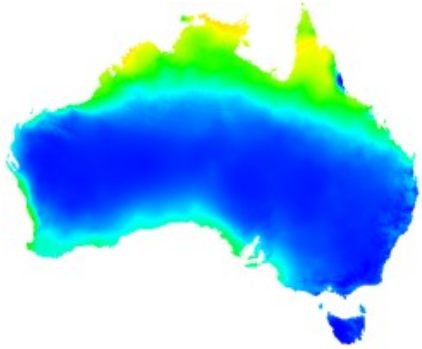
Occurrence distribution





Model results

Current



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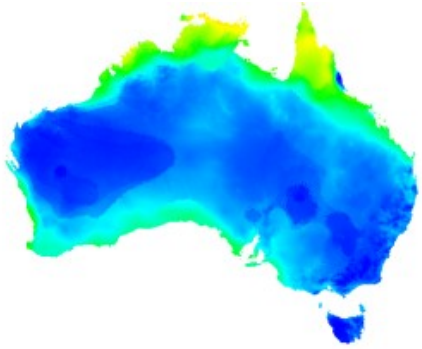

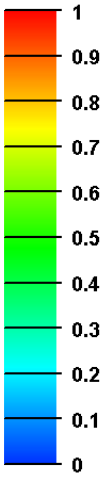

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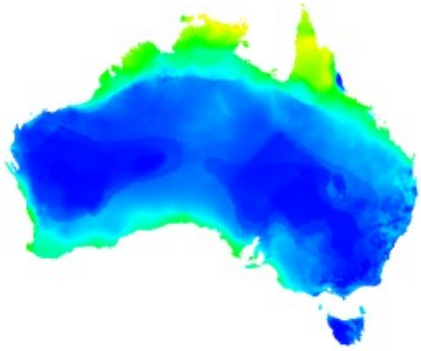

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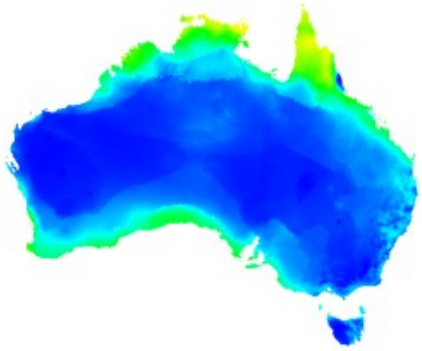


Annona glabra

Annonaceae

Common name(s): Pond apple

National list(s): WoNS declared

NSW status: C1(S)

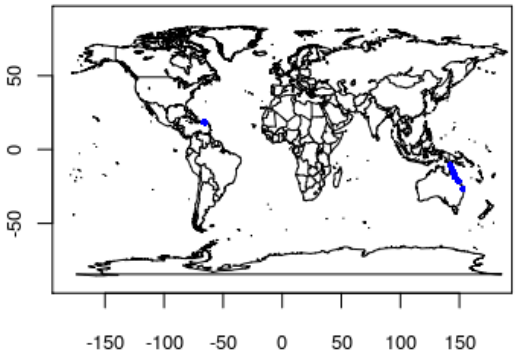
Number of occurrence records used: 34

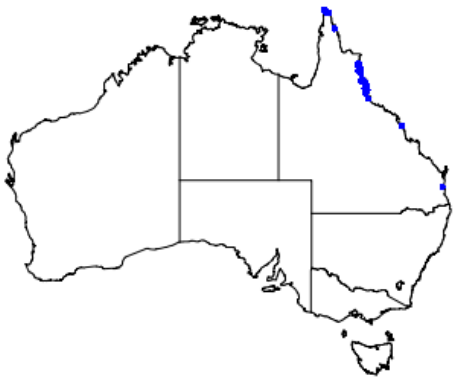
Outcomes

Relative change in overall climate suitability: -9.79%

Spatial trend: South-east

Occurrence distribution

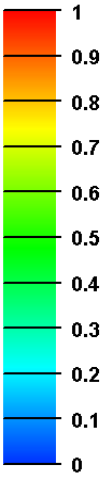




Model results

Current

2020



2050

2080

Anredera cordifolia

Basellaceae

Common name(s): Madeira vine

National list(s): WoNS shortlist

NSW status: C4(14)

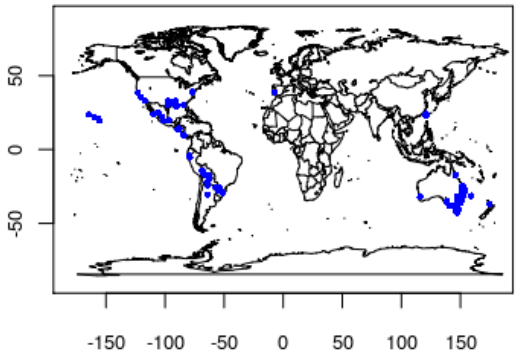
Number of occurrence records used: 197

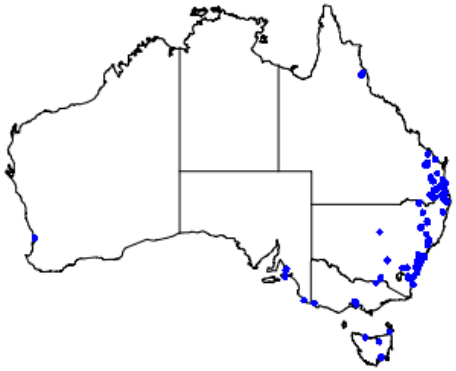
Outcomes

Relative change in overall climate suitability: -51.32%

Spatial trend: South-east

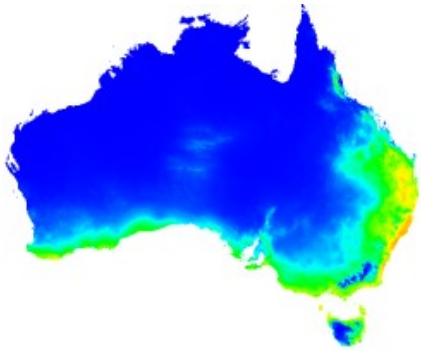
Occurrence distribution





Model results

Current



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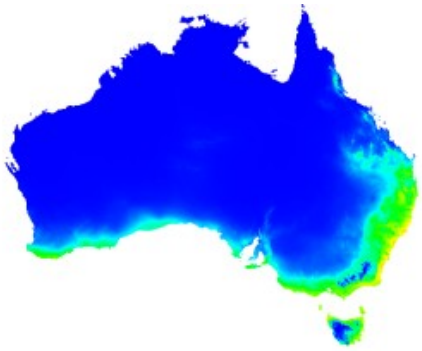

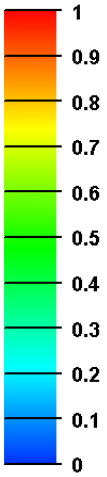

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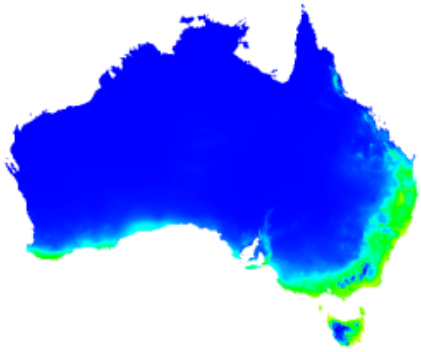

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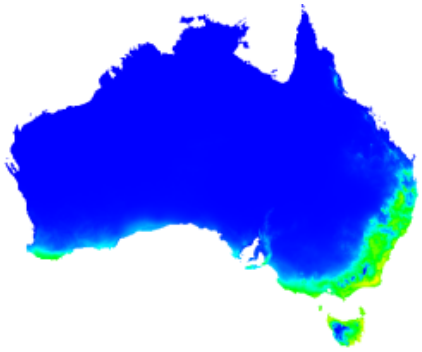


Argemone ochroleuca

Papaveraceae

Common name(s): Mexican poppy

National list(s): WoNS shortlist

NSW status: Not listed

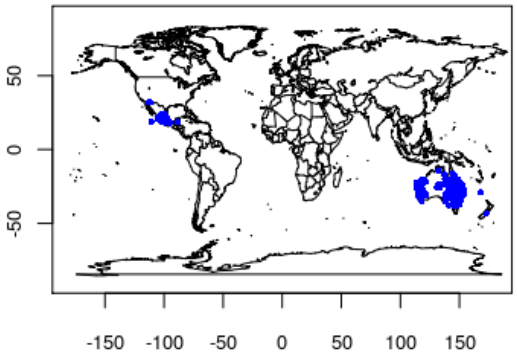
Number of occurrence records used: 422

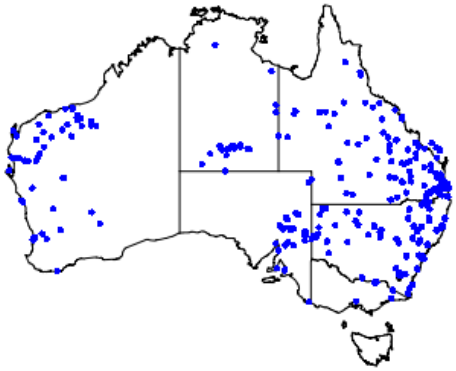
Outcomes

Relative change in overall climate suitability: -41.13%

Spatial trend: South-west

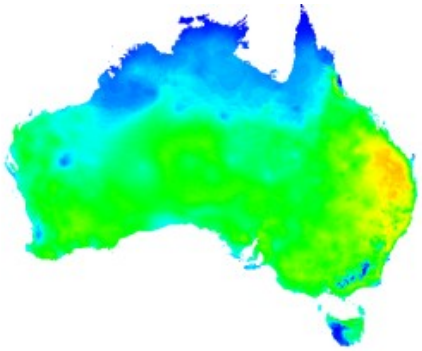
Occurrence distribution





Model results

Current



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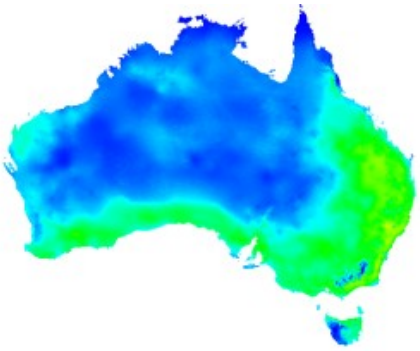

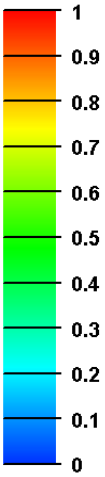

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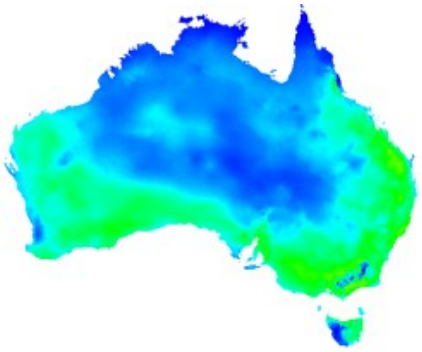
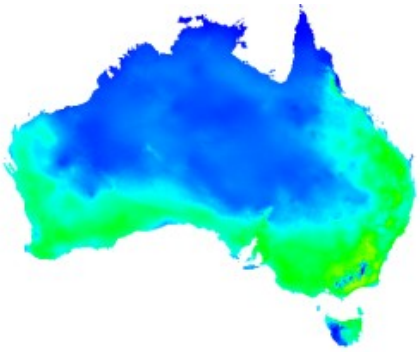


2080



Asparagus asparagoides

Asparagaceae

Common name(s): Bridal veil, bridal creeper, bridal veil creeper, baby smilax, smilax

National list(s): WoNS declared

NSW status: C4(S)

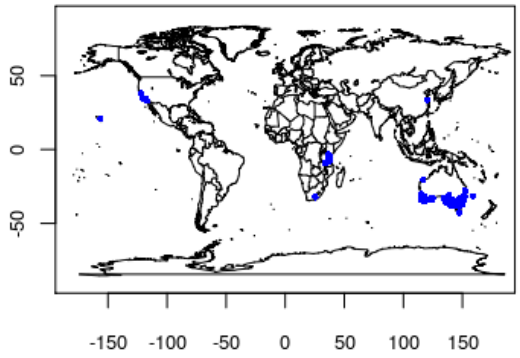
Number of occurrence records used: 376

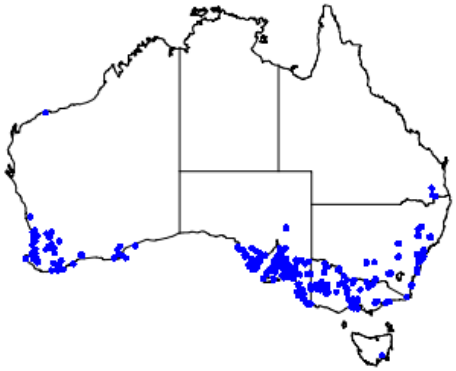
Outcomes

Relative change in overall climate suitability: -43.81%

Spatial trend: South-east

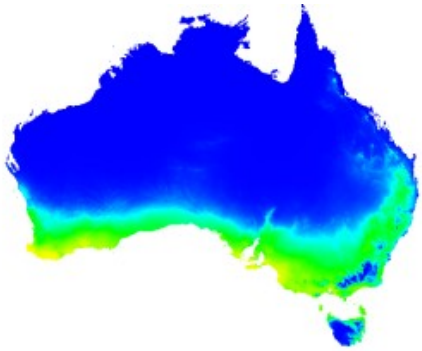
Occurrence distribution





Model results

Current



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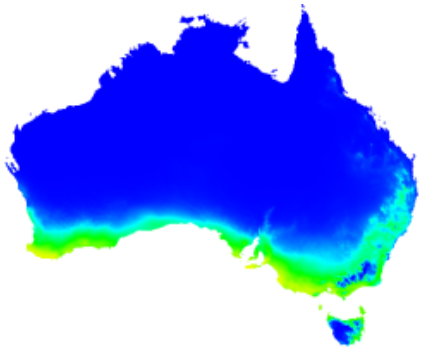
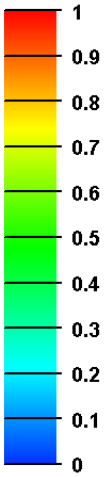
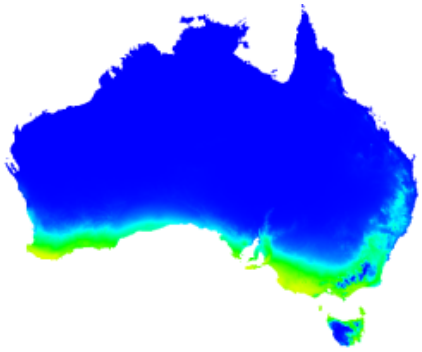




2050



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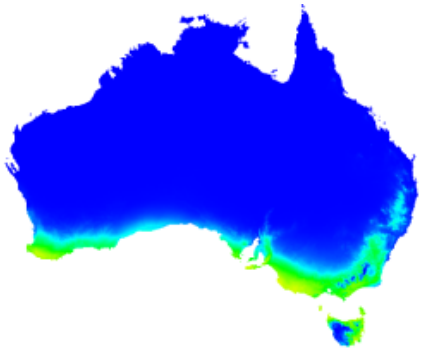


Asparagus declinatus

Asparagaceae

Common name(s): Bridal veil

National list(s): WoNS shortlist

NSW status: Not listed

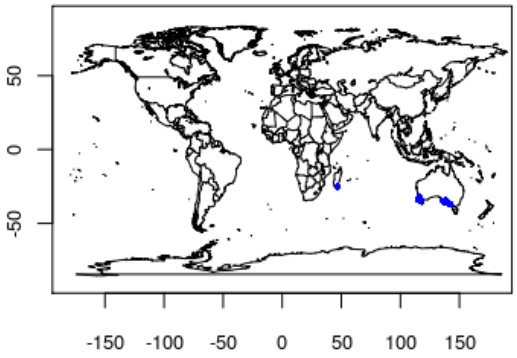
Number of occurrence records used: 28

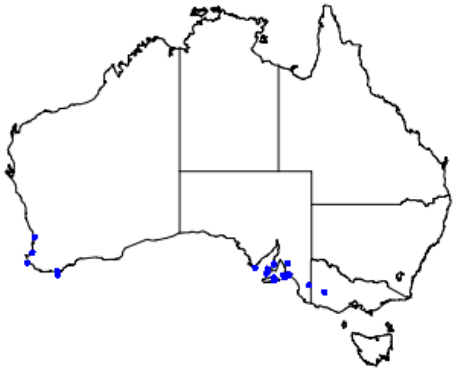
Outcomes

Relative change in overall climate suitability: -15.89%

Spatial trend: South-east

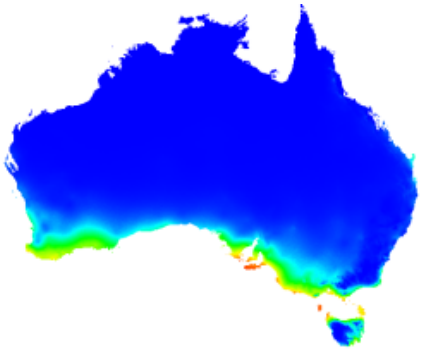
Occurrence distribution





Model results

Current



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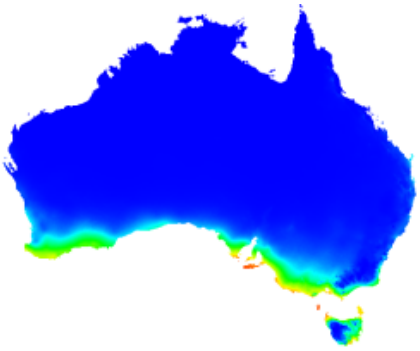

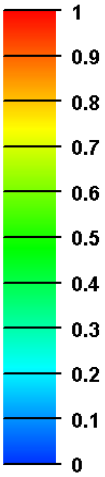

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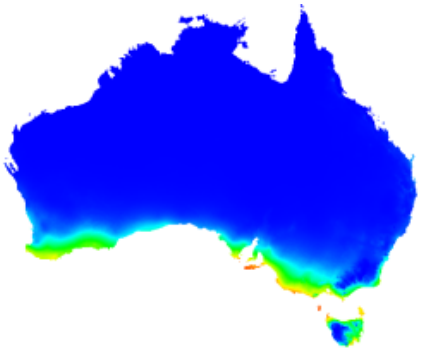
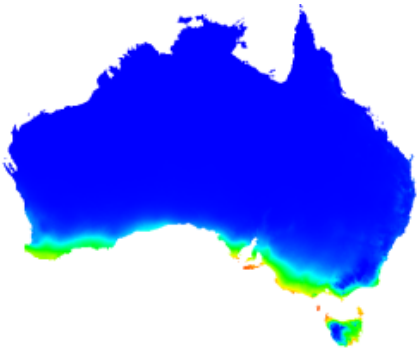


2080



Asystasia gangetica

Acanthaceae

Common name(s): Chinese violet

National list(s): Alert list

NSW status: C1(S)

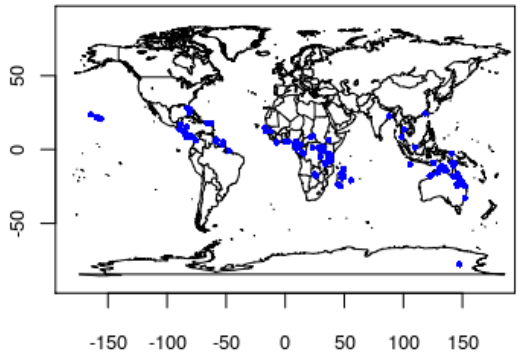
Number of occurrence records used: 170

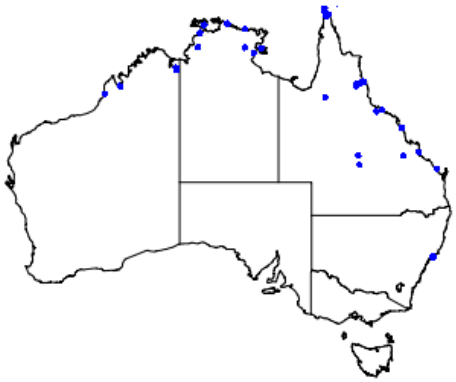
Outcomes

Relative change in overall climate suitability: -4.56%

Spatial trend: South-east

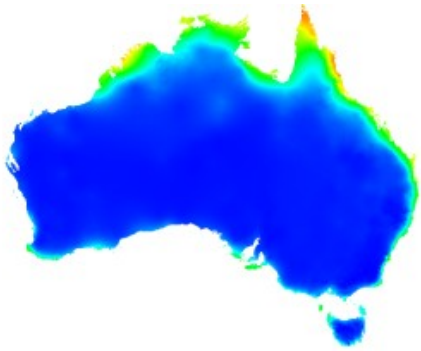
Occurrence distribution



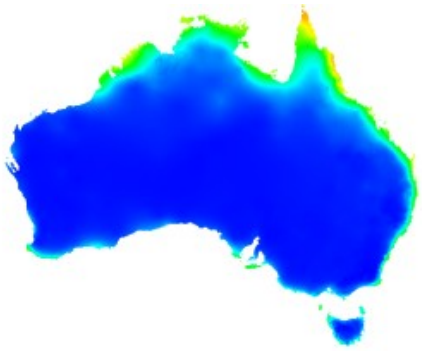


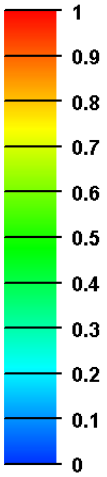
Model results

Current



2020





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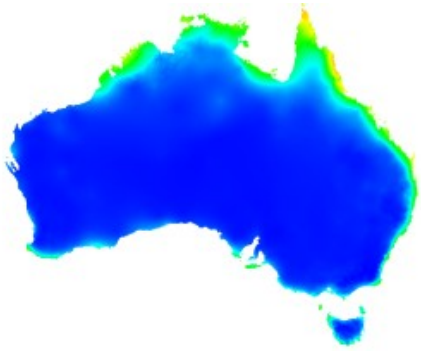

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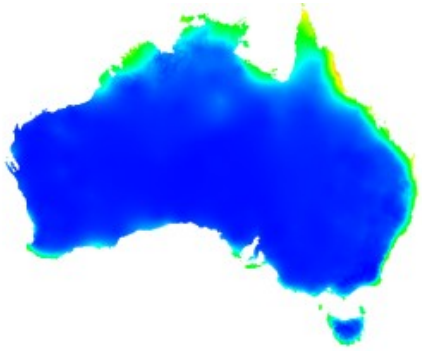


Barleria prionitis

Acanthaceae

Common name(s): Barleria

National list(s): Alert list

NSW status: Not listed

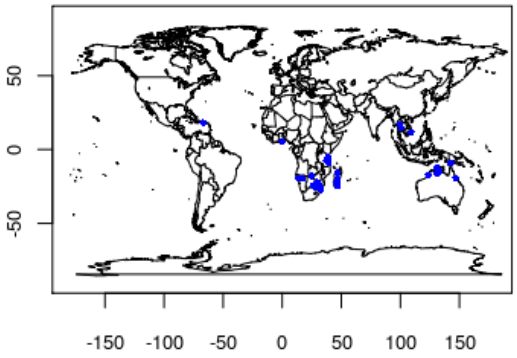
Number of occurrence records used: 49

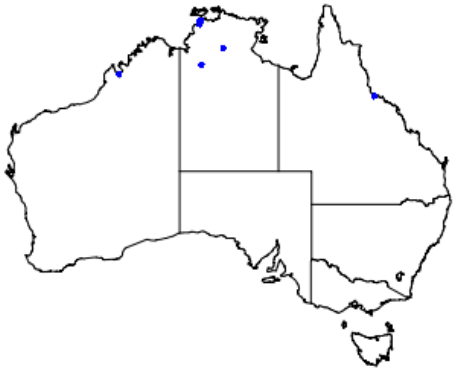
Outcomes

Relative change in overall climate suitability: -3.43%

Spatial trend: South-east

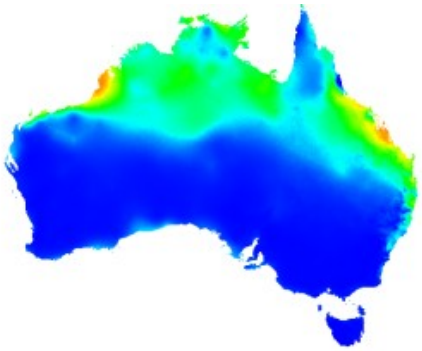
Occurrence distribution



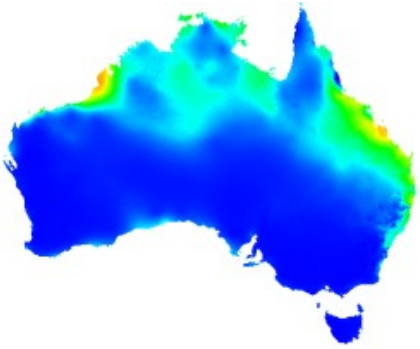


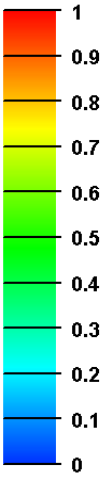
Model results

Current

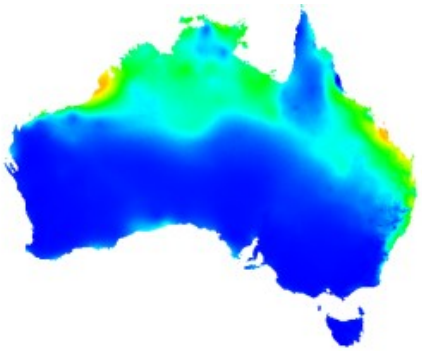


2020

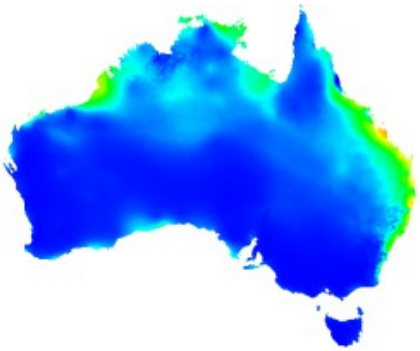




2050



2080



Bassia scoparia

Chenopodiaceae

Common name(s): Kochia

National list(s): WoNS shortlist, Alert list **NSW status:** C1(S)(h)

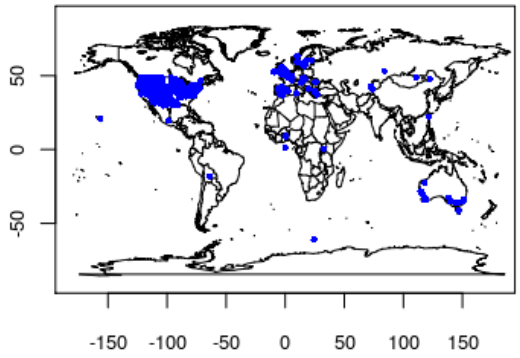
Number of occurrence records used: 826

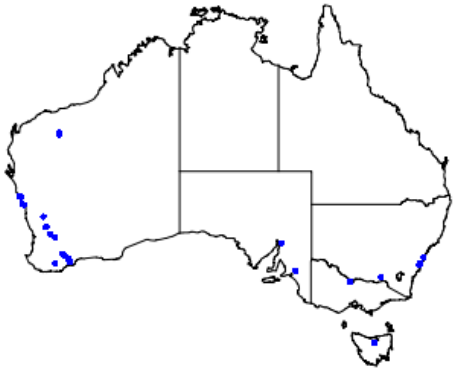
Outcomes

Relative change in overall climate suitability: -28.6%

Spatial trend: South-east

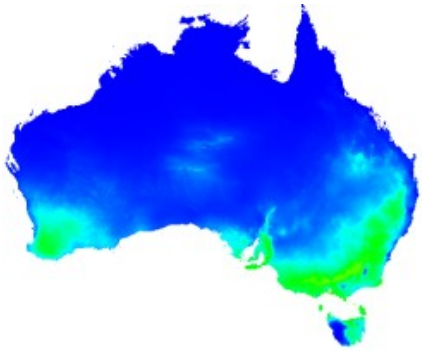
Occurrence distribution



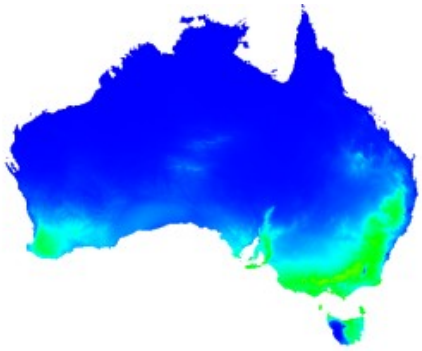


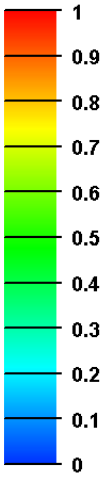
Model results

Current

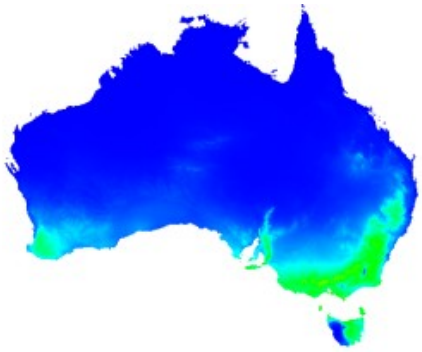


2020

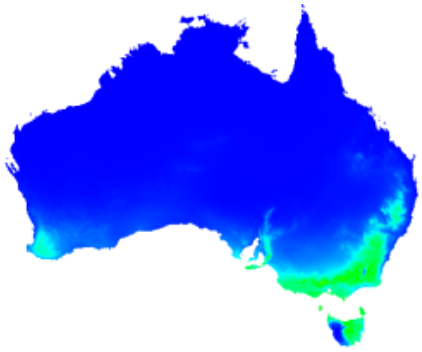




2050



2080



Bryophyllum delagoense

Crassulaceae

Common name(s): Mother of millions

National list(s): WoNS shortlist

NSW status: C3(12)/C4(13)

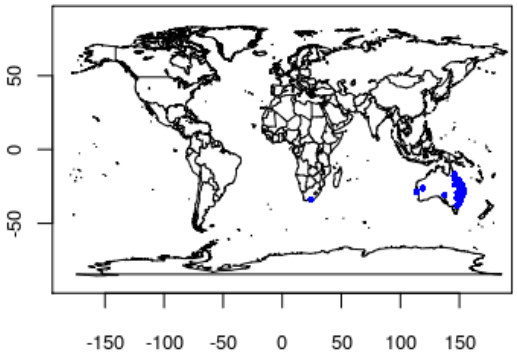
Number of occurrence records used: 111

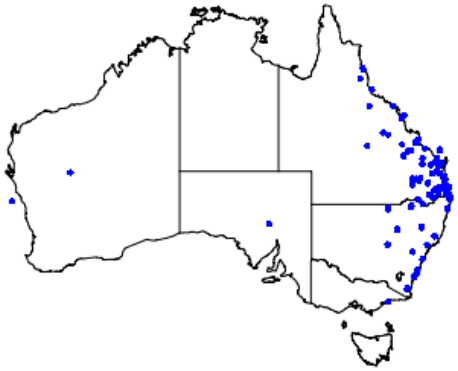
Outcomes

Relative change in overall climate suitability: -63.69%

Spatial trend: South-east

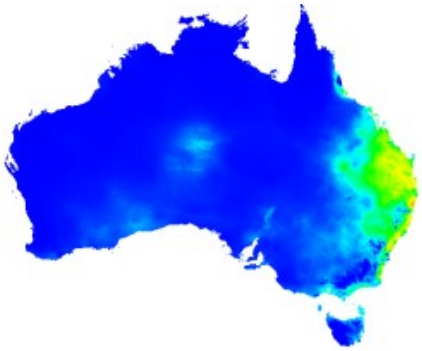
Occurrence distribution





Model results

Current



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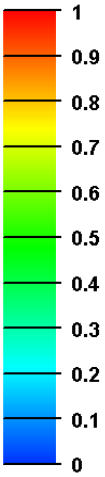


2050

2080

Cabomba caroliniana

Cabombaceae

Common name(s): Cabomba, fanwort, Carolina watershield, Washington grass

National list(s): WoNS declared

NSW status: C5(S)

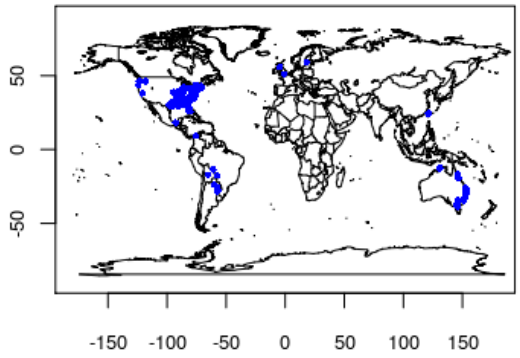
Number of occurrence records used: 352

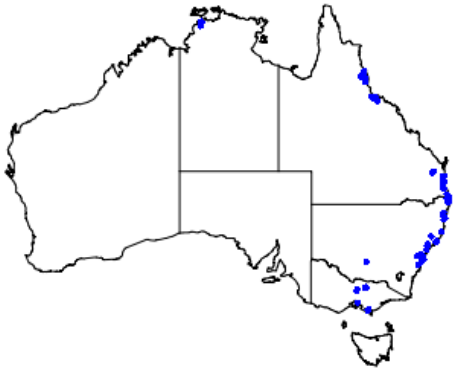
Outcomes

Relative change in overall climate suitability: -37.63%

Spatial trend: South-east

Occurrence distribution

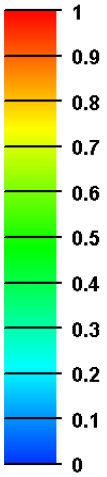




Model results

Current

2020



2050

2080

Calluna vulgaris

Ericaceae

Common name(s): Heather

National list(s): Alert list

NSW status: Not listed

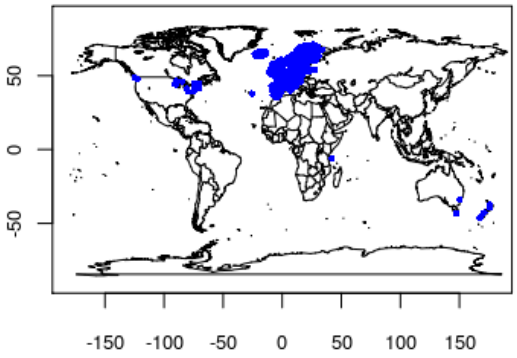
Number of occurrence records used: 16138

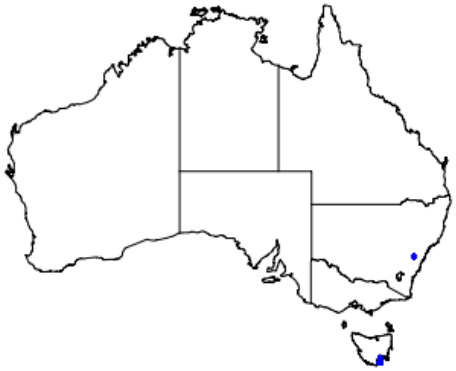
Outcomes

Relative change in overall climate suitability: -41.29%

Spatial trend: South-east

Occurrence distribution

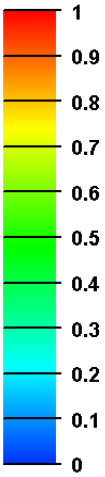




Model results

Current

2020



Calotropis procera

Apocynaceae

Common name(s): Calotrope

National list(s): WoNS shortlist

NSW status: Not listed

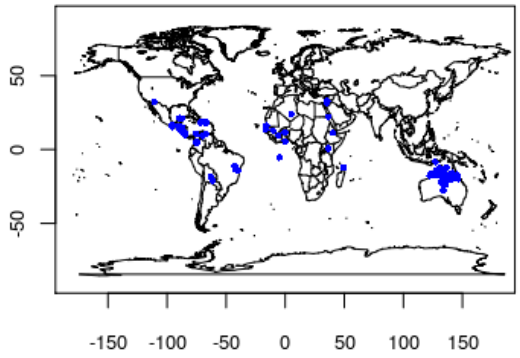
Number of occurrence records used: 258

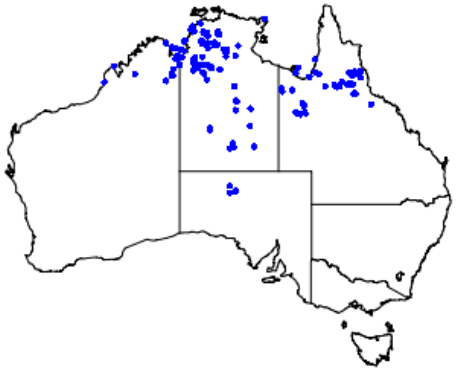
Outcomes

Relative change in overall climate suitability: +7.53%

Spatial trend: South-east

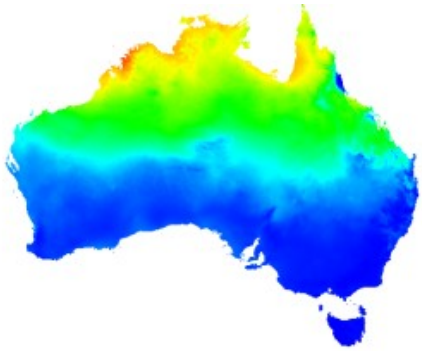
Occurrence distribution



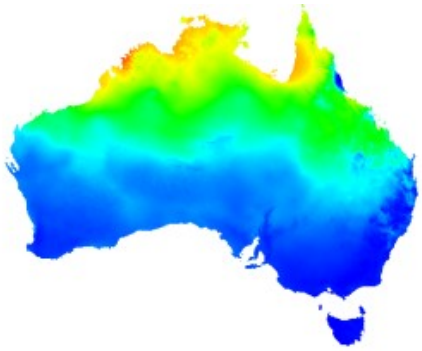


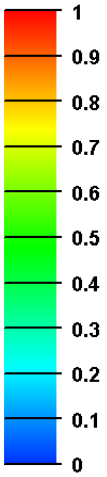
Model results

Current

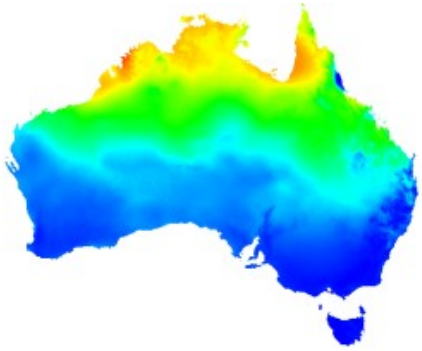


2020

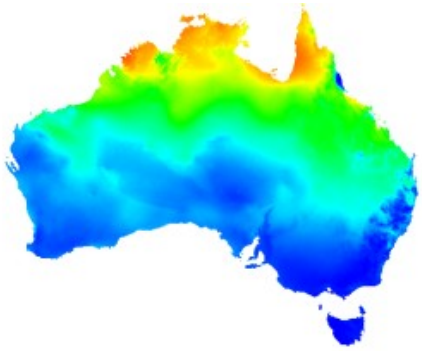




2050



2080



Celtis sinensis

Cannabaceae

Common name(s): Chinese elm, Japanese hackberry

National list(s): WoNS shortlist

NSW status: C3(10)

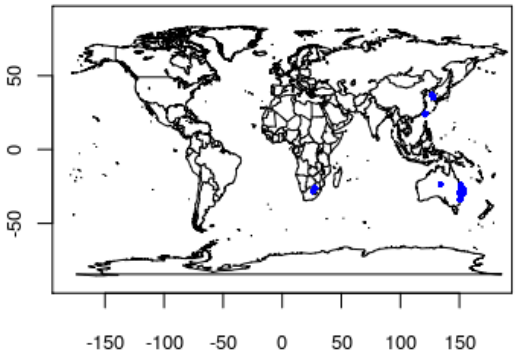
Number of occurrence records used: 75

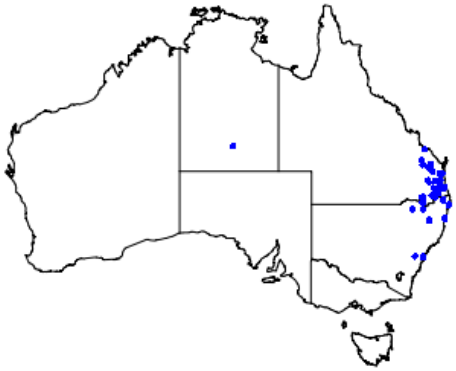
Outcomes

Relative change in overall climate suitability: -56.68%

Spatial trend: South-east

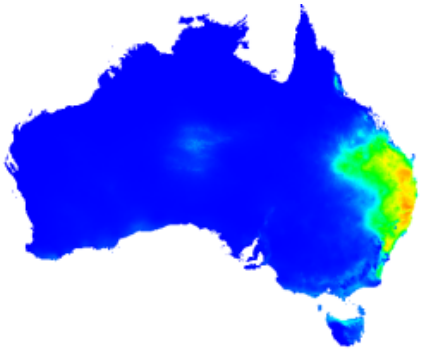
Occurrence distribution



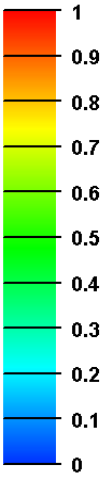


Model results

Current



2020



2050

2080

Cenchrus ciliaris

Poaceae

Common name(s): Buffel grass

National list(s): Not listed

NSW status: Not listed

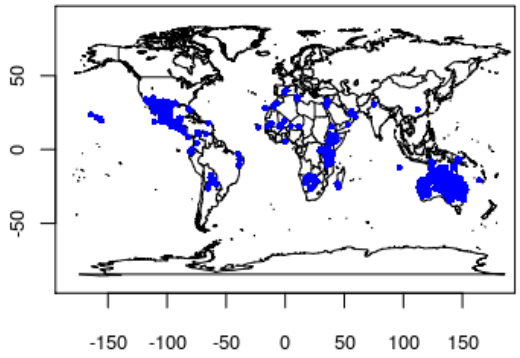
Number of occurrence records used: 1111

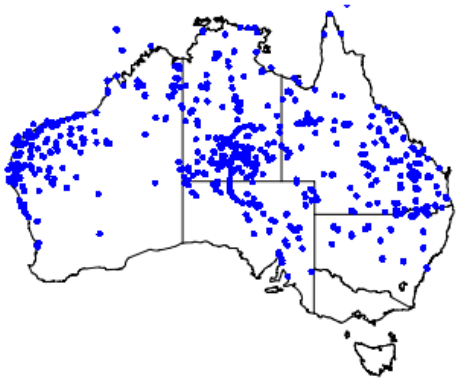
Outcomes

Relative change in overall climate suitability: -16.29%

Spatial trend: South-west

Occurrence distribution





Model results

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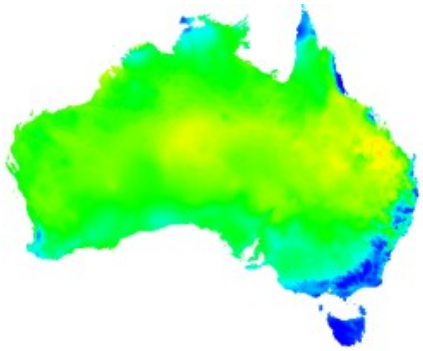
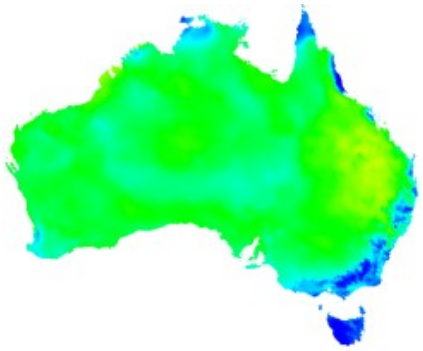
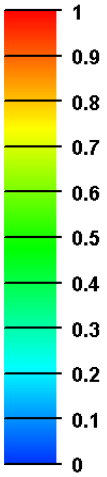
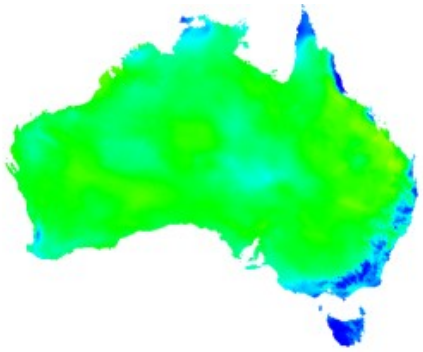


2020

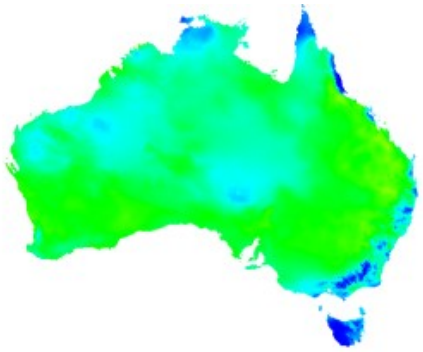




2050



2080



Chromolaena odorata

Asteraceae

Common name(s): Siam weed, Chromolaena

National list(s): Alert list

NSW status: C1(S)

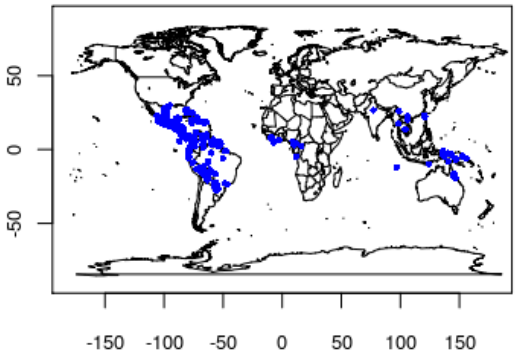
Number of occurrence records used: 747

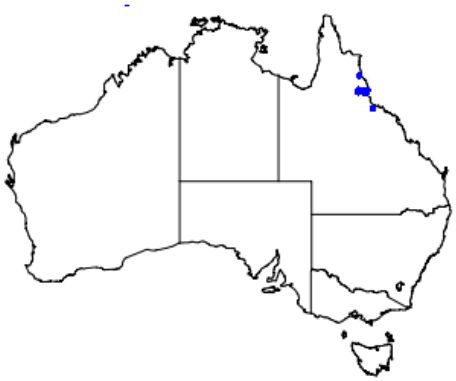
Outcomes

Relative change in overall climate suitability: -3.91%

Spatial trend: South-east

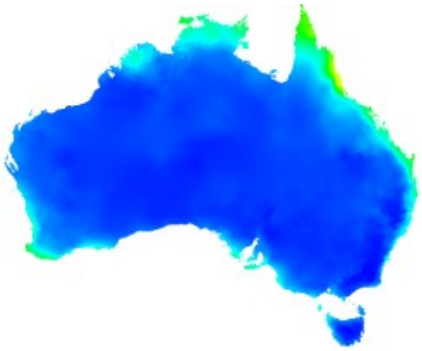
Occurrence distribution





Model results

Current



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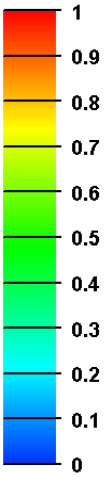


2050

2080

Chrysanthemoides monilifera

Asteraceae

Common name(s): Bitou bush, Boneseed

National list(s): WoNS declared

NSW status: C2(1)/C3(24)/C4(22)

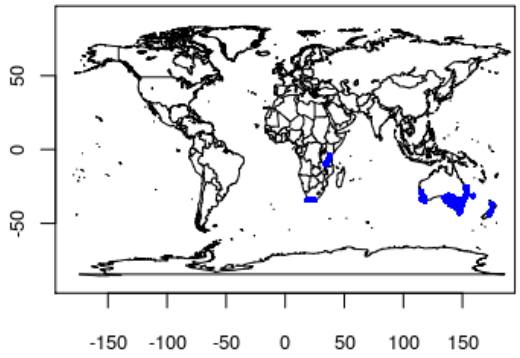
Number of occurrence records used: 294

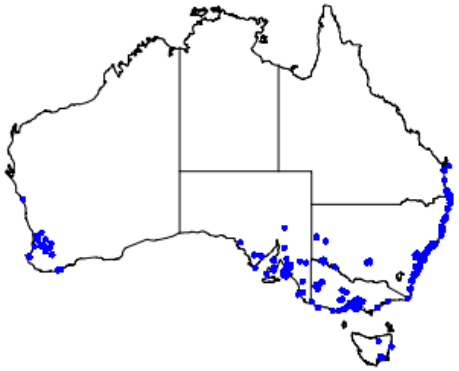
Outcomes

Relative change in overall climate suitability: -36.62%

Spatial trend: South-east

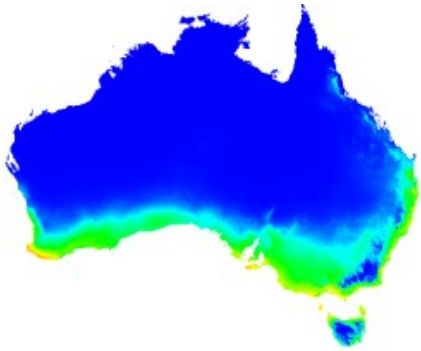
Occurrence distribution



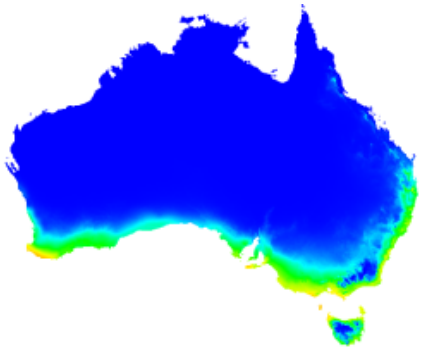


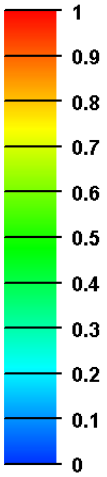
Model results

Current

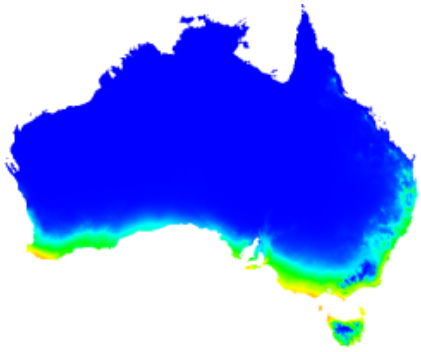


2020





2050



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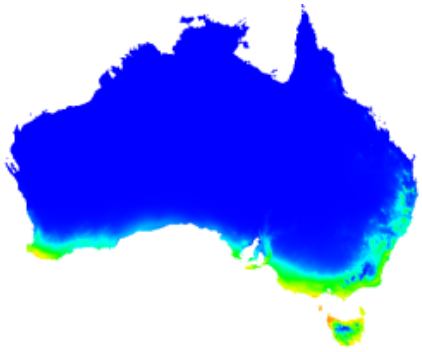


Cortaderia selloana

Poaceae

Common name(s): Pampas grass

National list(s): WoNS shortlist

NSW status: C4(98)

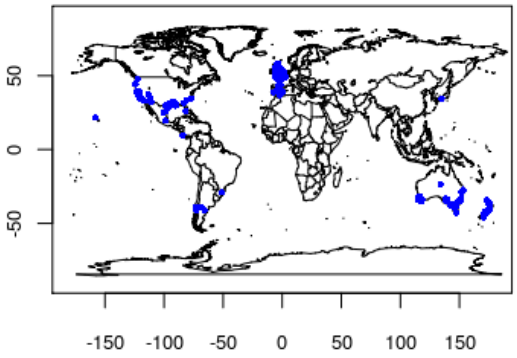
Number of occurrence records used: 384

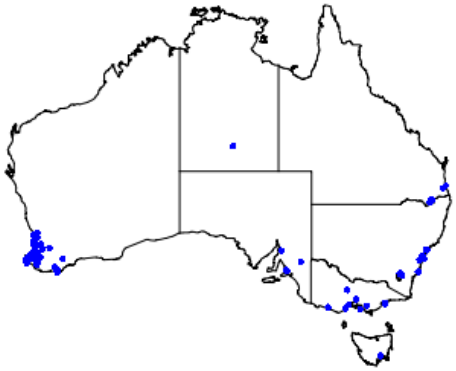
Outcomes

Relative change in overall climate suitability: -23.97%

Spatial trend: South-east

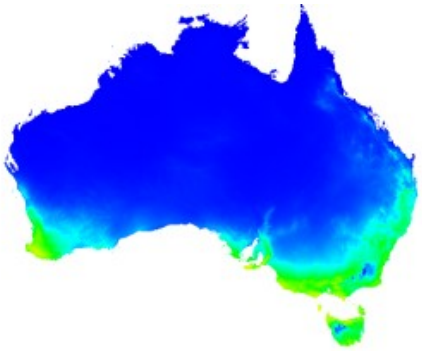
Occurrence distribution



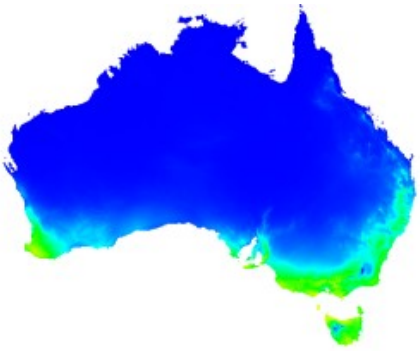


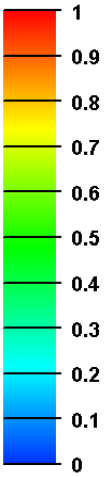
Model results

Current



2020





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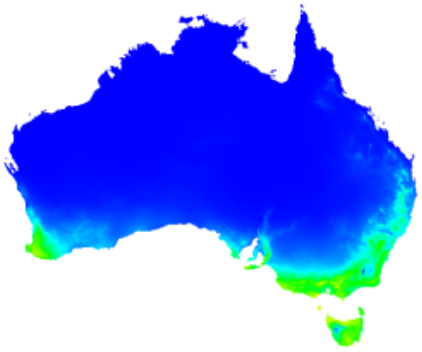

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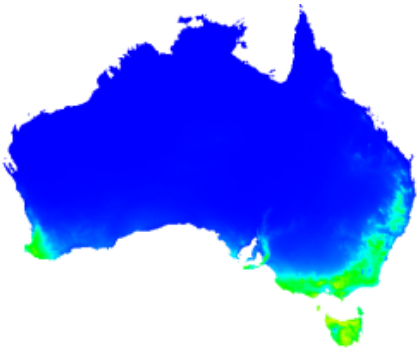


Cryptostegia grandiflora

Apocynaceae

Common name(s): Rubber vine

National list(s): WoNS declared

NSW status: C1(S)

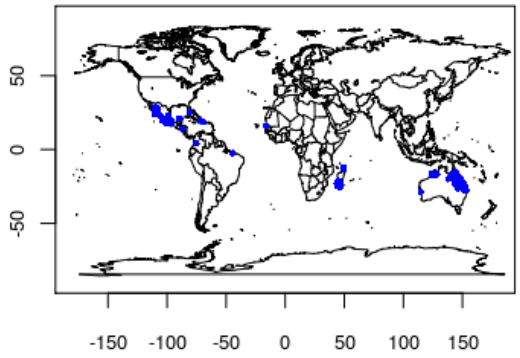
Number of occurrence records used: 170

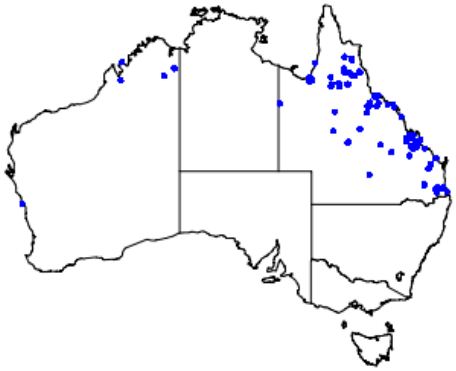
Outcomes

Relative change in overall climate suitability: -45.65%

Spatial trend: South-east

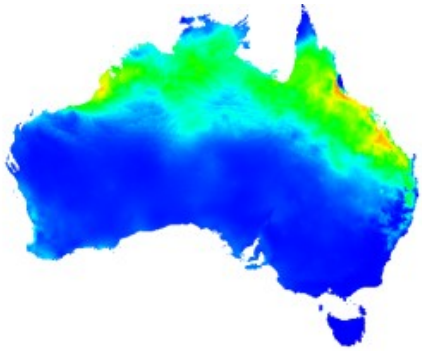
Occurrence distribution





Model results

Current



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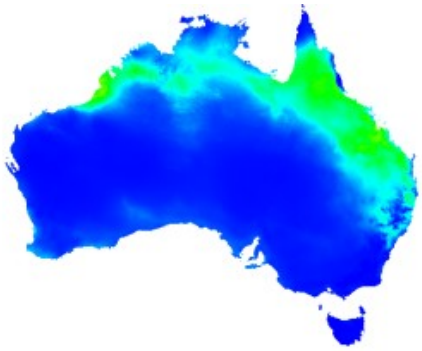

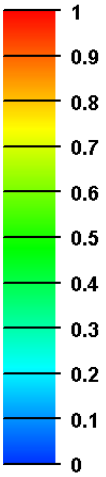

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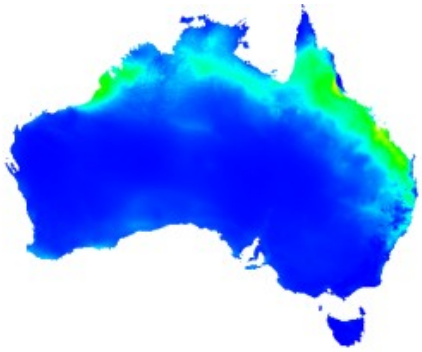


2080

Cuscuta campestris

Convolvulaceae

Common name(s): Golden dodder

National list(s): WoNS shortlist

NSW status: C4(88)(S)

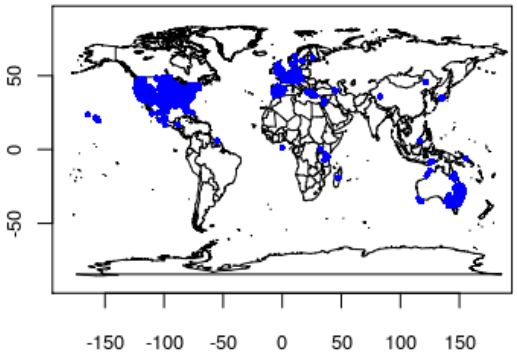
Number of occurrence records used: 1671

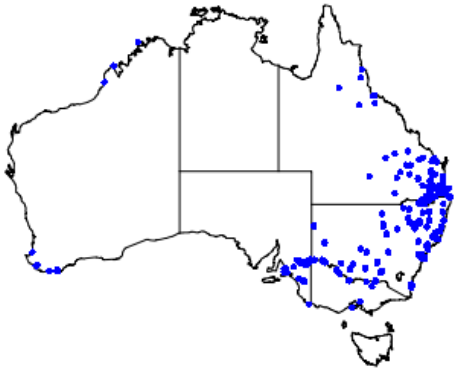
Outcomes

Relative change in overall climate suitability: -32.77%

Spatial trend: South-east

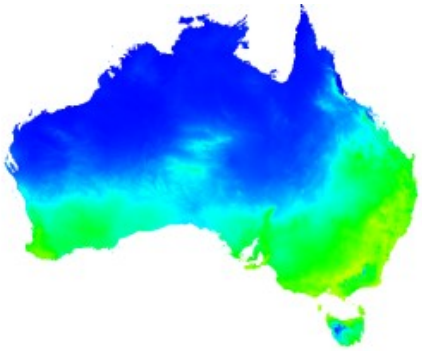
Occurrence distribution





Model results

Current



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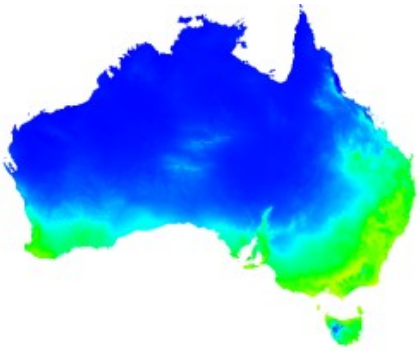

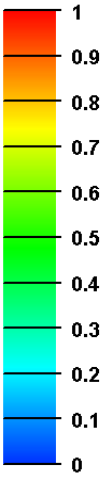

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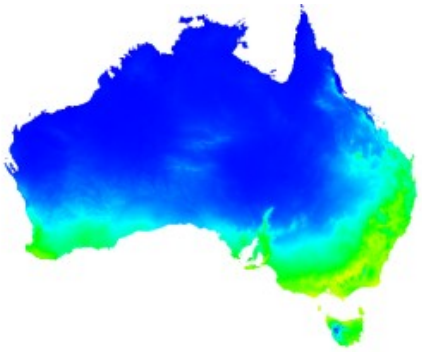

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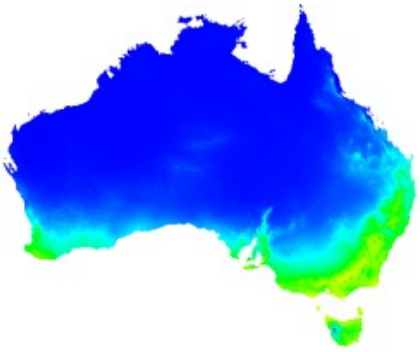


Cynoglossum creticum

Boraginaceae

Common name(s): Blue hound's tongue

National list(s): Alert list

NSW status: C2(1)

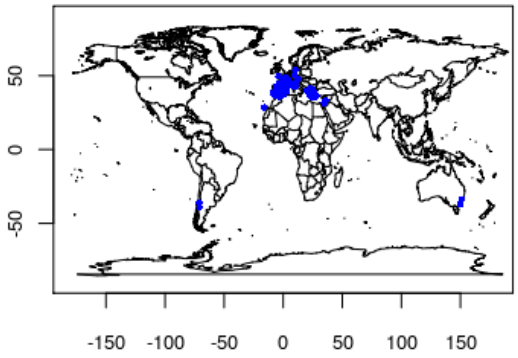
Number of occurrence records used: 366

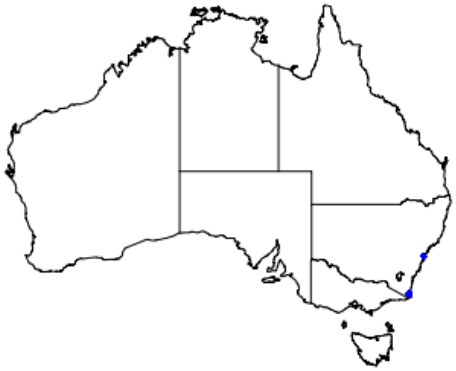
Outcomes

Relative change in overall climate suitability: +11.04%

Spatial trend: North-west

Occurrence distribution

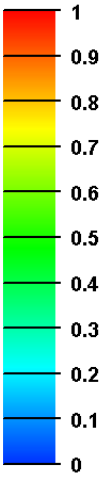




Model results

Current

2020



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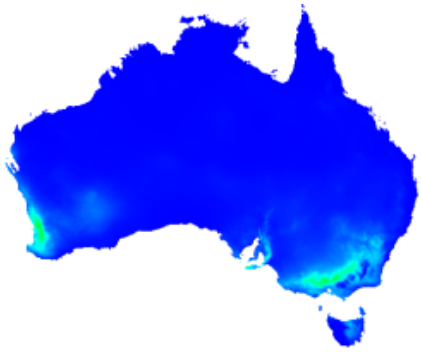


2080

Cyperus teneristolon

Cyperaceae

Common name(s): Cyperus

National list(s): Alert list

NSW status: Not listed

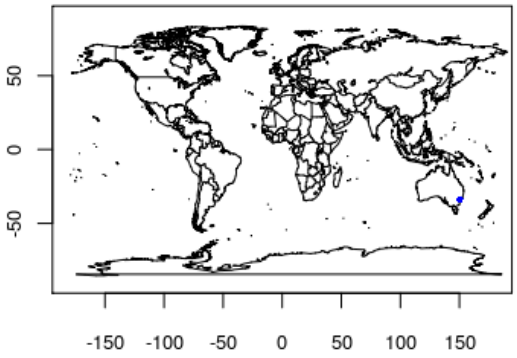
Number of occurrence records used: 5

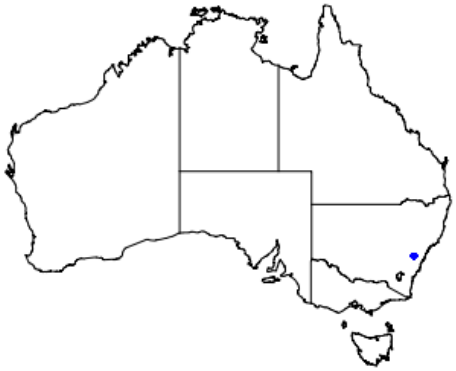
Outcomes

Relative change in overall climate suitability: -66.87%

Spatial trend: North-east

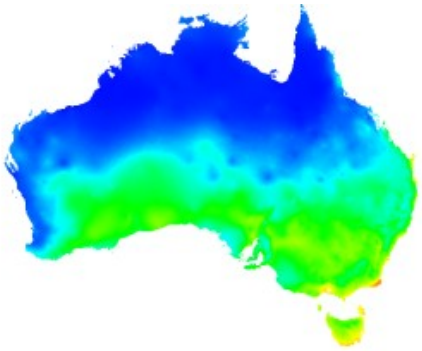
Occurrence distribution





Model results

Current



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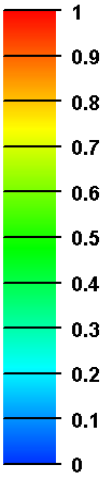


2050

2080

Cytisus multiflorus

Fabaceae

Common name(s): White Spanish broom

National list(s): Alert list

NSW status: Not listed

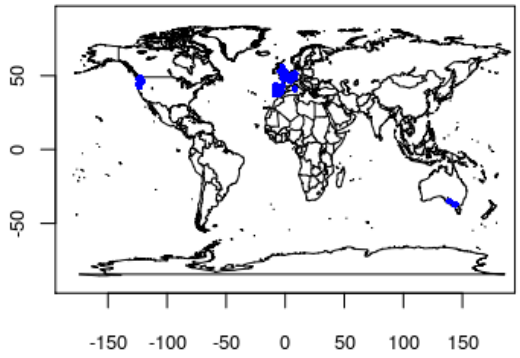
Number of occurrence records used: 226

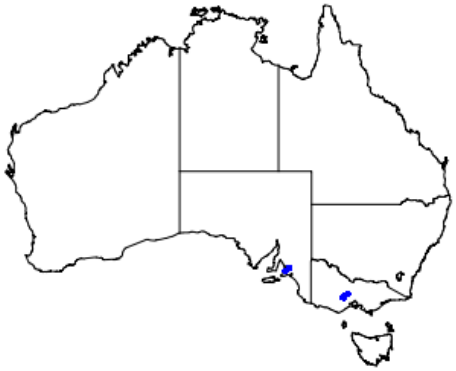
Outcomes

Relative change in overall climate suitability: +21.27%

Spatial trend: South-east

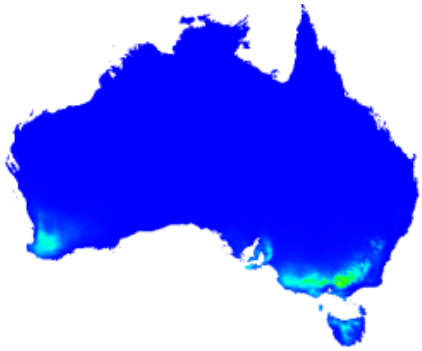
Occurrence distribution





Model results

Current



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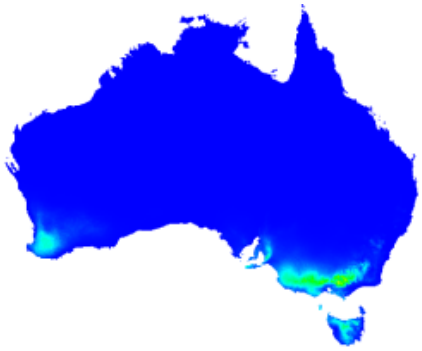

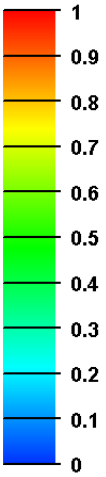

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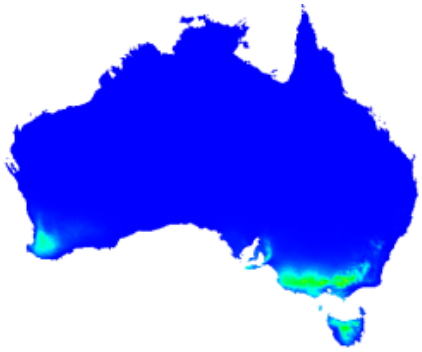


2080

Cytisus scoparius

Fabaceae

Common name(s): Broom, Common broom, Scotch broom, English broom

National list(s): WoNS shortlist

NSW status: C4(44)

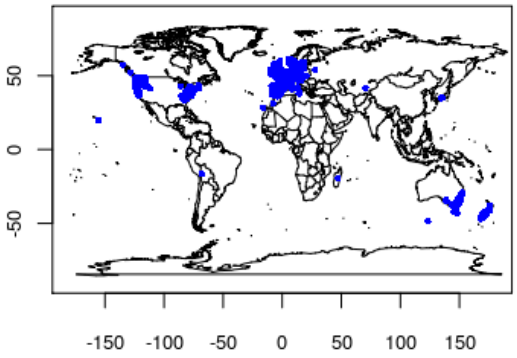
Number of occurrence records used: 8915

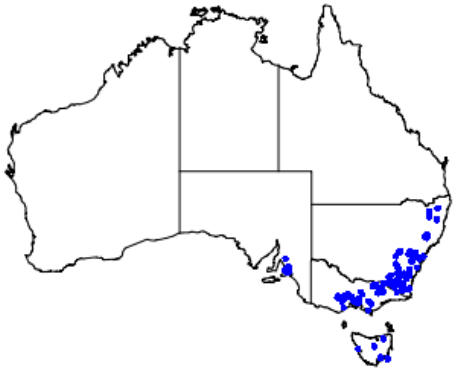
Outcomes

Relative change in overall climate suitability: -27.34%

Spatial trend: South-east

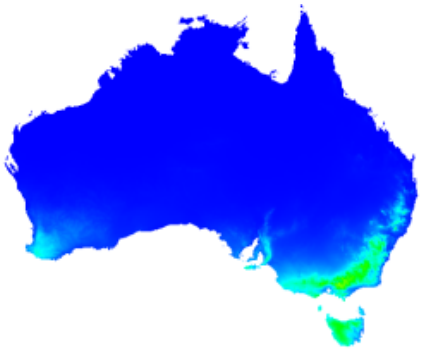
Occurrence distribution





Model results

Current



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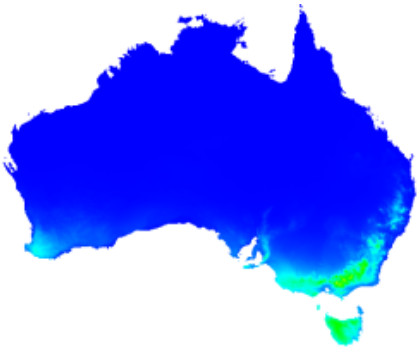

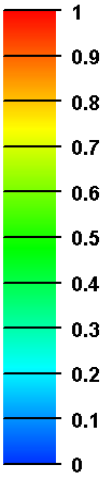

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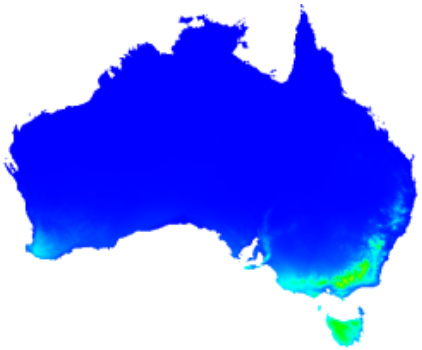


2080

Dittrichia viscosa

Asteraceae

Common name(s): False yellowhead

National list(s): Alert list

NSW status: Not listed

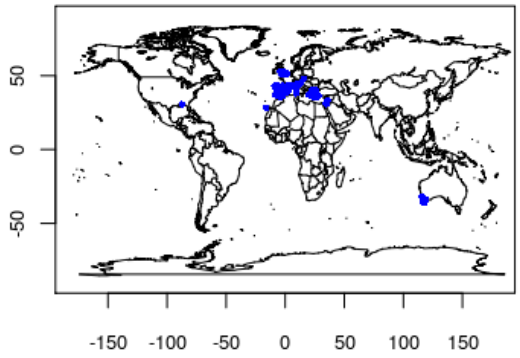
Number of occurrence records used: 525

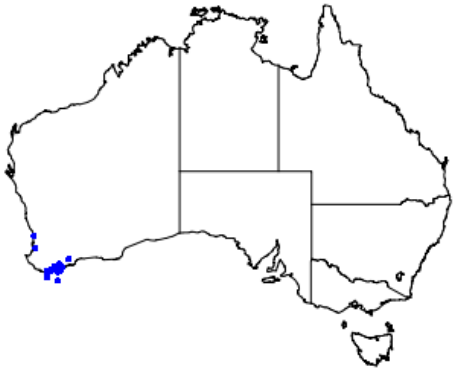
Outcomes

Relative change in overall climate suitability: +19.89%

Spatial trend: South-east

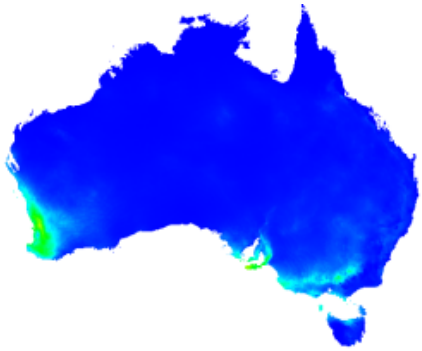
Occurrence distribution





Model results

Current



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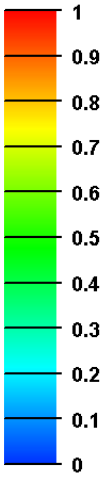

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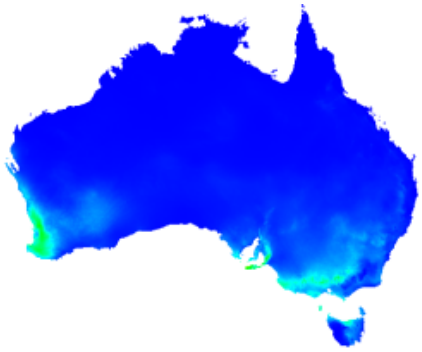


2080

Echium plantagineum

Boraginaceae

Common name(s): Paterson's curse, Salvation Jane

National list(s): WoNS shortlist

NSW status: C4(47)

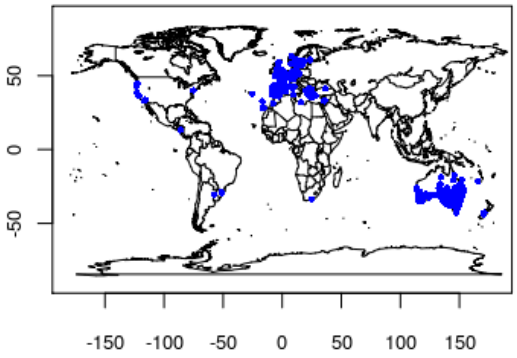
Number of occurrence records used: 1411

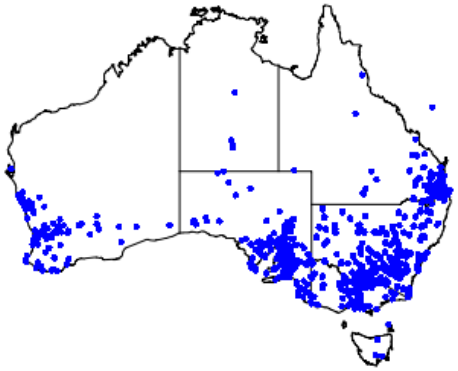
Outcomes

Relative change in overall climate suitability: -36.68%

Spatial trend: South-east

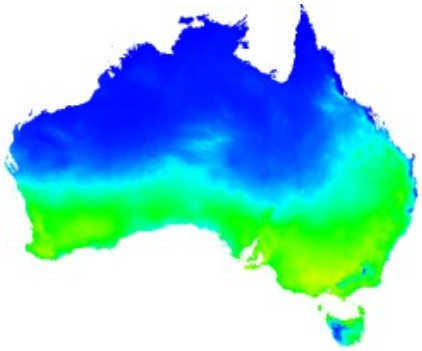
Occurrence distribution





Model results

Current



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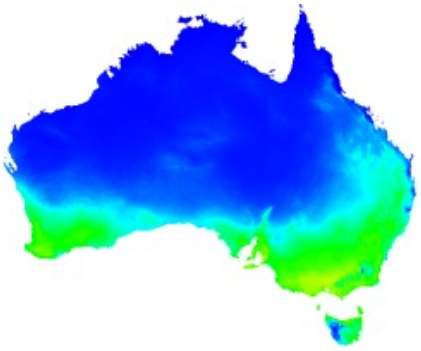

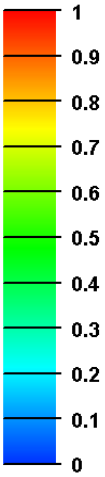

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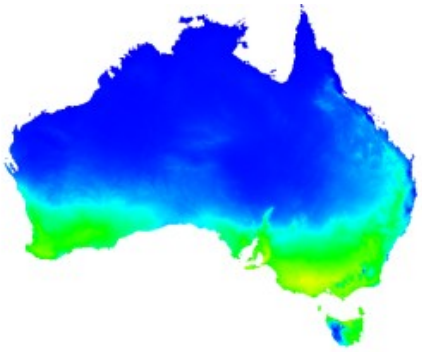

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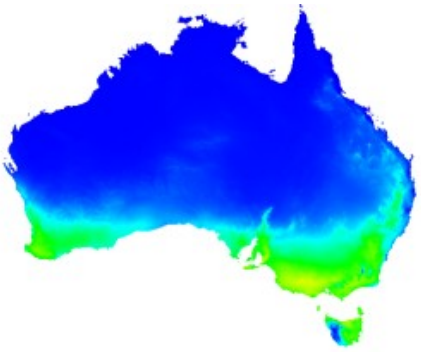


Eichhornia crassipes

Pontederiaceae

Common name(s): Water hyacinth

National list(s): WoNS shortlist

NSW status: C2(102)/C3(17)/C4(9)

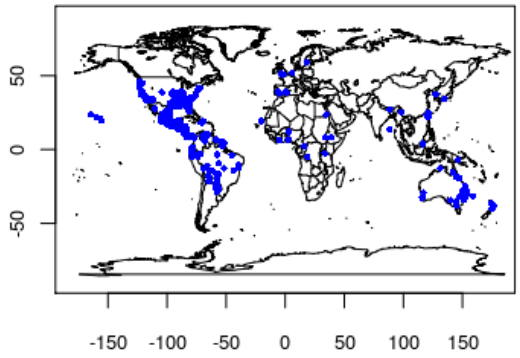
Number of occurrence records used: 695

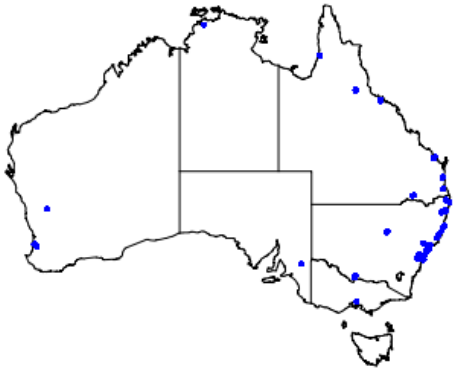
Outcomes

Relative change in overall climate suitability: -19.1%

Spatial trend: South-east

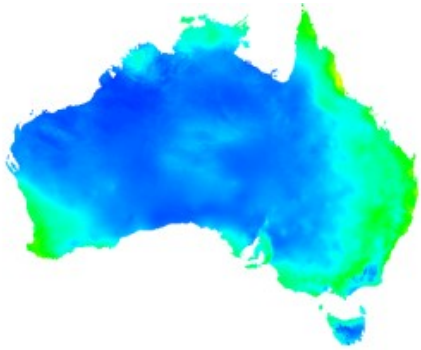
Occurrence distribution





Model results

Current



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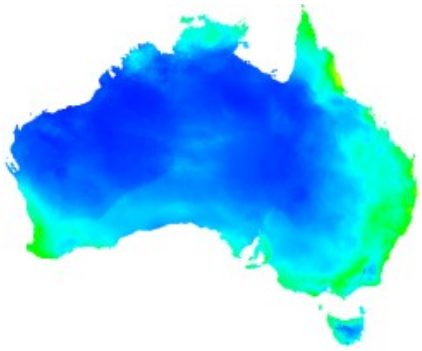

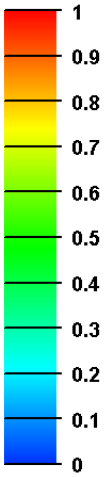

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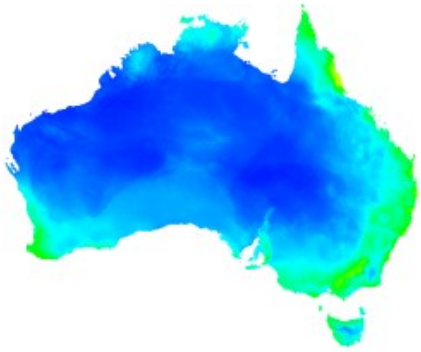
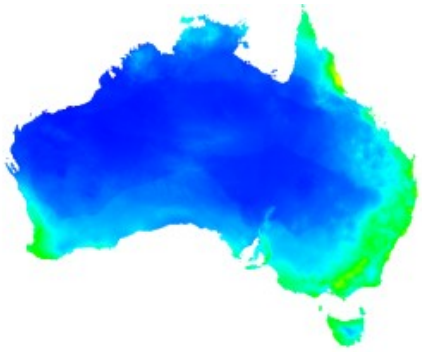


2080



Elephantopus mollis

Asteraceae

Common name(s): Tobacco weed

National list(s): WoNS shortlist

NSW status: Not listed

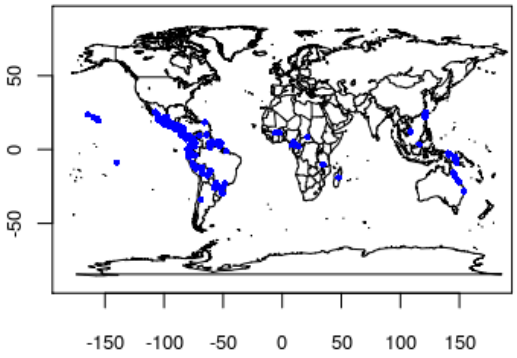
Number of occurrence records used: 418

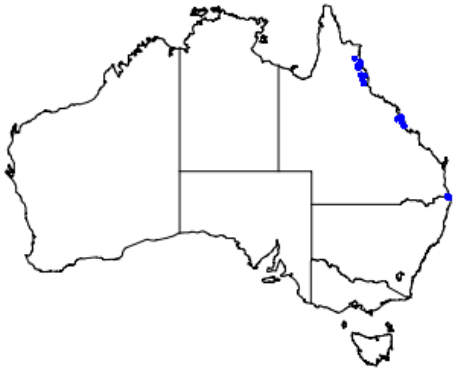
Outcomes

Relative change in overall climate suitability: -14.24%

Spatial trend: South-east

Occurrence distribution

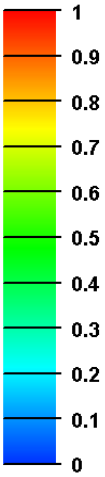




Model results

Current

2020



2050

2080

Equisetum spp.

Equisetaceae

Common name(s): Horsetails

National list(s): Alert list

NSW status: C1(S)

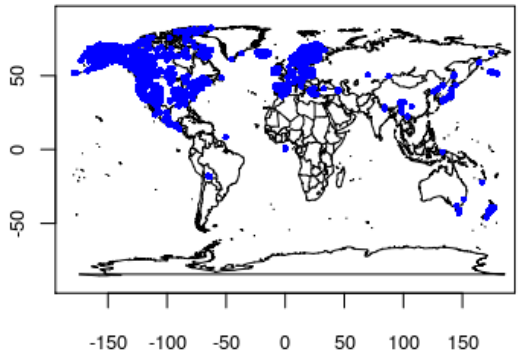
Number of occurrence records used: 4177

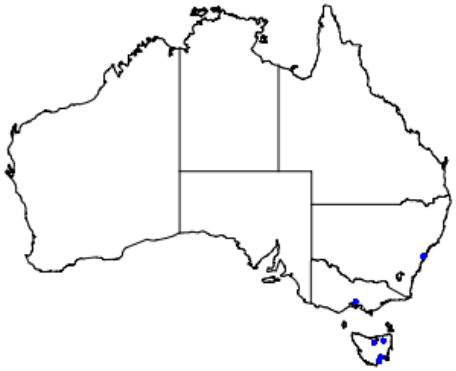
Outcomes

Relative change in overall climate suitability: -31.87%

Spatial trend: South-east

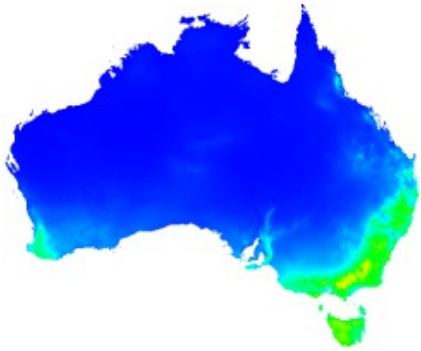
Occurrence distribution





Model results

Current



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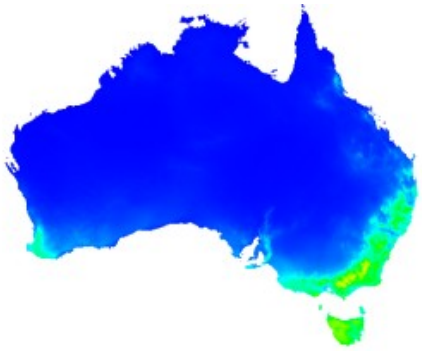

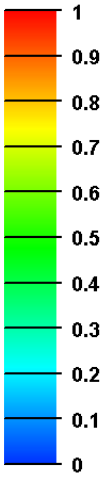

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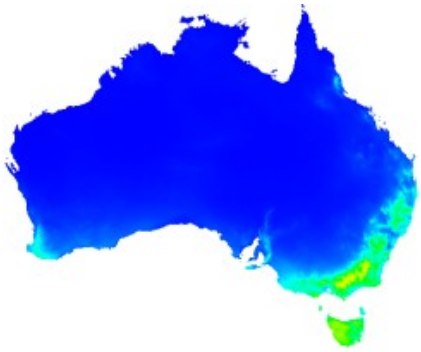

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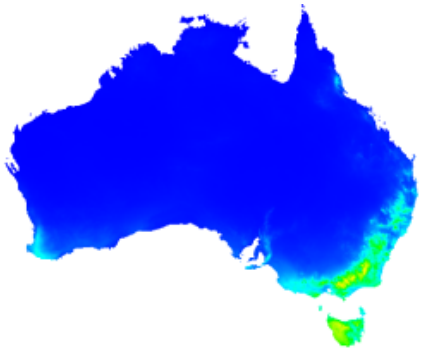


Eragrostis curvula

Poaceae

Common name(s): African Love Grass

National list(s): WoNS shortlist

NSW status: C4(20)

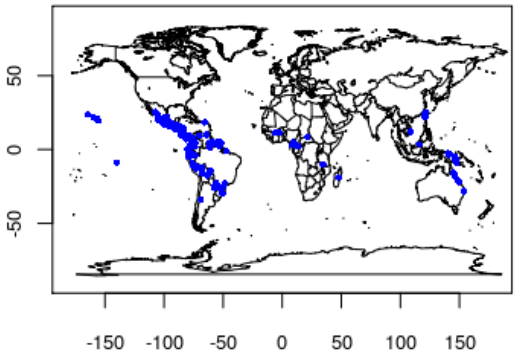
Number of occurrence records used: 1774

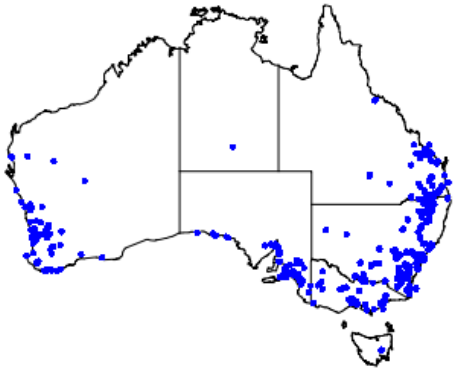
Outcomes

Relative change in overall climate suitability: -38.04%

Spatial trend: South-east

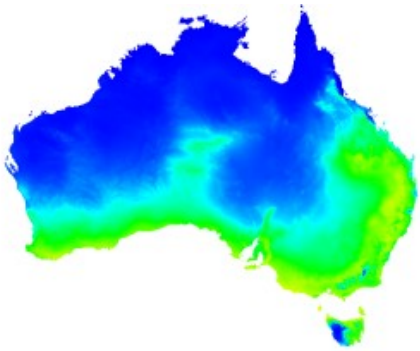
Occurrence distribution



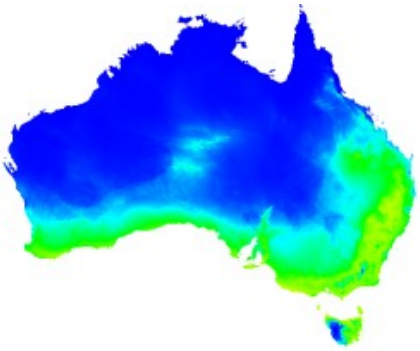


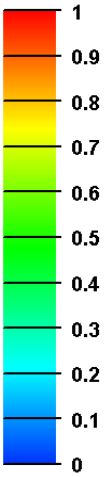
Model results

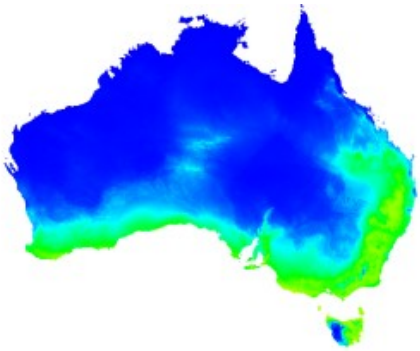
Current

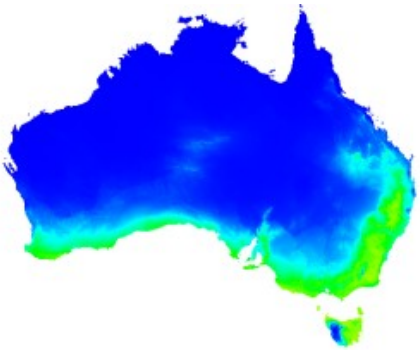


2020









Erica lusitanica

Ericaceae

Common name(s): Spanish heath

National list(s): WoNS shortlist

NSW status: Not listed

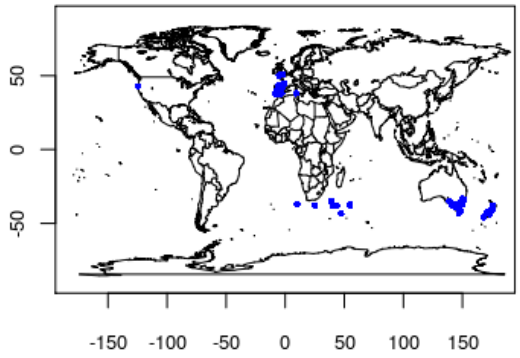
Number of occurrence records used: 172

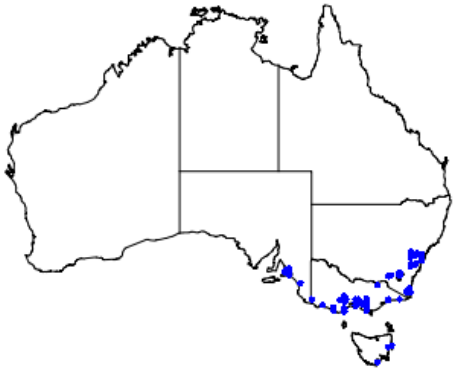
Outcomes

Relative change in overall climate suitability: -28.51%

Spatial trend: South-east

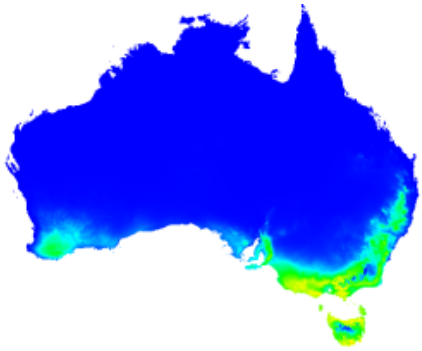
Occurrence distribution



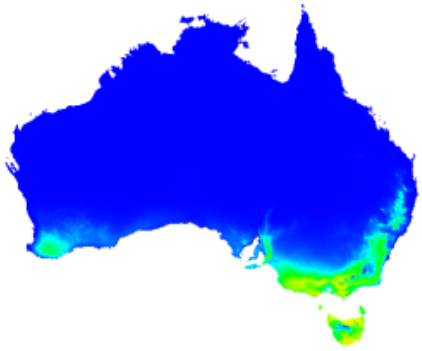


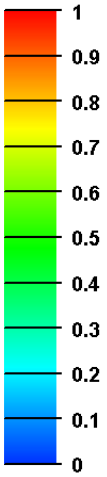
Model results

Current

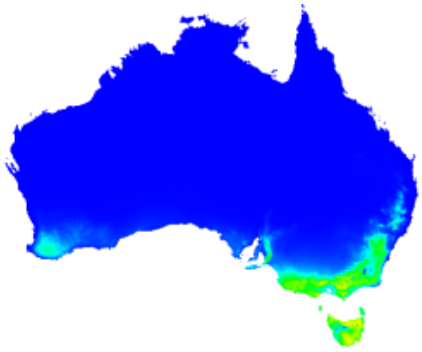


2020

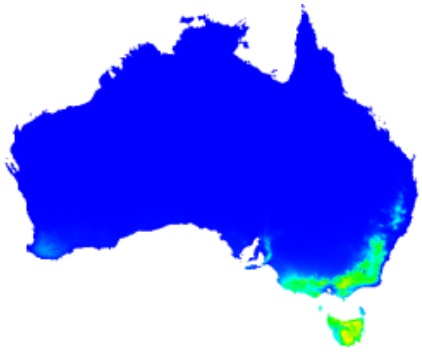




2050



2080



Euphorbia paralias

Euphorbiaceae

Common name(s): Sea spurge

National list(s): WoNS shortlist

NSW status: Not listed

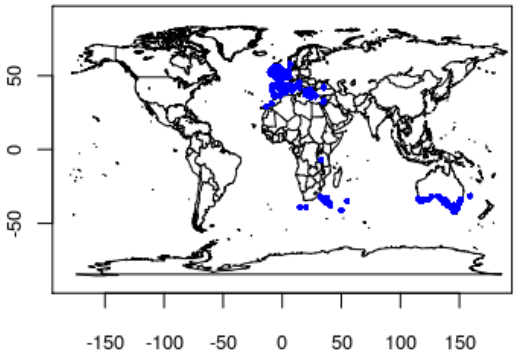
Number of occurrence records used: 569

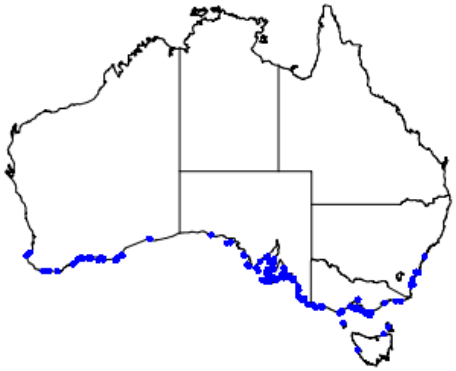
Outcomes

Relative change in overall climate suitability: -24.43%

Spatial trend: South-east

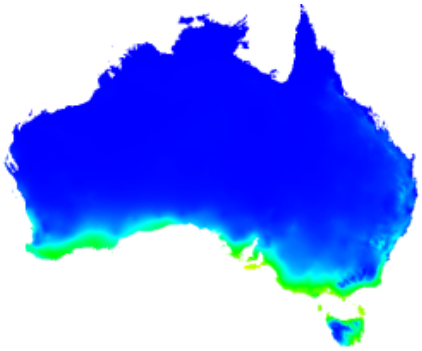
Occurrence distribution





Model results

Current



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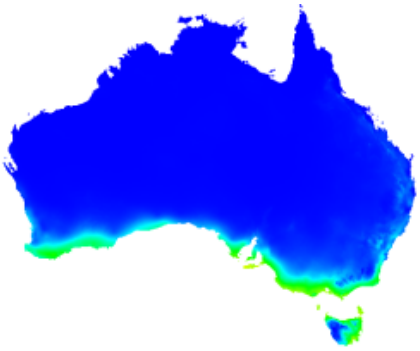
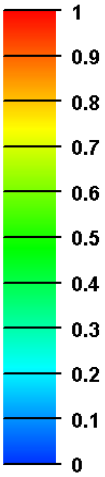
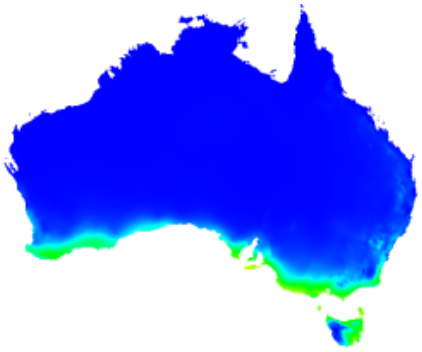
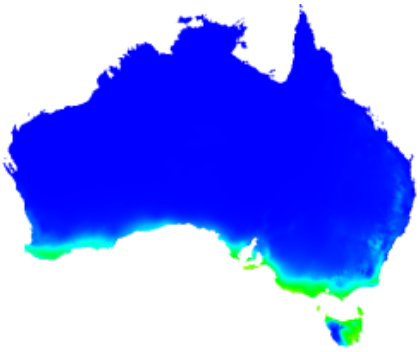








Genista monspessulana

Fabaceae

Common name(s): Cape broom, Canary broom, Montpellier broom, Common broom

National list(s): WoNS shortlist

NSW status: C2(3)/C3(9)

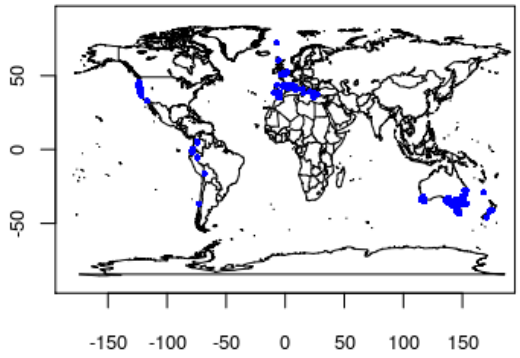
Number of occurrence records used: 452

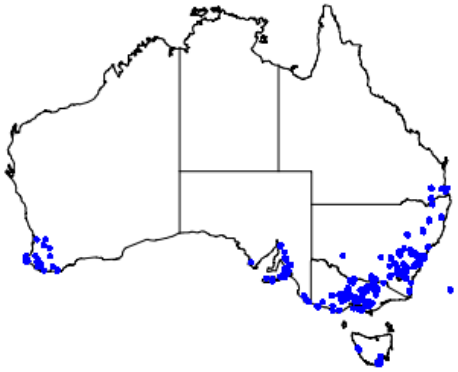
Outcomes

Relative change in overall climate suitability: -33.54%

Spatial trend: South-east

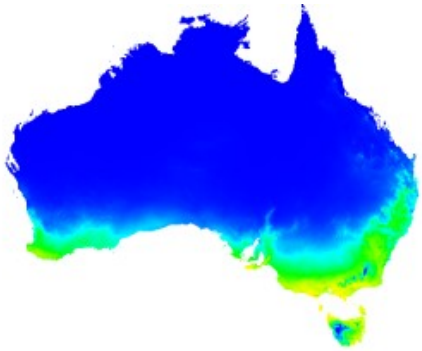
Occurrence distribution



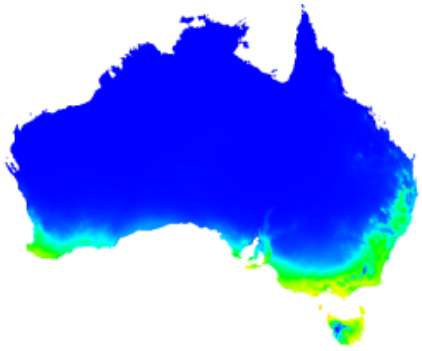


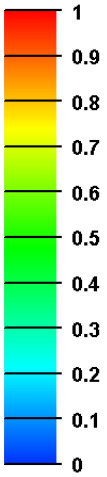
Model results

Current

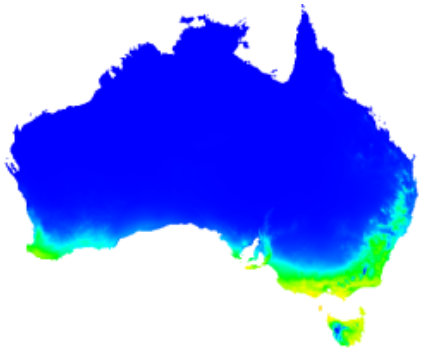


2020

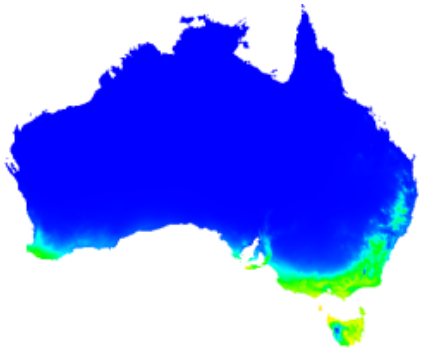




2050



2080



Gleditsia triacanthos

Fabaceae

Common name(s): Honey locust

National list(s): WoNS shortlist

NSW status: C3(5)

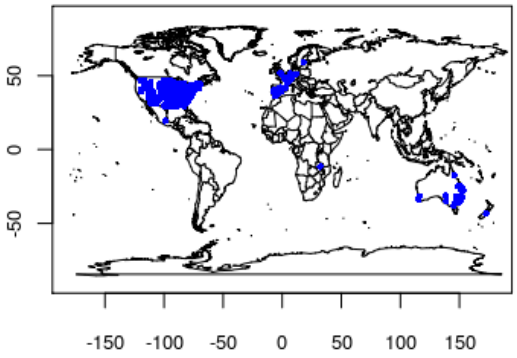
Number of occurrence records used: 1365

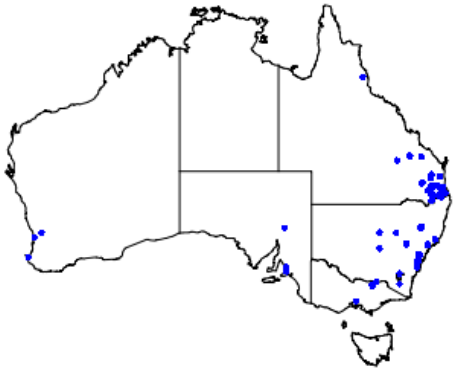
Outcomes

Relative change in overall climate suitability: -12.03%

Spatial trend: South-east

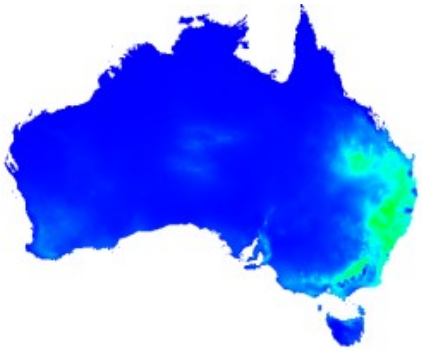
Occurrence distribution





Model results

Current



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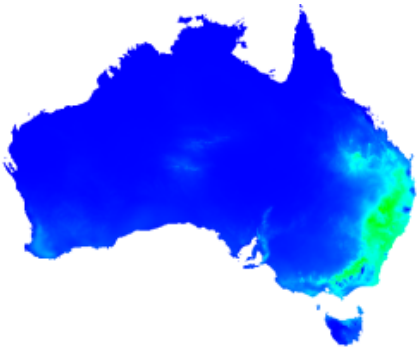
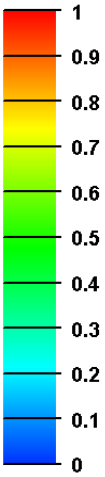
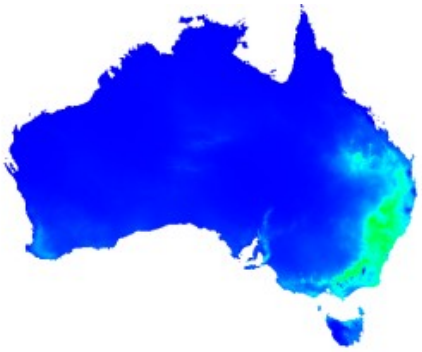
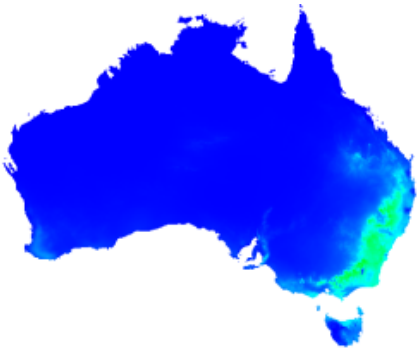




2050



2080



Gomphocarpus fruticosus

Apocynaceae

Common name(s): Narrow-leaf cotton bush

National list(s): WoNS shortlist

NSW status: Not listed

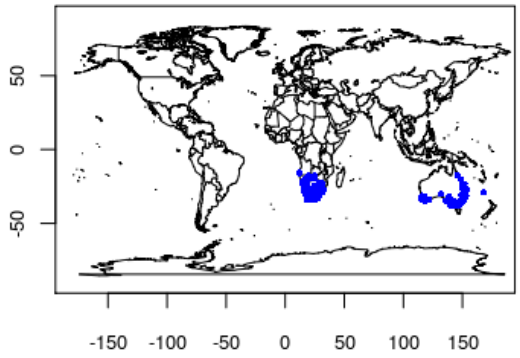
Number of occurrence records used: 757

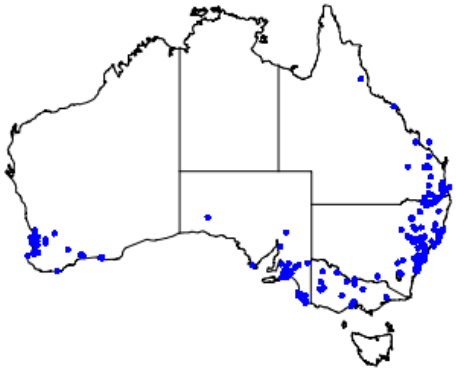
Outcomes

Relative change in overall climate suitability: -45.45%

Spatial trend: South-west

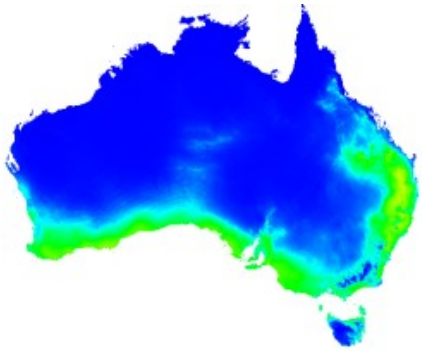
Occurrence distribution



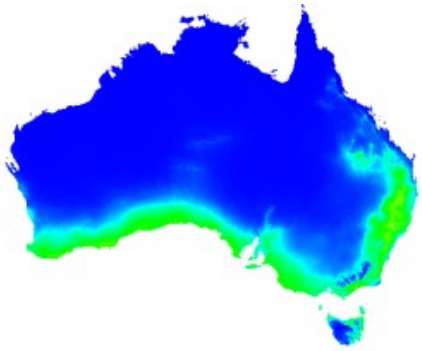


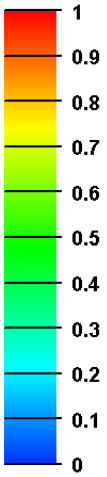
Model results

Current



2020





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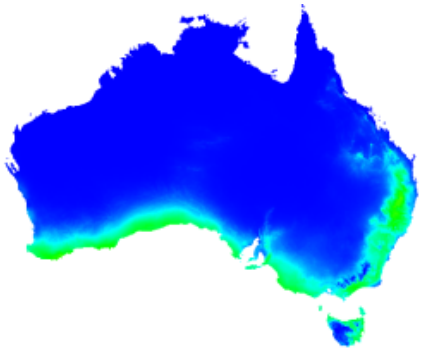
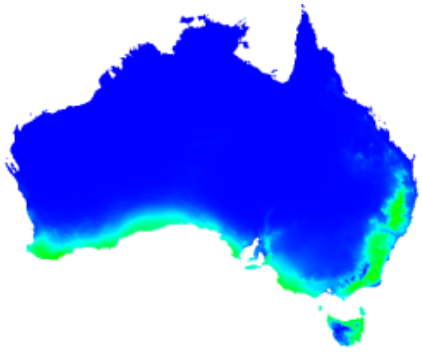


2080



Gymnocoronis spilanthoides

Asteraceae

Common name(s): Senegal tea plant

National list(s): Alert list

NSW status: C1(S)

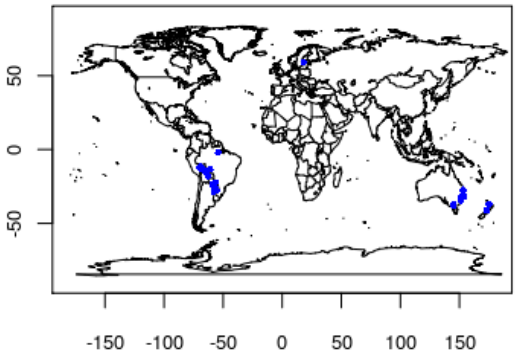
Number of occurrence records used: 63

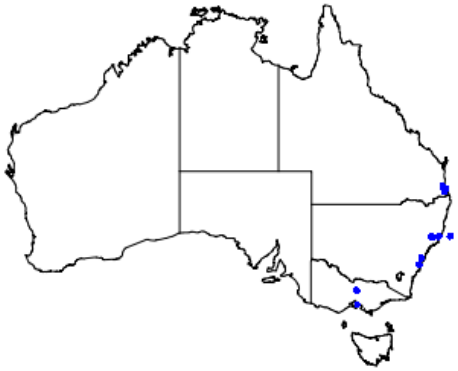
Outcomes

Relative change in overall climate suitability: -41.23%

Spatial trend: South-east

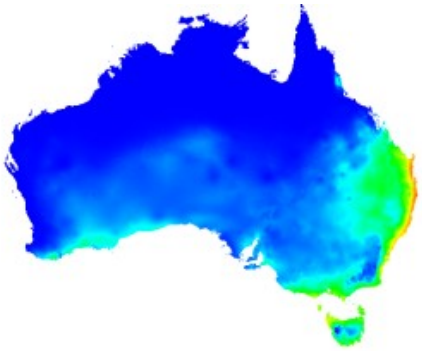
Occurrence distribution





Model results

Current



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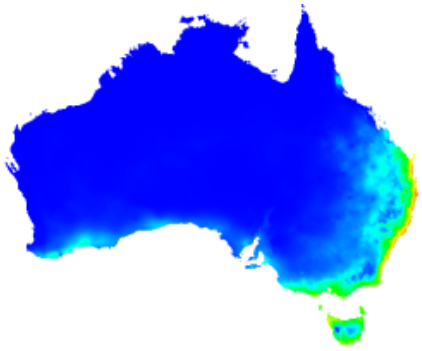
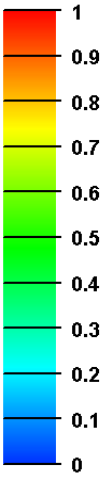
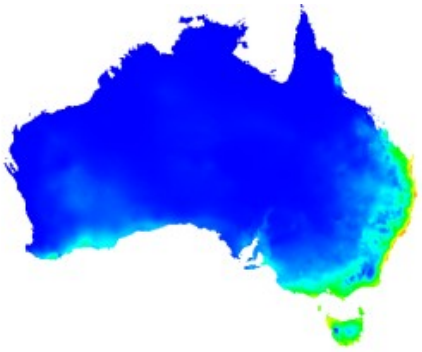
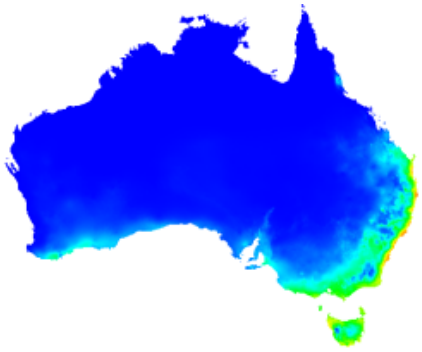








Hieracium aurantiacum

Asteraceae

Common name(s): Orange hawkweed

National list(s): Alert list

NSW status: C1(S)

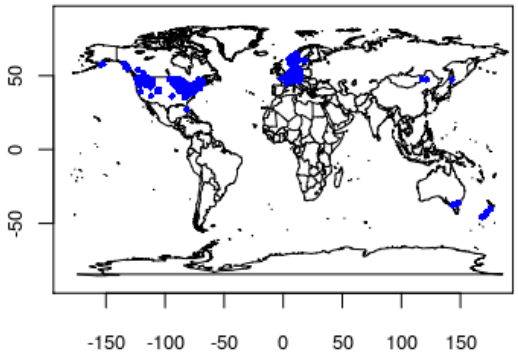
Number of occurrence records used: 1968

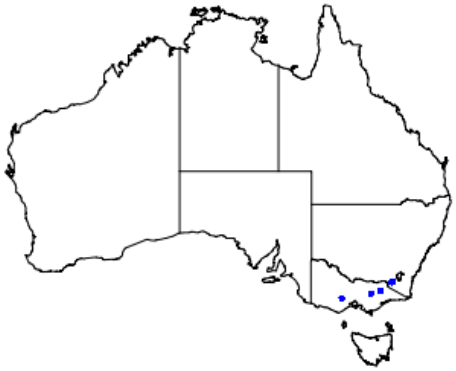
Outcomes

Relative change in overall climate suitability: -34.36%

Spatial trend: South-east

Occurrence distribution

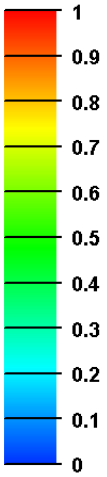




Model results

Current

2020



2050

2080

Hydrocotyle ranunculoides

Apiaceae

Common name(s): Hydrocotyle, water pennywort

National list(s): WoNS shortlist

NSW status: Not listed

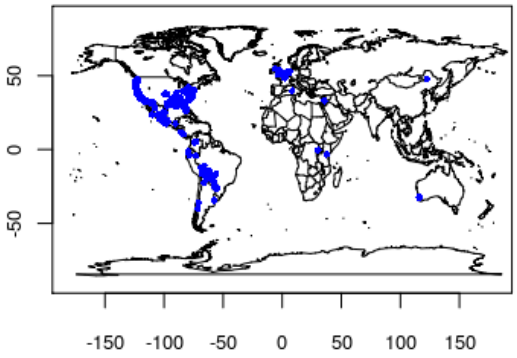
Number of occurrence records used: 489

Outcomes

Relative change in overall climate suitability: -27.62%

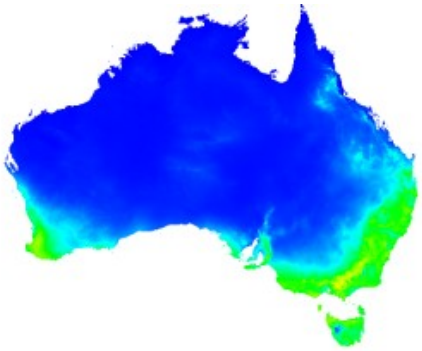
Spatial trend: South-east

Occurrence distribution



Model results

Current



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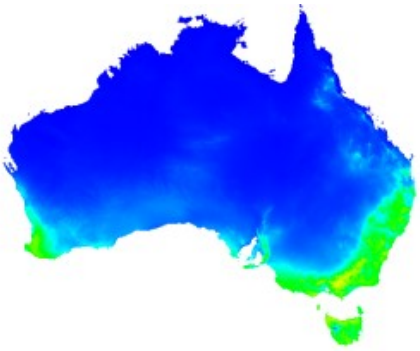

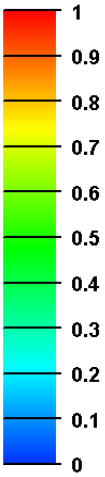

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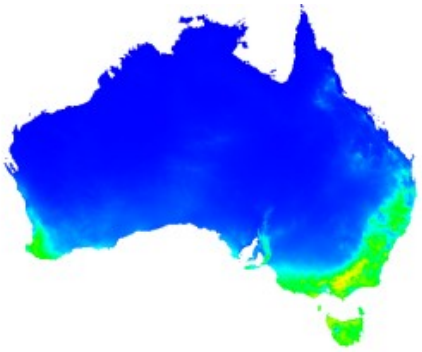

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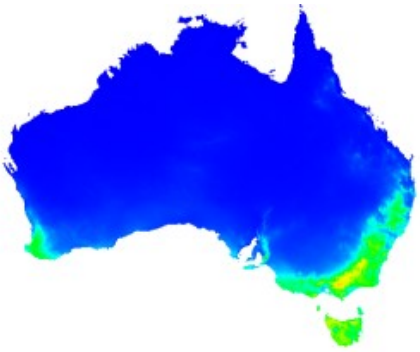


Hymenachne amplexicaulis

Poaceae

Common name(s): Hymenachne

National list(s): WoNS declared

NSW status: C1(S)

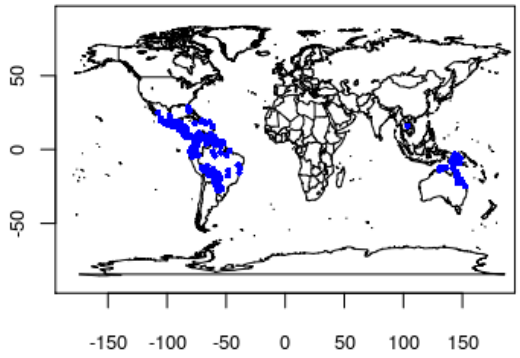
Number of occurrence records used: 41

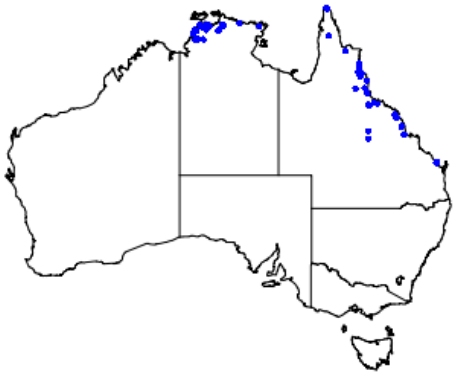
Outcomes

Relative change in overall climate suitability: -10.74%

Spatial trend: South-east

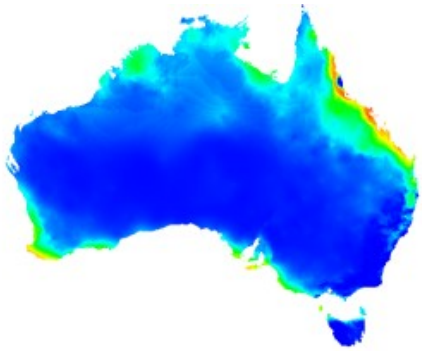
Occurrence distribution





Model results

Current



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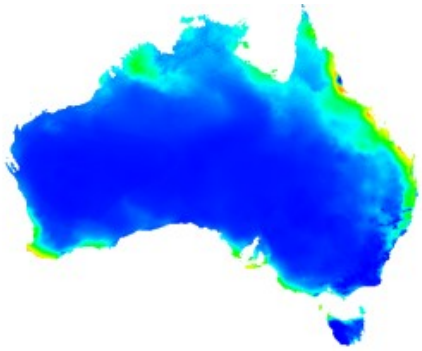

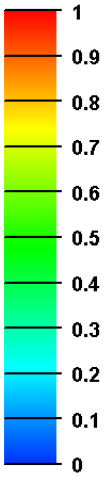

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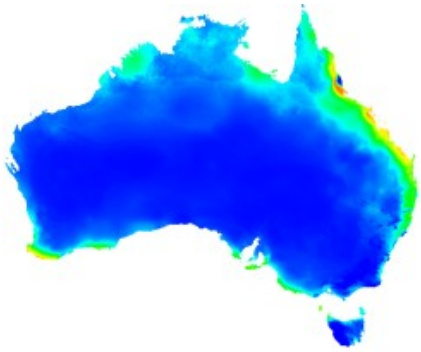

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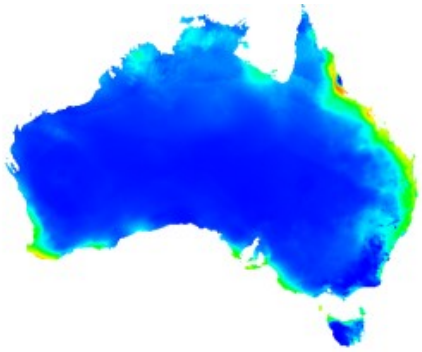


Hyparrhenia hirta

Poaceae

Common name(s): Coolatai grass

National list(s): Not listed

NSW status: C3(33)

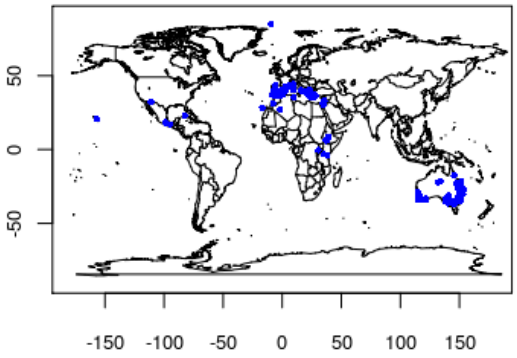
Number of occurrence records used: 811

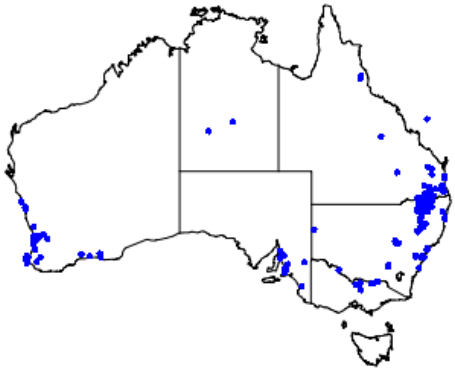
Outcomes

Relative change in overall climate suitability: -14.84%

Spatial trend: South-east

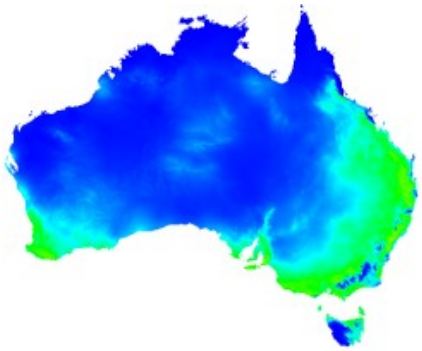
Occurrence distribution





Model results

Current



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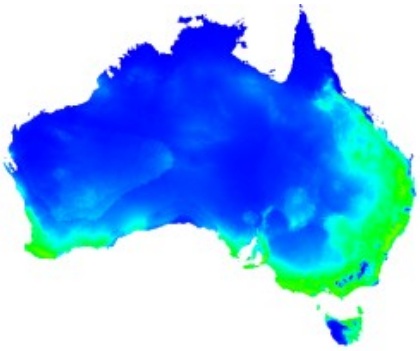
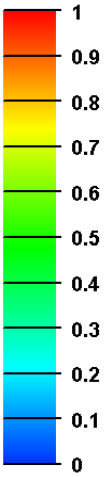
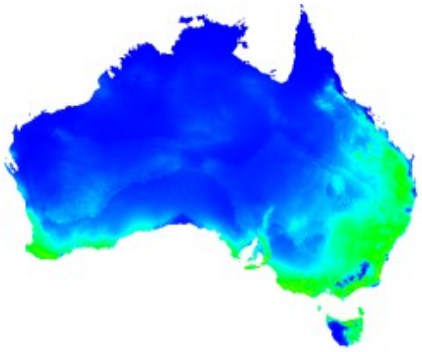
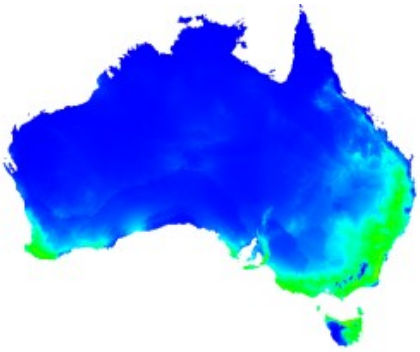








Hypericum perforatum

Hypericaceae

Common name(s): St Johns wort

National list(s): WoNS shortlist

NSW status: C3(36)/C4(77)

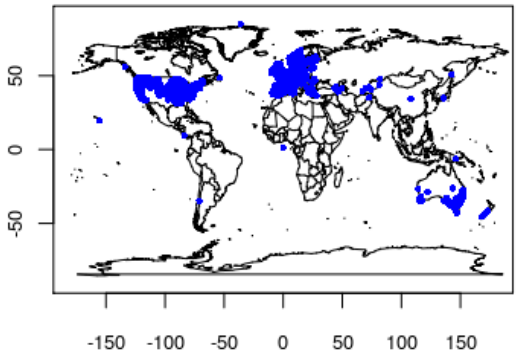
Number of occurrence records used: 11230

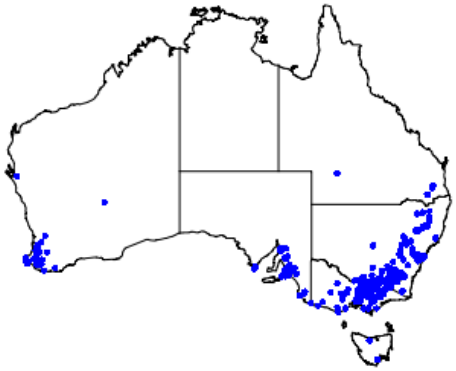
Outcomes

Relative change in overall climate suitability: -29.78%

Spatial trend: South-east

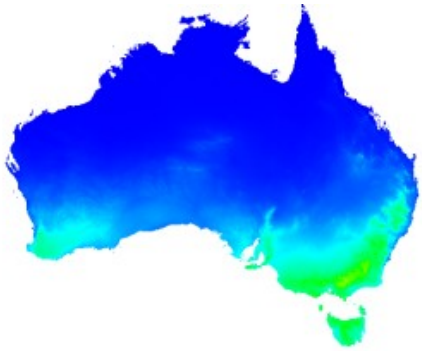
Occurrence distribution





Model results

Current



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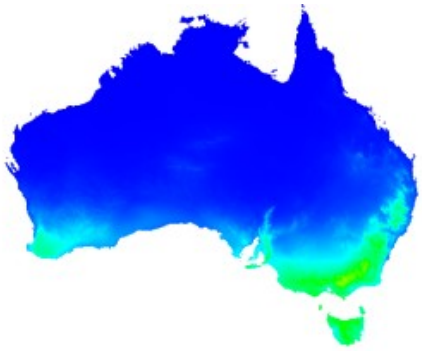
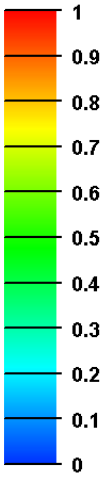
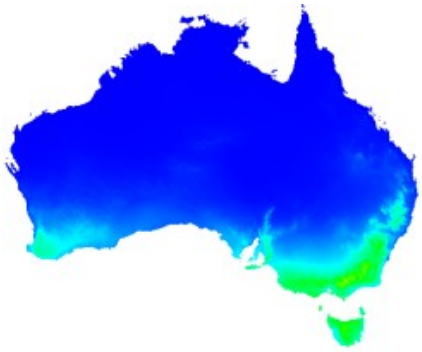
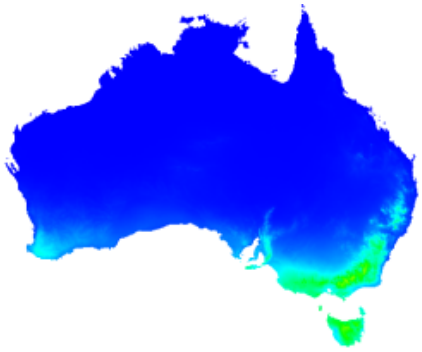




2050



2080



Hyptis suaveolens

Lamiaceae

Common name(s): Hyptis

National list(s): WoNS shortlist

NSW status: Not listed

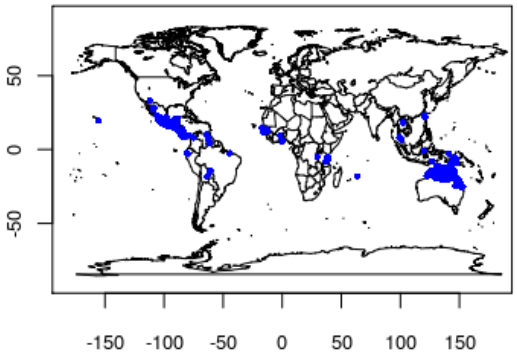
Number of occurrence records used: 596

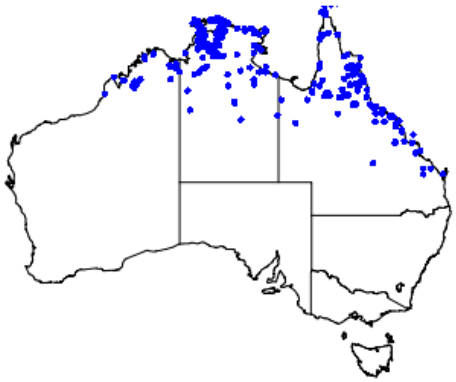
Outcomes

Relative change in overall climate suitability: +11.5%

Spatial trend: South-east

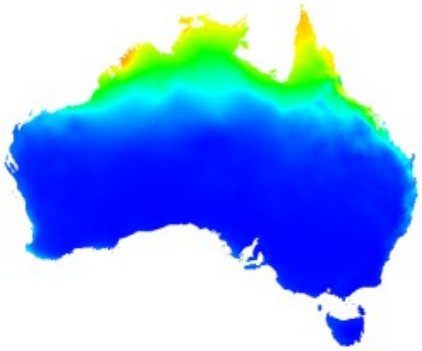
Occurrence distribution





Model results

Current



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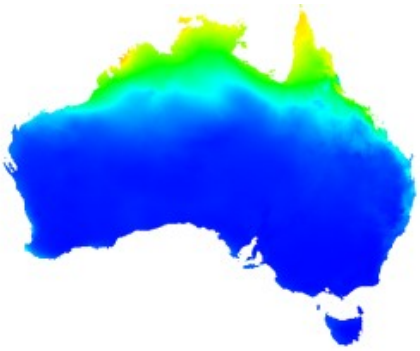

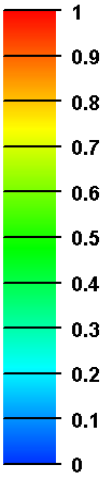

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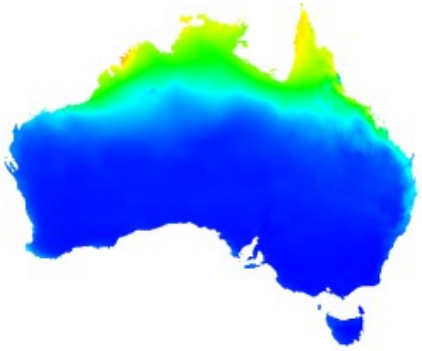

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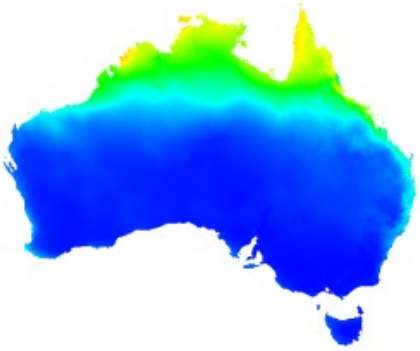


Jatropha gossypifolia

Euphorbiaceae

Common name(s): Bellyache bush

National list(s): WoNS shortlist

NSW status: Not listed

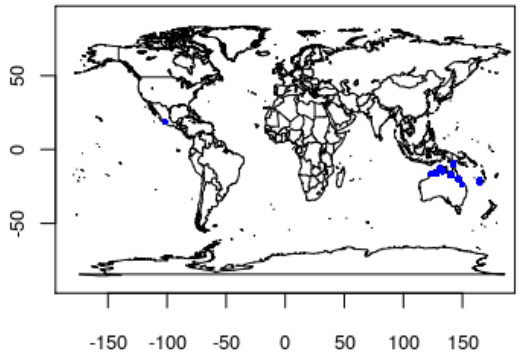
Number of occurrence records used: 33

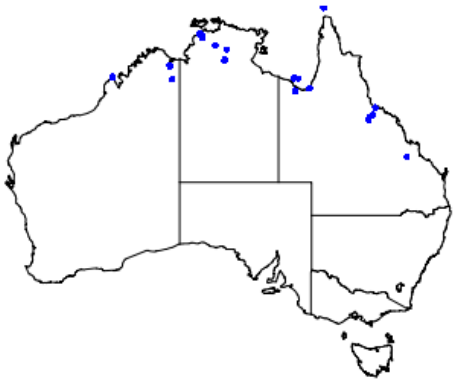
Outcomes

Relative change in overall climate suitability: +31.96%

Spatial trend: South-east

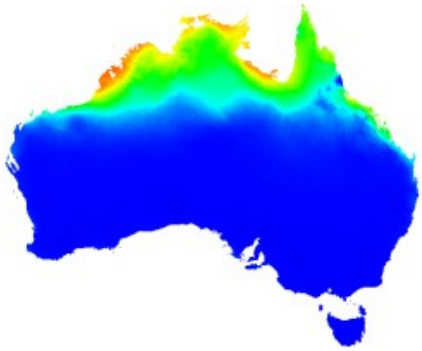
Occurrence distribution





Model results

Current



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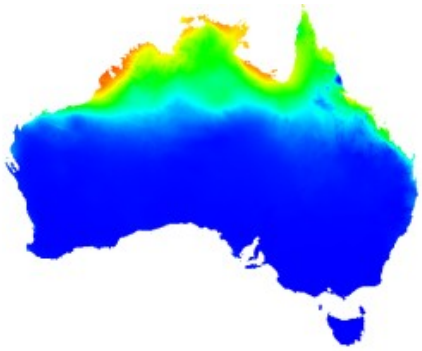

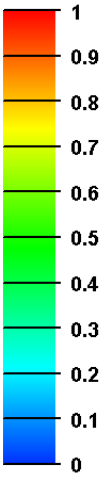

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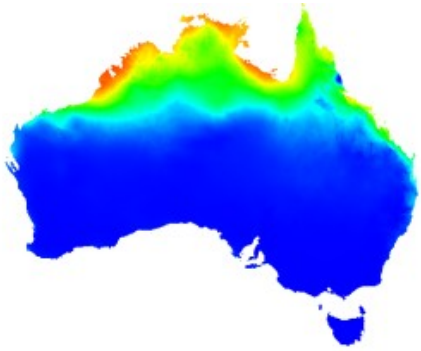

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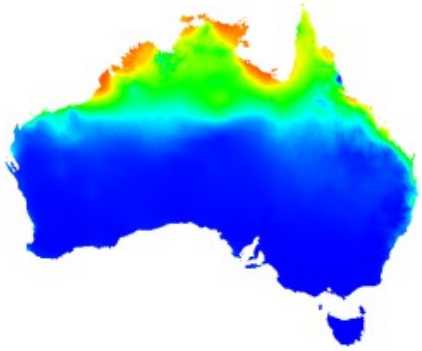


Koelreuteria elegans

Sapindaceae

Common name(s): Chinese rain tree

National list(s): Alert list

NSW status: Not listed

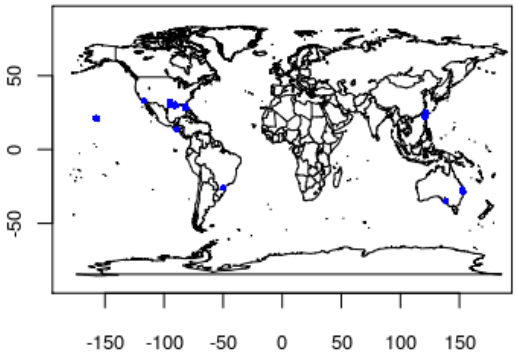
Number of occurrence records used: 32

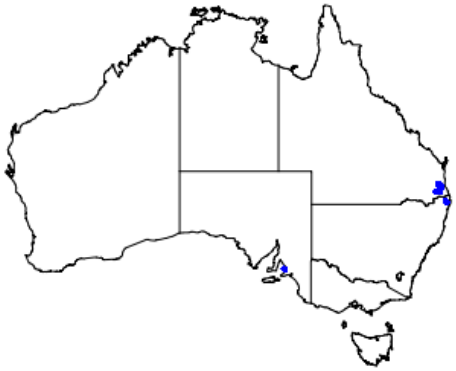
Outcomes

Relative change in overall climate suitability: -31.36%

Spatial trend: South-east

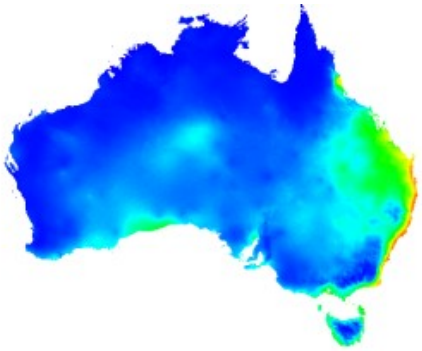
Occurrence distribution





Model results

Current



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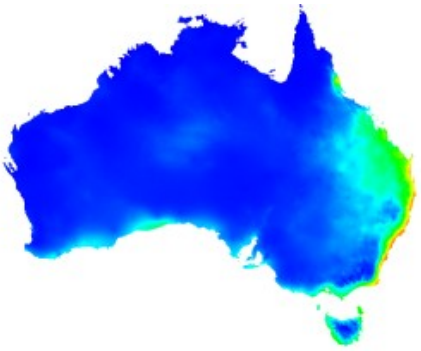

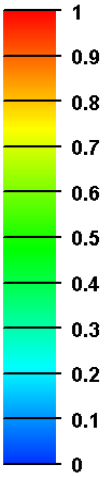

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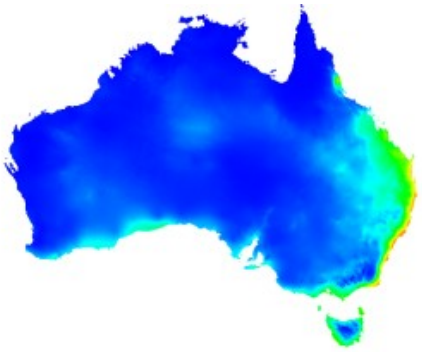

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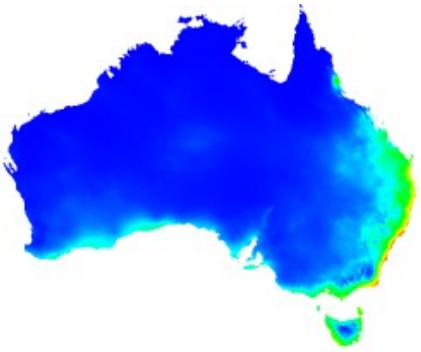


Lachenalia reflexa

Asparagaceae

Common name(s): Yellow soldier

National list(s): Alert list

NSW status: Not listed

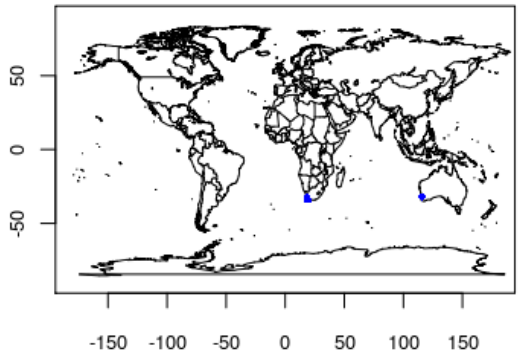
Number of occurrence records used: 9

Outcomes

Relative change in overall climate suitability: -1.33%

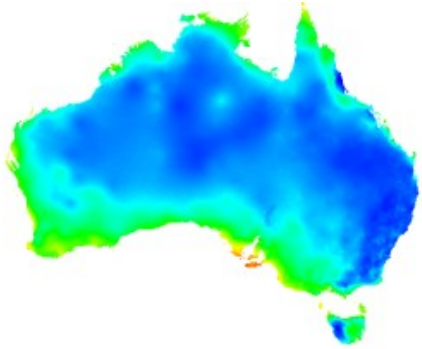
Spatial trend: South-east

Occurrence distribution

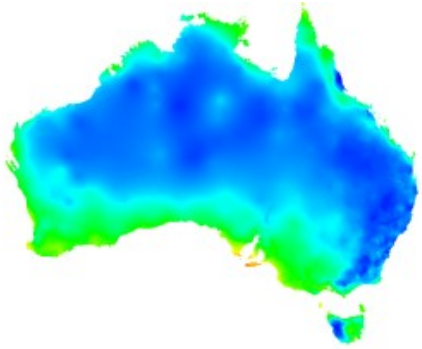


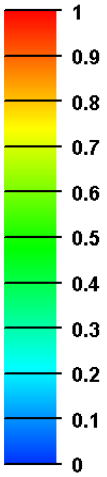
Model results

Current

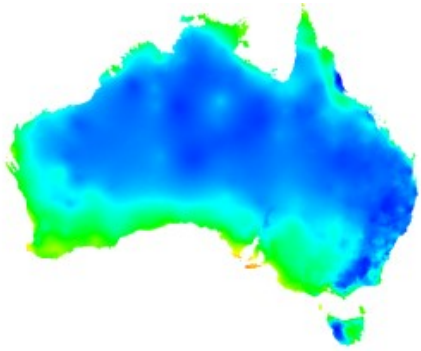


2020





2050



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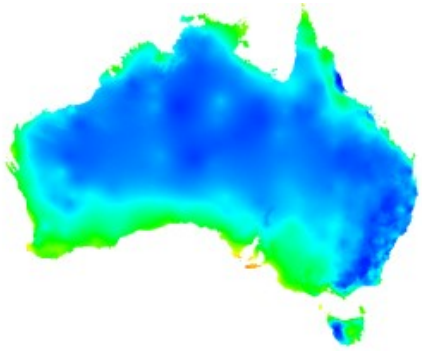


Lagarosiphon major

Hydrocharitaceae

Common name(s): Lagarosiphon, oxygen weed

National list(s): Alert list

NSW status: C1(S)

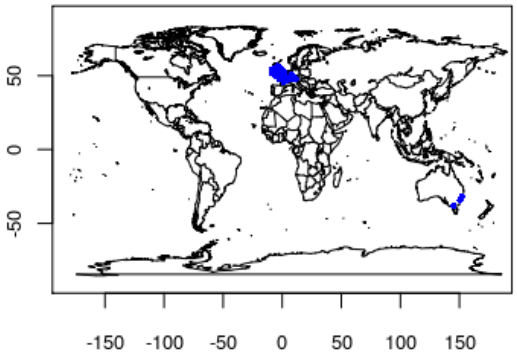
Number of occurrence records used: 486

Outcomes

Relative change in overall climate suitability: -56.47%

Spatial trend: South-east

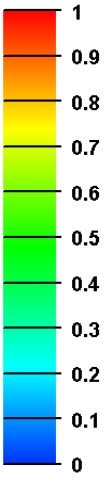
Occurrence distribution



Model results

Current

2020



2050

2080

Lantana camara

Verbenaceae

Common name(s): Lantana

National list(s): WoNS declared

NSW status: C3(3)/C4(47)/C5(S)

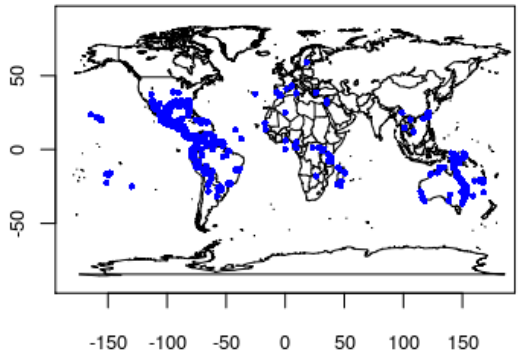
Number of occurrence records used: 1113

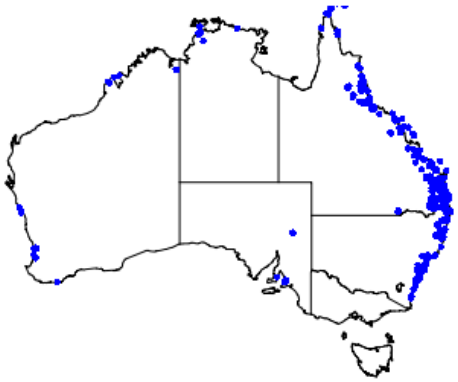
Outcomes

Relative change in overall climate suitability: -29.14%

Spatial trend: South-east

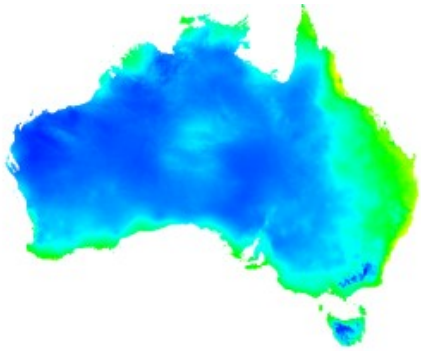
Occurrence distribution





Model results

Current



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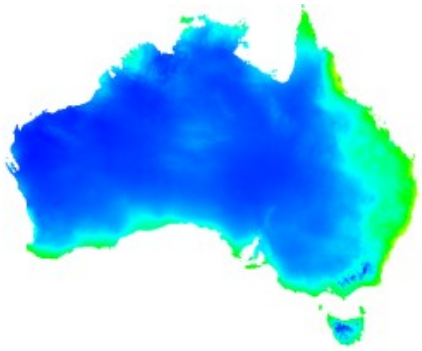

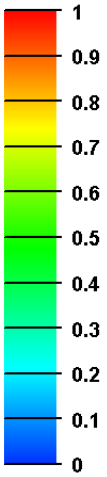

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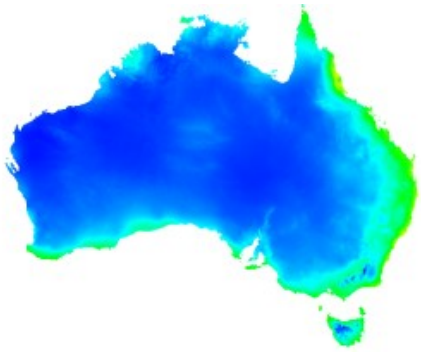

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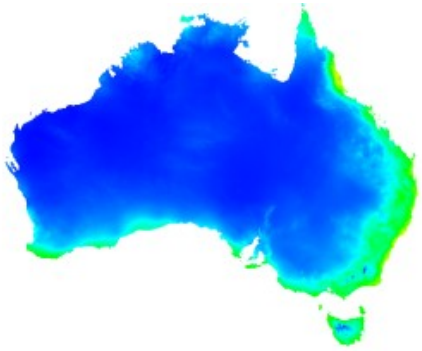


Lantana montevidensis

Verbenaceae

Common name(s): Creeping lantana

National list(s): WoNS shortlist

NSW status: C3(3)/C4(125)/C5(S)

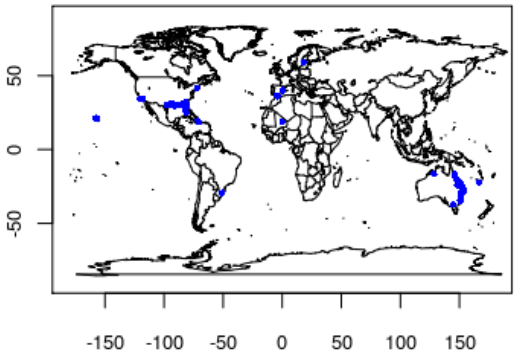
Number of occurrence records used: 131

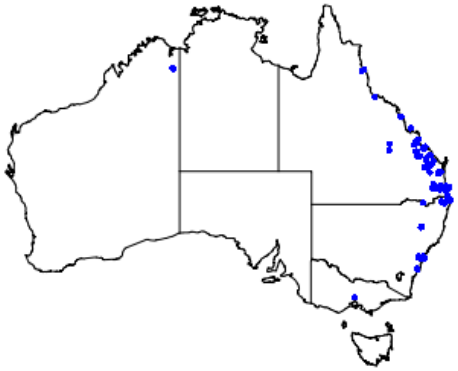
Outcomes

Relative change in overall climate suitability: -33.84%

Spatial trend: South-east

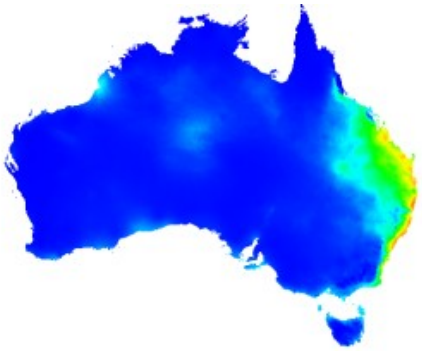
Occurrence distribution



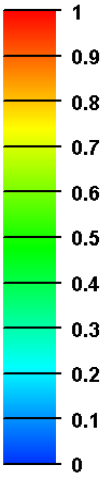


Model results

Current



2020



2050

2080

Ligustrum lucidum

Oleaceae

Common name(s): Broad-leaved privet

National list(s): WoNS shortlist

NSW status: C4(48)

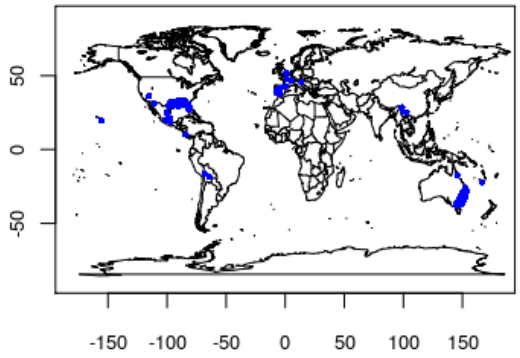
Number of occurrence records used: 213

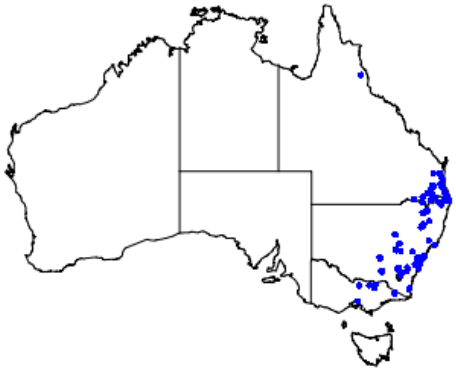
Outcomes

Relative change in overall climate suitability: -53.96%

Spatial trend: South-east

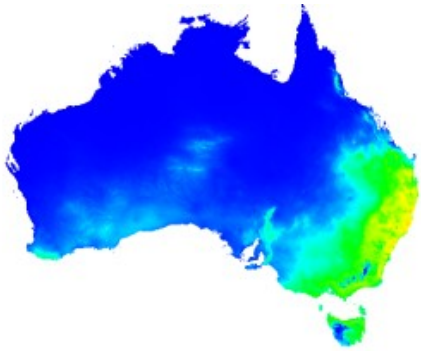
Occurrence distribution



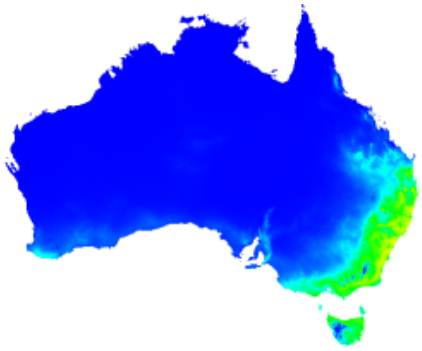


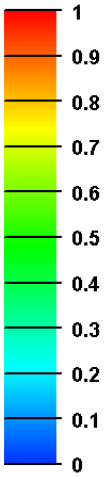
Model results

Current



2020





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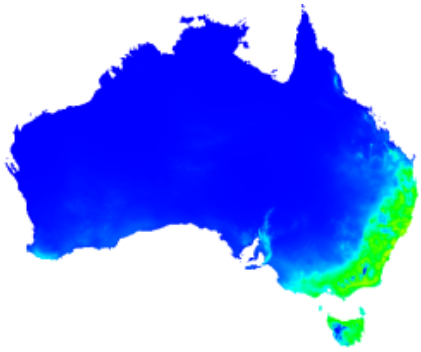

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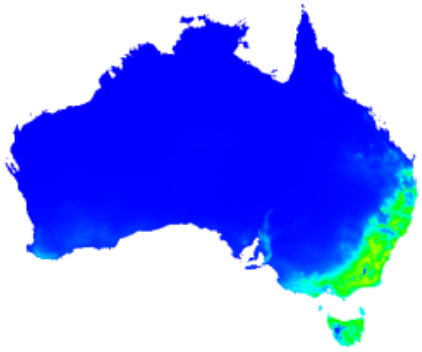


Ligustrum sinense

Oleaceae

Common name(s): Small-leaved privet

National list(s): WoNS shortlist

NSW status: C4(38)

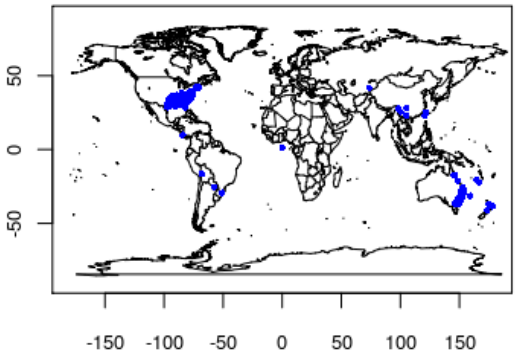
Number of occurrence records used: 624

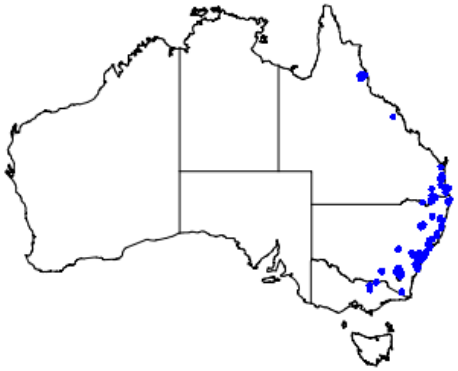
Outcomes

Relative change in overall climate suitability: -53.61%

Spatial trend: South-east

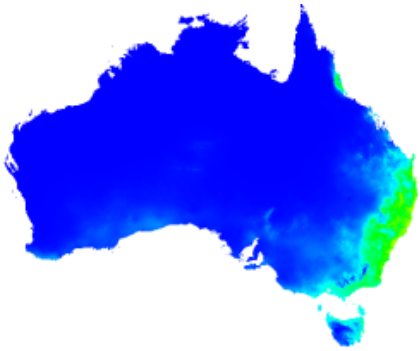
Occurrence distribution



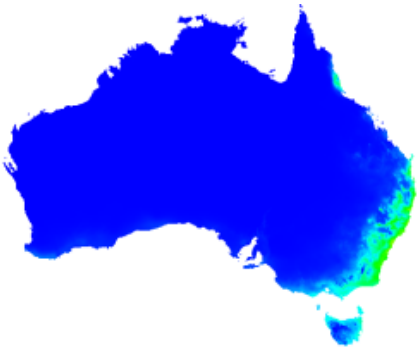


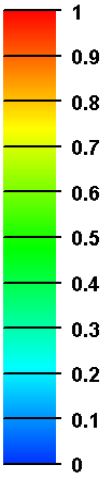
Model results

Current



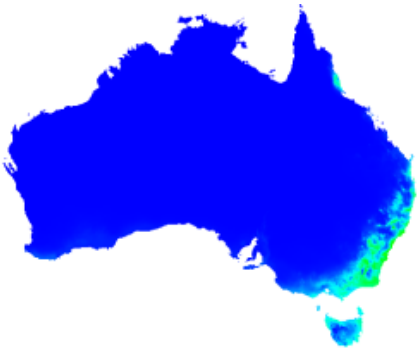
2020





2050

2080



Lycium ferocissimum

Solanaceae

Common name(s): African Boxthorn

National list(s): WoNS shortlist

NSW status: C4(85)

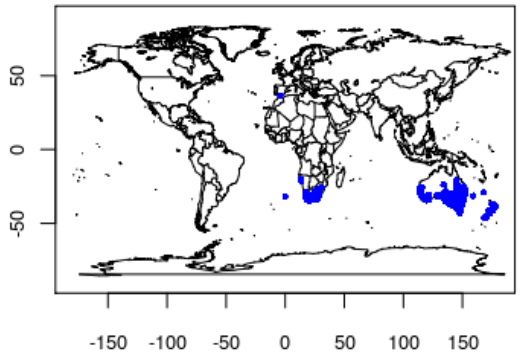
Number of occurrence records used: 652

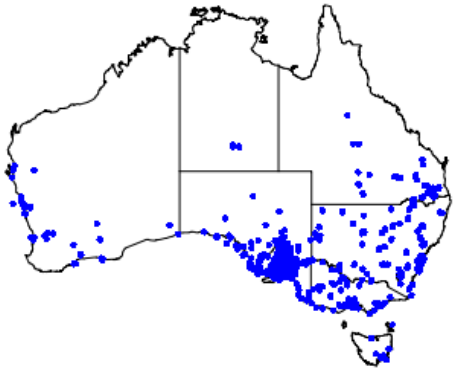
Outcomes

Relative change in overall climate suitability: -51.89%

Spatial trend: South-west

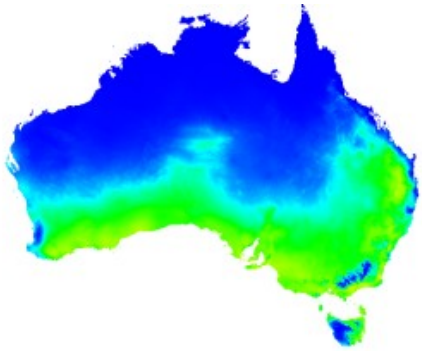
Occurrence distribution





Model results

Current



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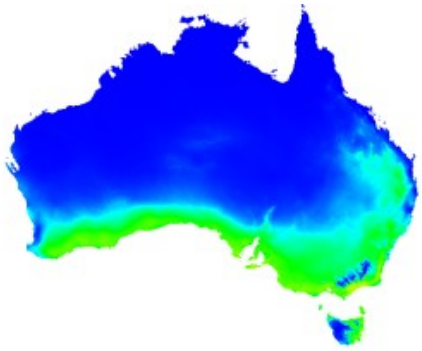

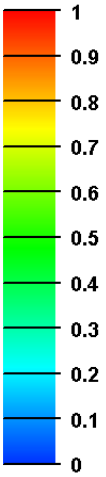

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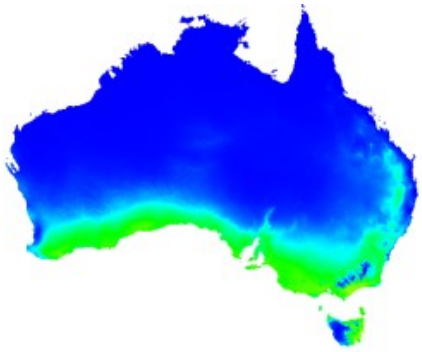
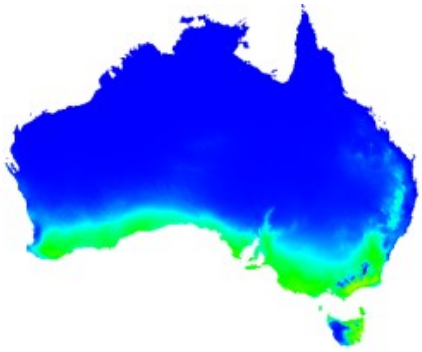


2080



Macfadyena unguis-cati

Bignoniaceae

Common name(s): Cats claw creeper

National list(s): WoNS shortlist

NSW status: C4(12)

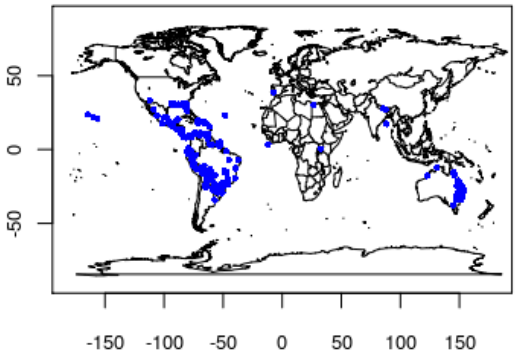
Number of occurrence records used: 406

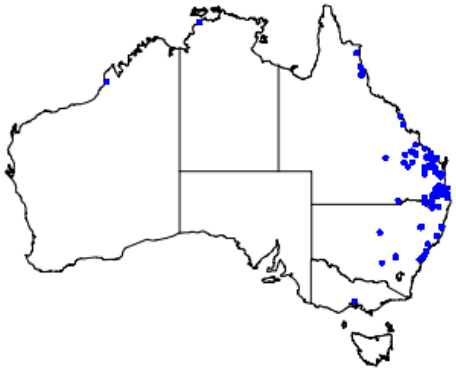
Outcomes

Relative change in overall climate suitability: -43.41%

Spatial trend: South-east

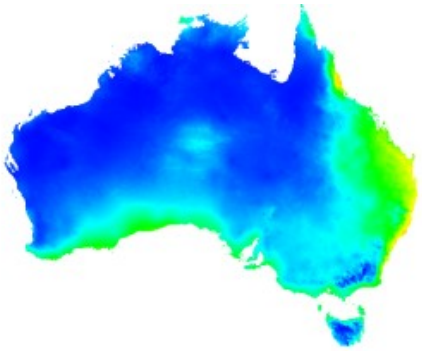
Occurrence distribution



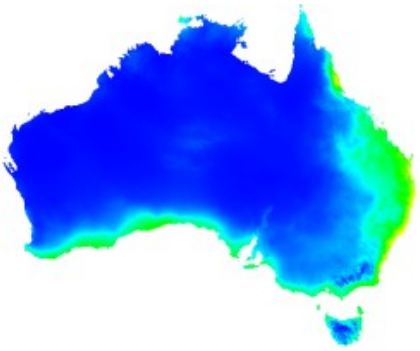


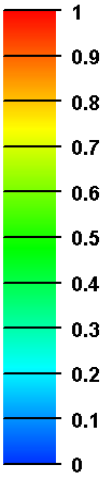
Model results

Current



2020





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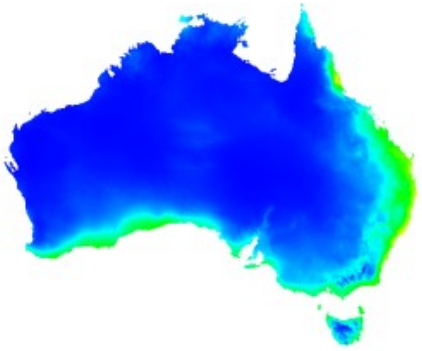
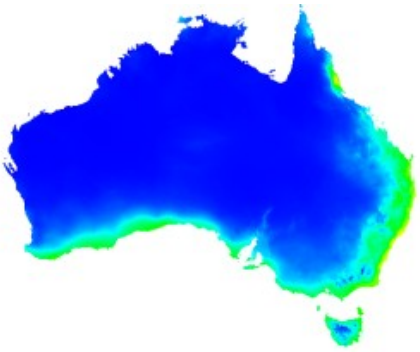


2080



Mimosa pigra

Fabaceae

Common name(s): Mimosa

National list(s): WoNS declared

NSW status: C1(S)

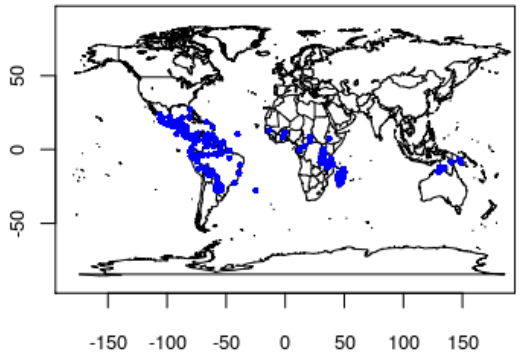
Number of occurrence records used: 545

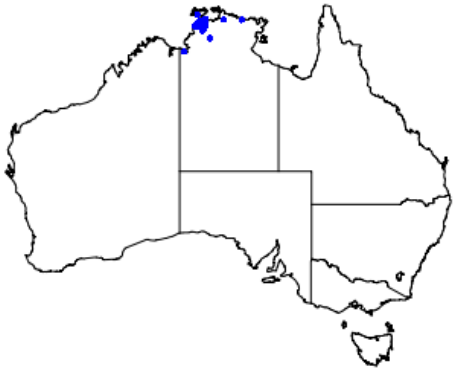
Outcomes

Relative change in overall climate suitability: +5.57%

Spatial trend: South-east

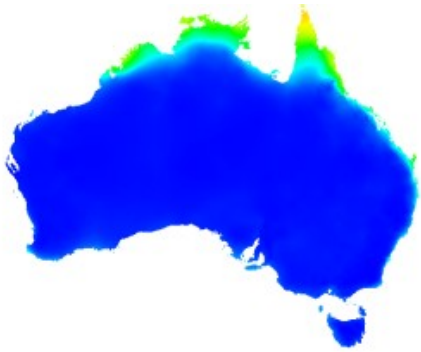
Occurrence distribution



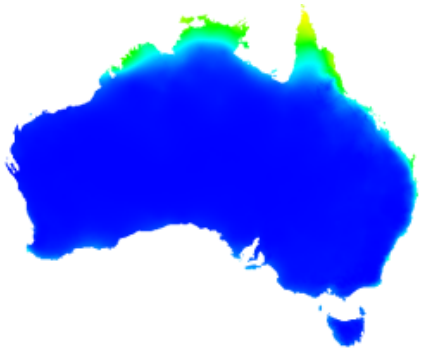


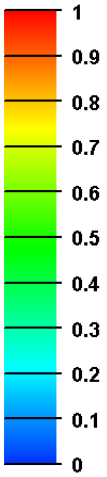
Model results

Current



2020





2050

2080

Nassella charruana

Poaceae

Common name(s): Lobed needle grass

National list(s): Alert list

NSW status: Not listed

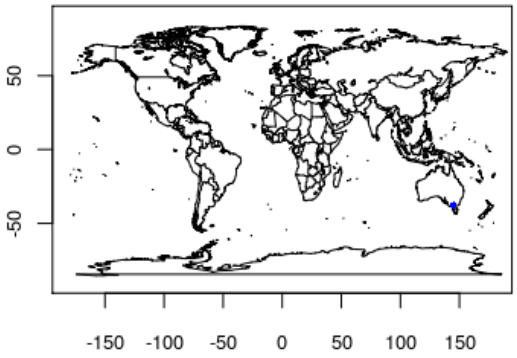
Number of occurrence records used: 5

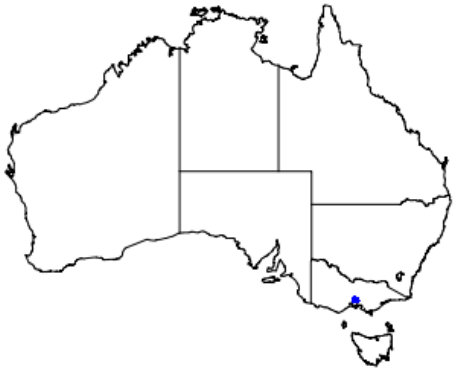
Outcomes

Relative change in overall climate suitability: -68.94%

Spatial trend: South-west

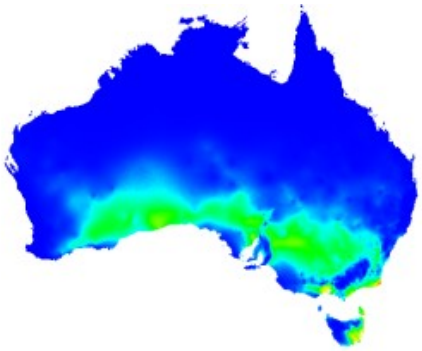
Occurrence distribution



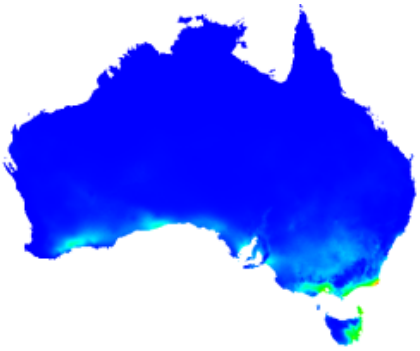


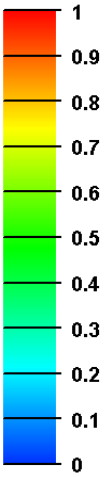
Model results

Current

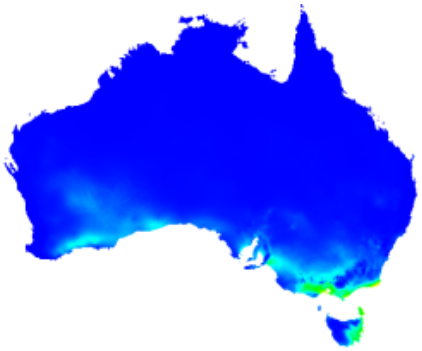


2020

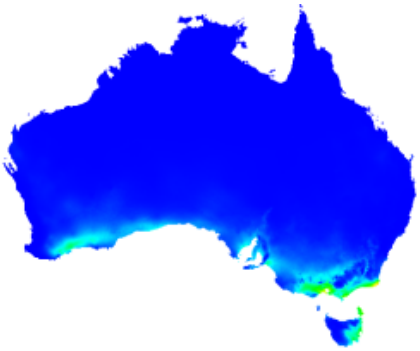




2050



2080



Nassella hyalina

Poaceae

Common name(s): Cane needle grass

National list(s): Alert list

NSW status: Not listed

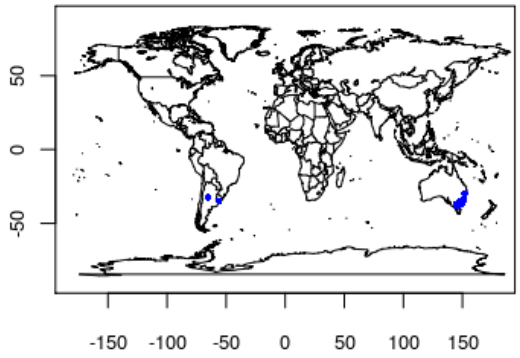
Number of occurrence records used: 29

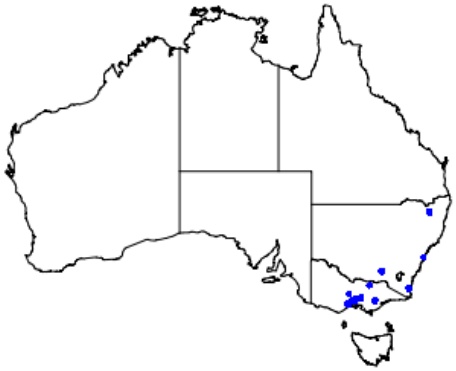
Outcomes

Relative change in overall climate suitability: -62.61%

Spatial trend: South-east

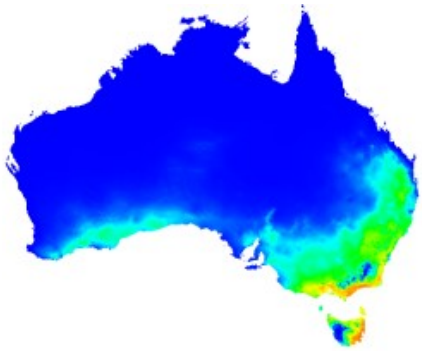
Occurrence distribution





Model results

Current



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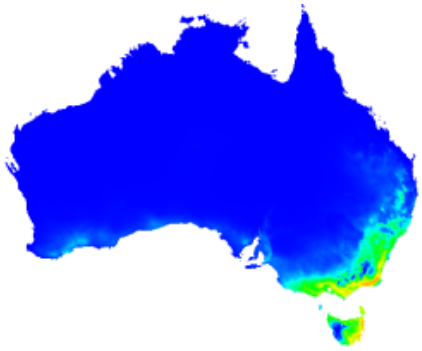

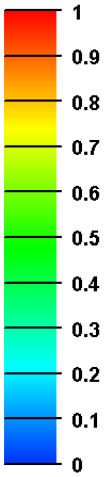

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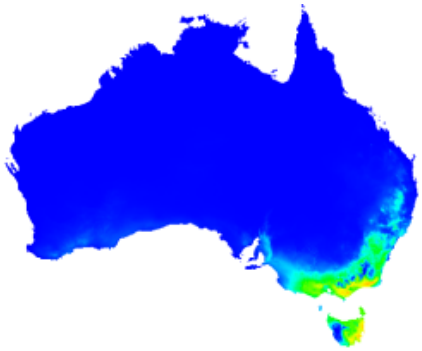

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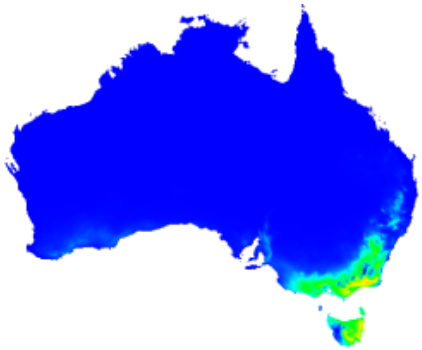


Nassella neesiana

Poaceae

Common name(s): Chilean needle grass

National list(s): WoNS declared

NSW status: C3(25)/C4(103)

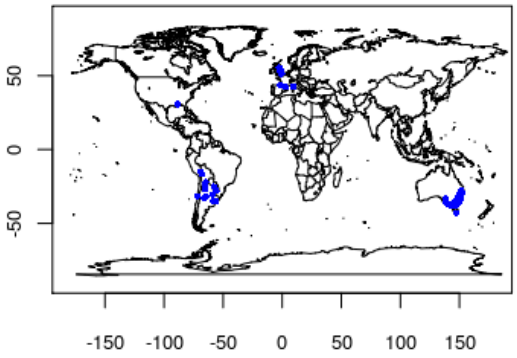
Number of occurrence records used: 114

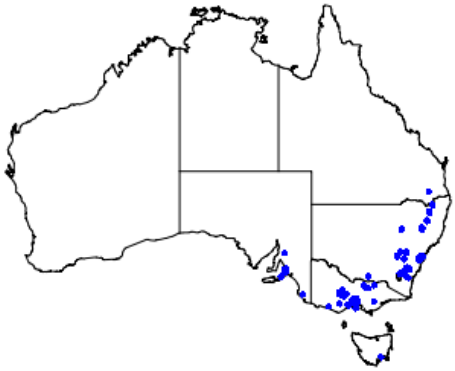
Outcomes

Relative change in overall climate suitability: -55.09%

Spatial trend: South-east

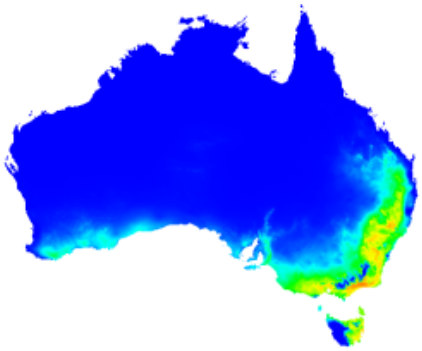
Occurrence distribution





Model results

Current



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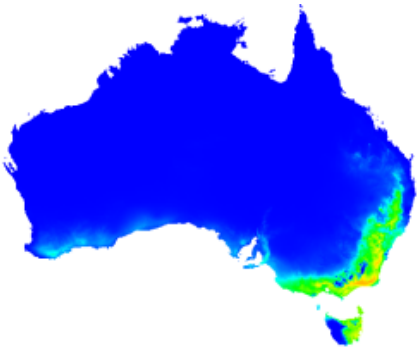

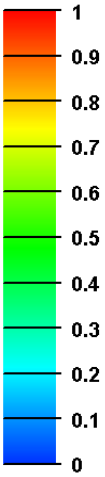

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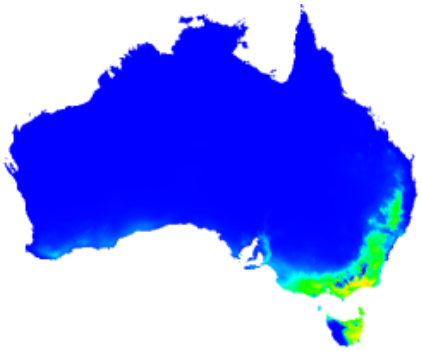

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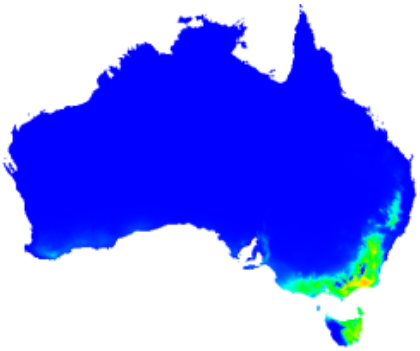


Nassella trichotoma

Poaceae

Common name(s): Serrated tussock

National list(s): WoNS declared

NSW status: C3(33)/C4(95)

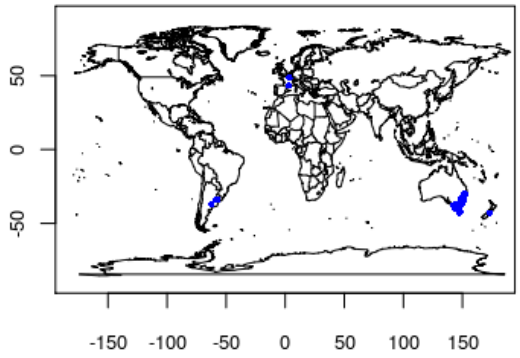
Number of occurrence records used: 160

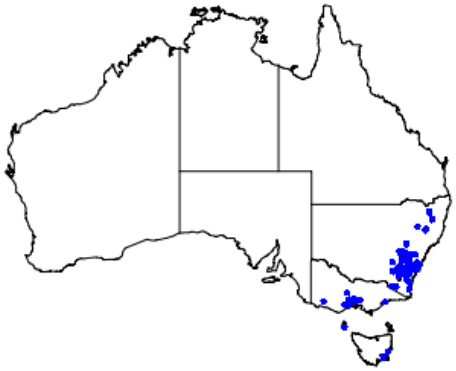
Outcomes

Relative change in overall climate suitability: -58.38%

Spatial trend: South-east

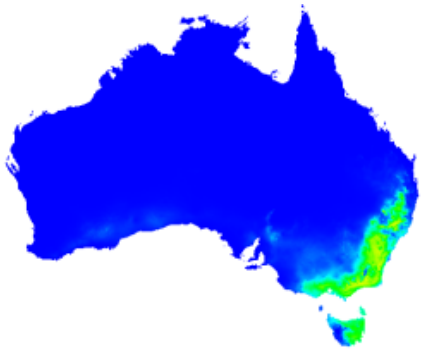
Occurrence distribution





Model results

Current



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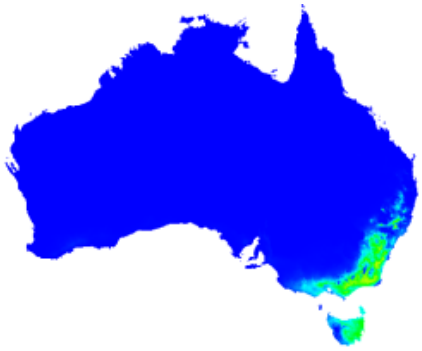

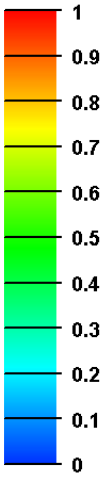

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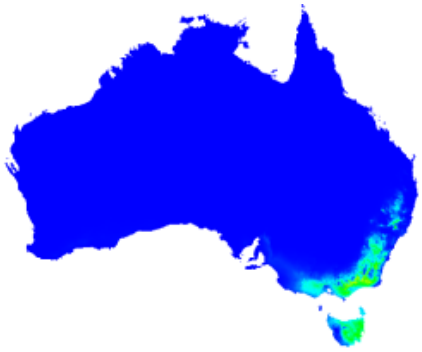
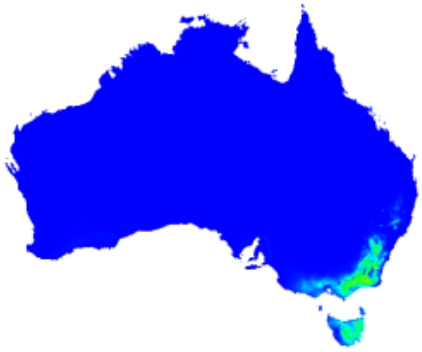


2080



Onopordum acanthium

Asteraceae

Common name(s): Onopordum thistle

National list(s): WoNS shortlist

NSW status: C4(34)

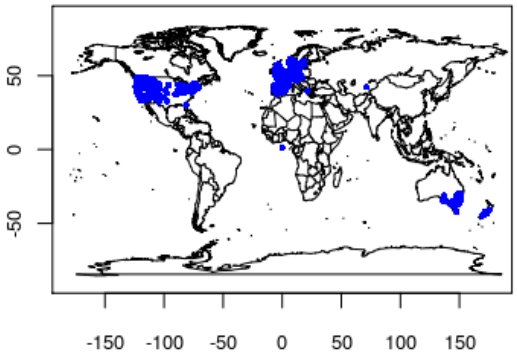
Number of occurrence records used: 3958

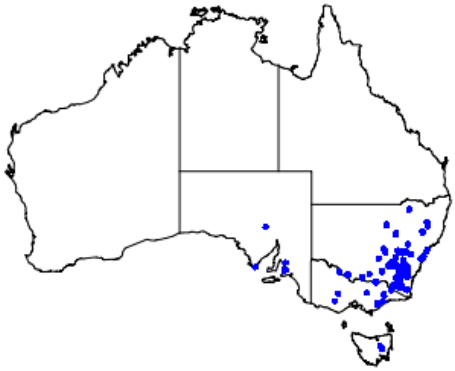
Outcomes

Relative change in overall climate suitability: -44.48%

Spatial trend: South-east

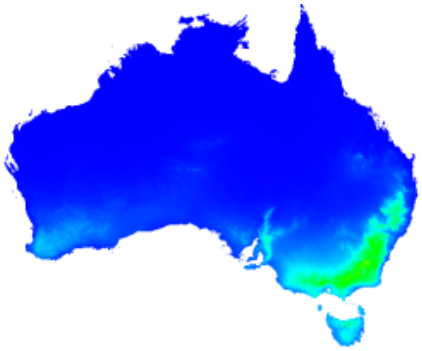
Occurrence distribution





Model results

Current



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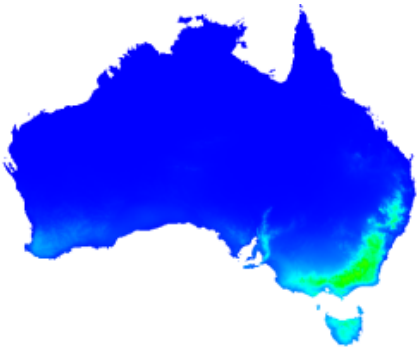

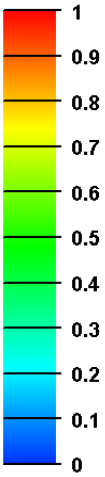

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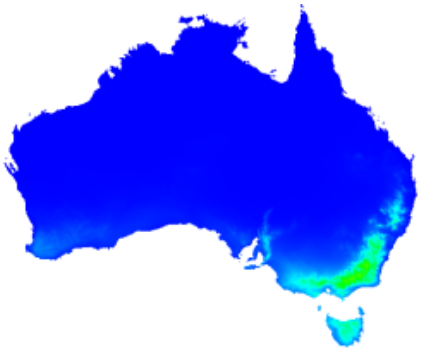


2080

Onopordum acaulon

Asteraceae

Common name(s): Stemless Thistle

National list(s): WoNS shortlist

NSW status: C4(34)

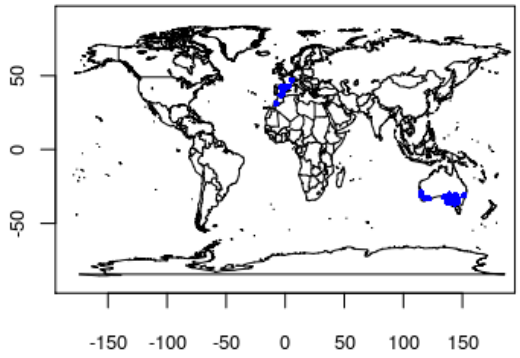
Number of occurrence records used: 150

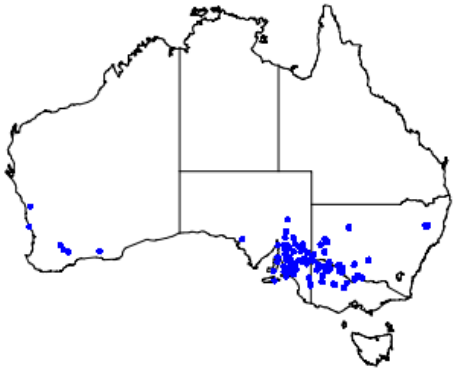
Outcomes

Relative change in overall climate suitability: -53.75%

Spatial trend: South-east

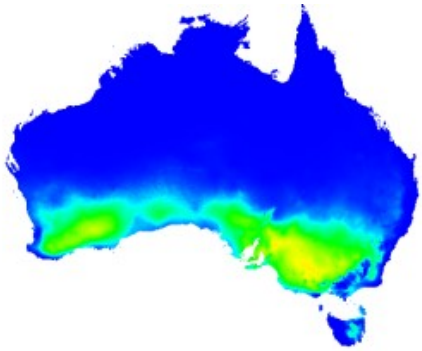
Occurrence distribution





Model results

Current



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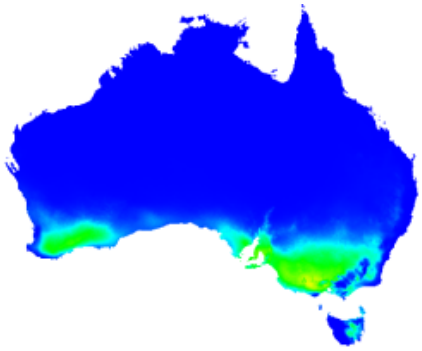

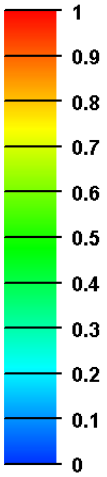

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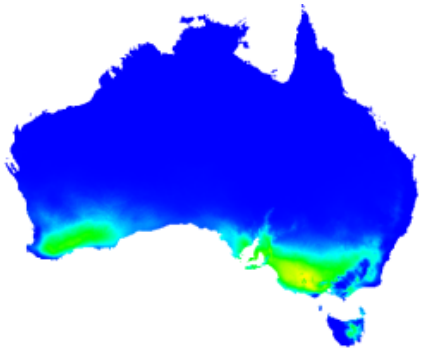

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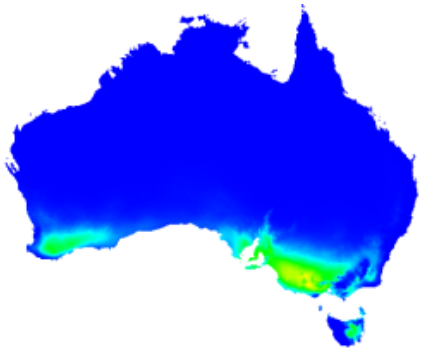


Onopordum illyricum

Asteraceae

Common name(s): Illyrian Thistle

National list(s): WoNS shortlist

NSW status: C4(34)

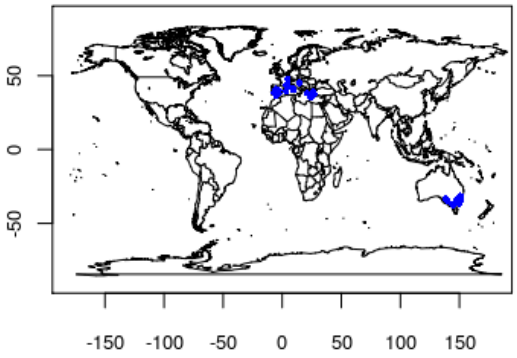
Number of occurrence records used: 122

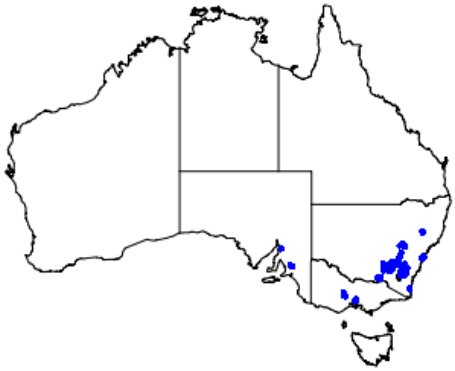
Outcomes

Relative change in overall climate suitability: -43.65%

Spatial trend: South-east

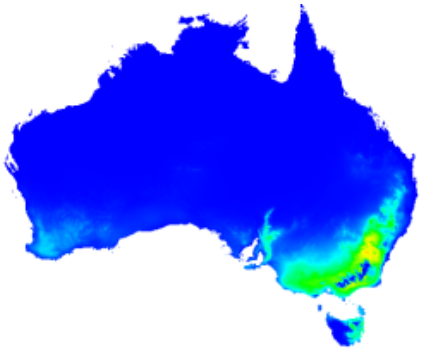
Occurrence distribution





Model results

Current



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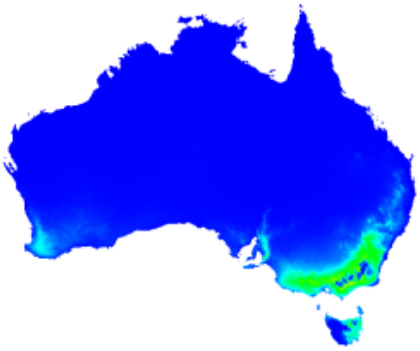

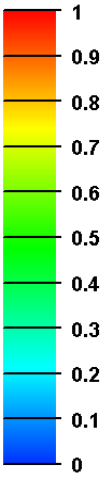

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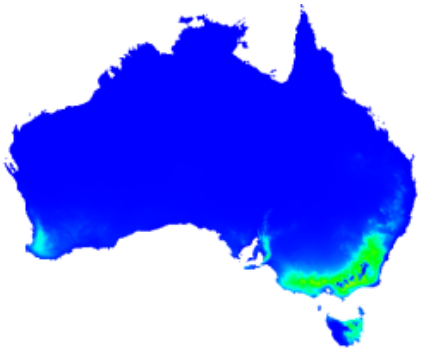
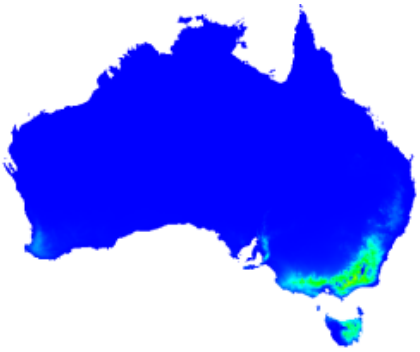


2080



Orobanche minor

Orobanchaceae

Common name(s): Branched broomrape

National list(s): WoNS shortlist

NSW status: C1(S)(c)

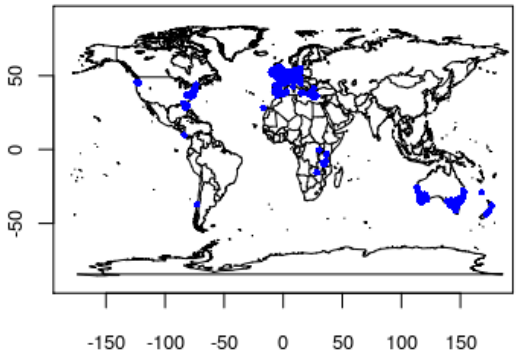
Number of occurrence records used: 2039

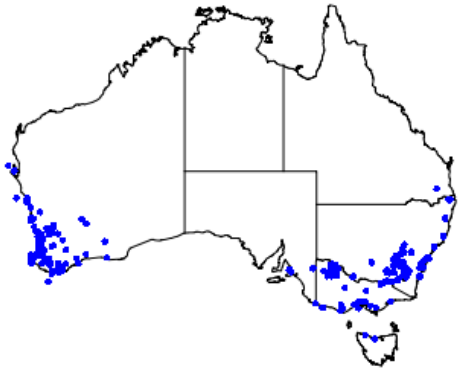
Outcomes

Relative change in overall climate suitability: -39.95%

Spatial trend: South-east

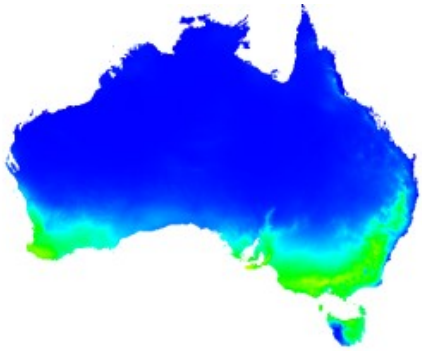
Occurrence distribution



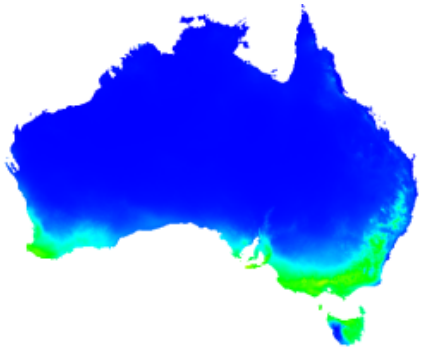


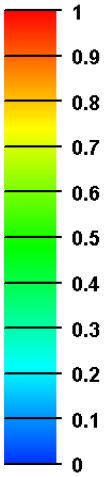
Model results

Current

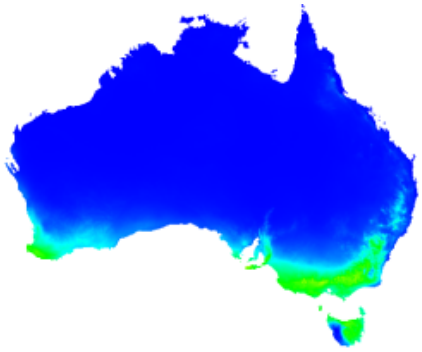


2020

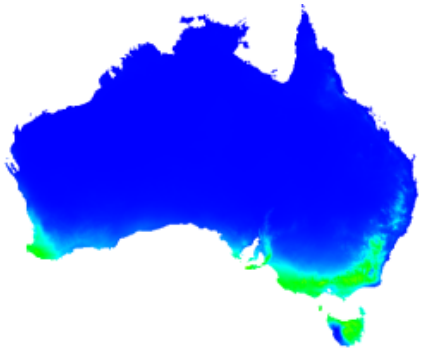




2050



2080



Parkinsonia aculeata

Fabaceae

Common name(s): Parkinsonia

National list(s): WoNS declared

NSW status: C2(48)

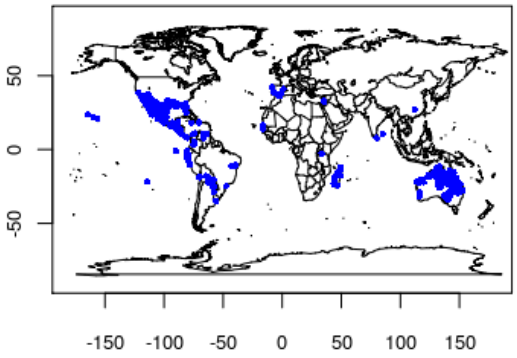
Number of occurrence records used: 534

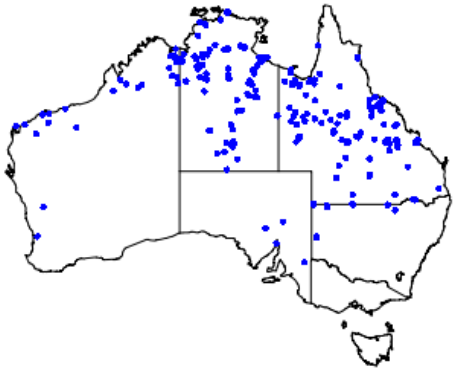
Outcomes

Relative change in overall climate suitability: -10.09%

Spatial trend: South-east

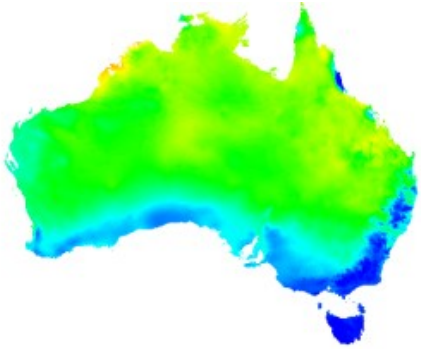
Occurrence distribution



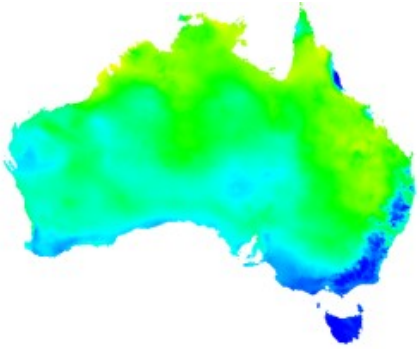


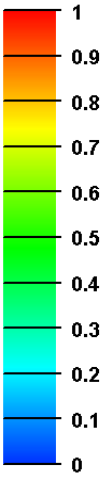
Model results

Current

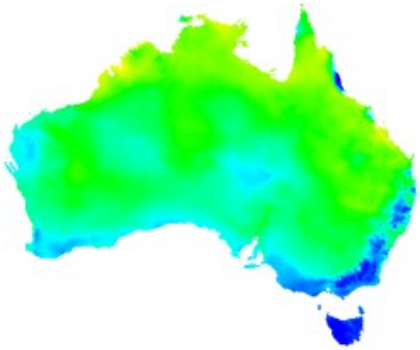


2020

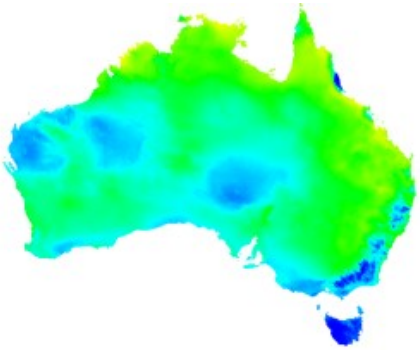




2050



2080



Parthenium hysterophorus

Asteraceae

Common name(s): Parthenium weed

National list(s): WoNS declared

NSW status: C1(S)

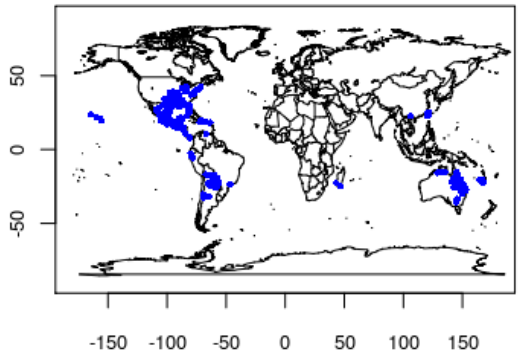
Number of occurrence records used: 566

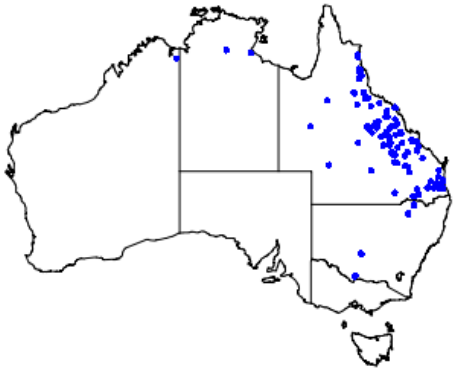
Outcomes

Relative change in overall climate suitability: -36.02%

Spatial trend: South-east

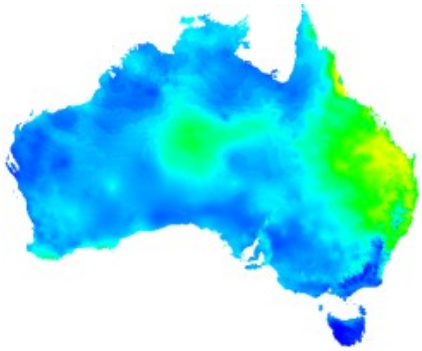
Occurrence distribution



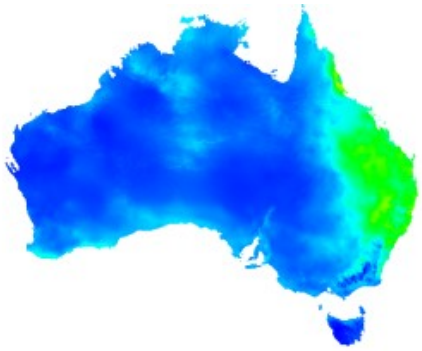


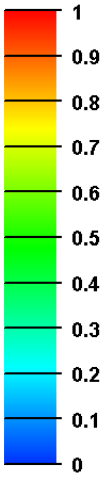
Model results

Current

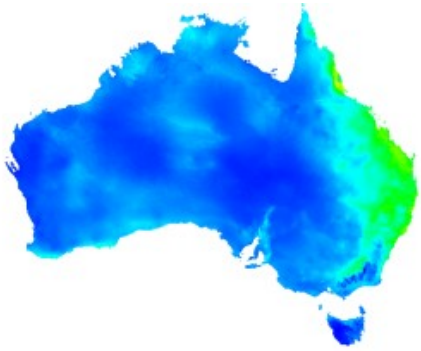


2020

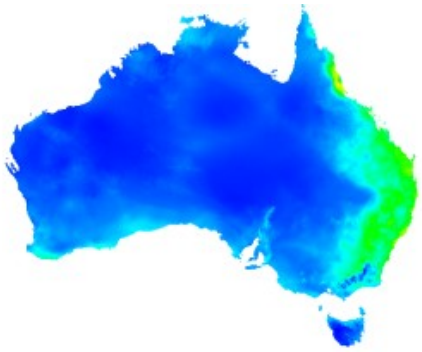




2050



2080



Pelargonium alchemilloides

Geraniaceae

Common name(s): Garden geranium

National list(s): Alert list

NSW status: Not listed

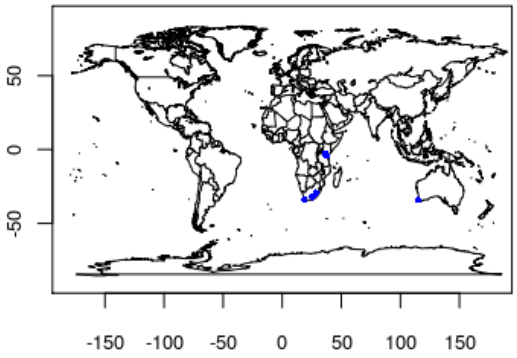
Number of occurrence records used: 8

Outcomes

Relative change in overall climate suitability: -19.59%

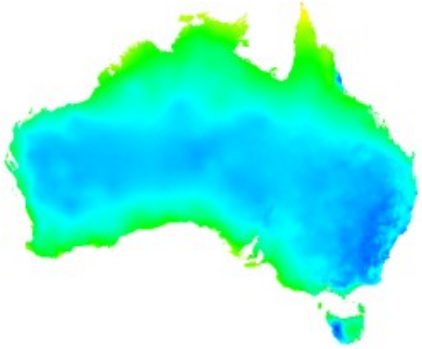
Spatial trend: South-east

Occurrence distribution

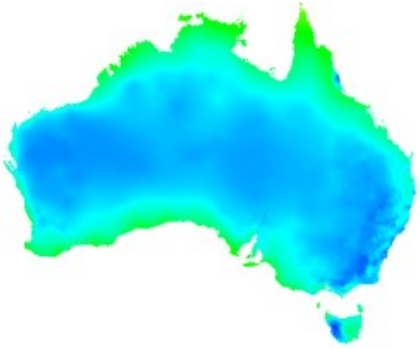


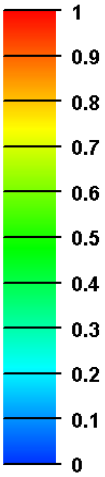
Model results

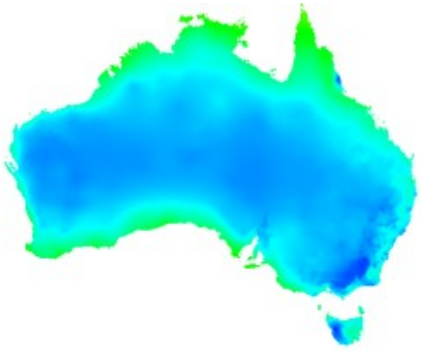
Current

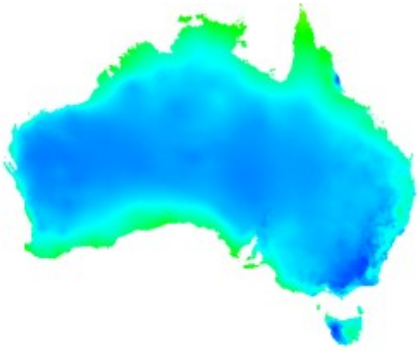


2020









Pennisetum polystachion

Poaceae

Common name(s): Mission grass

National list(s): WoNS shortlist

NSW status: Not listed

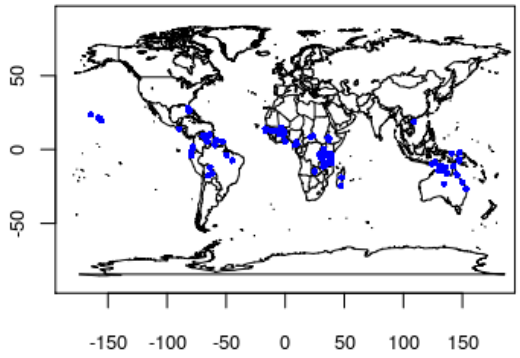
Number of occurrence records used: 197

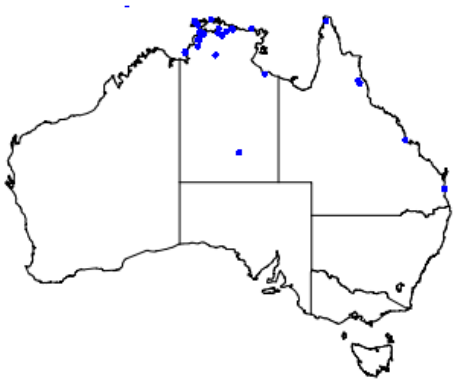
Outcomes

Relative change in overall climate suitability: -6.86%

Spatial trend: South-east

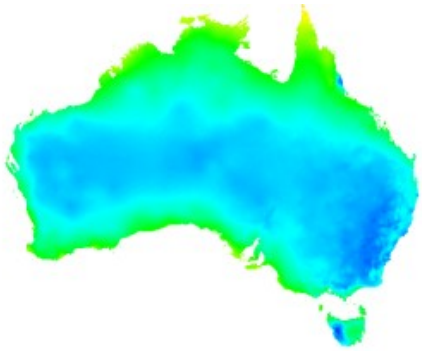
Occurrence distribution





Model results

Current



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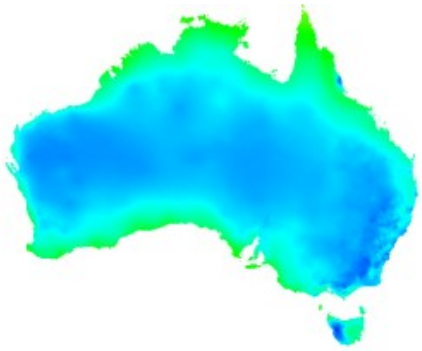
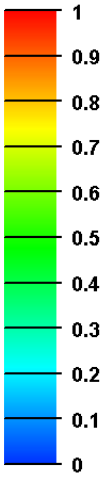
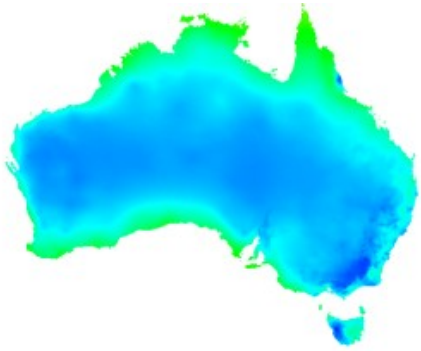
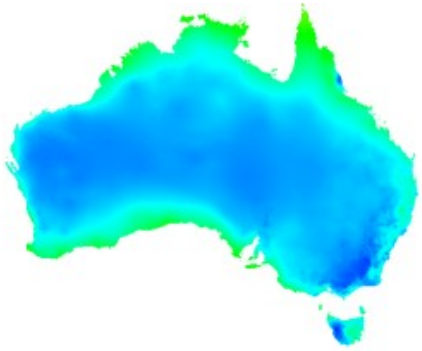




2050



2080



Pereskia aculeata

Cactaceae

Common name(s): Leaf cactus

National list(s): Alert list

NSW status: Not listed

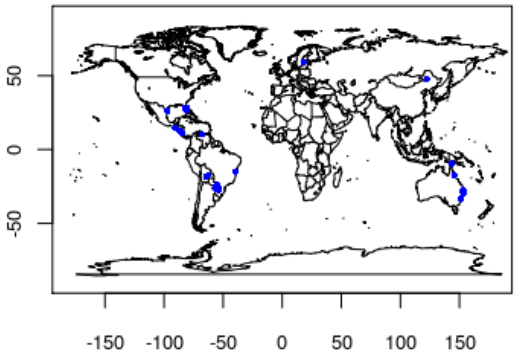
Number of occurrence records used: 61

Outcomes

Relative change in overall climate suitability: -13.81%

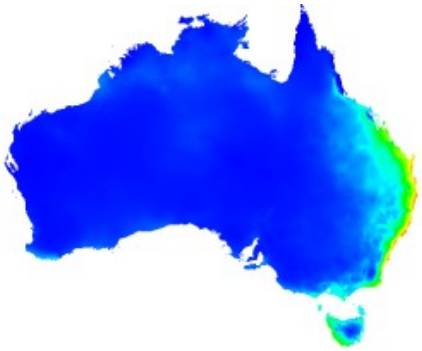
Spatial trend: North-west

Occurrence distribution



Model results

Current



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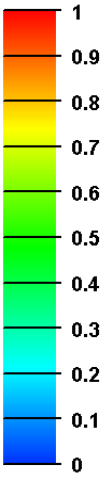


2050

2080

Phyla canescens

Verbenaceae

Common name(s): Lippia

National list(s): WoNS shortlist

NSW status: C4(S)

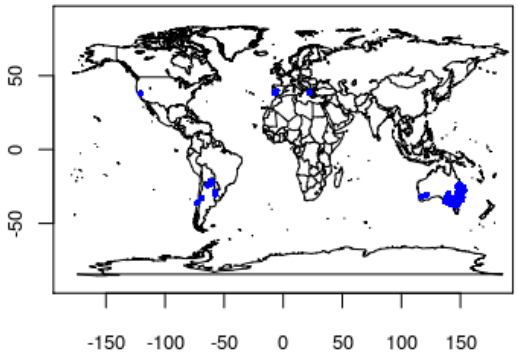
Number of occurrence records used: 195

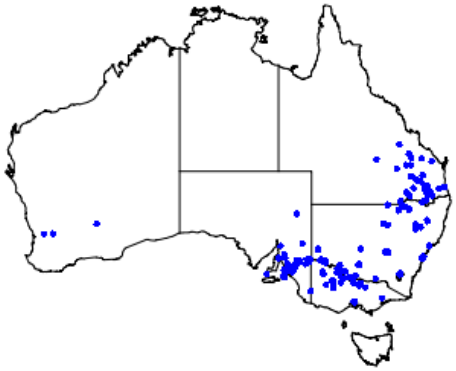
Outcomes

Relative change in overall climate suitability: -50.77%

Spatial trend: South-east

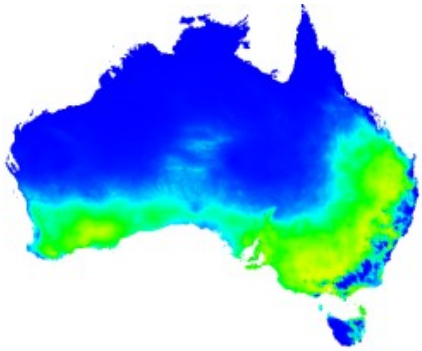
Occurrence distribution





Model results

Current



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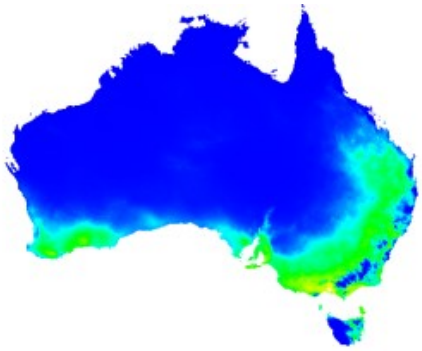

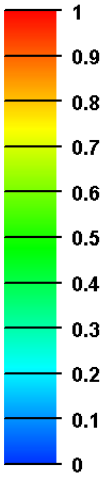

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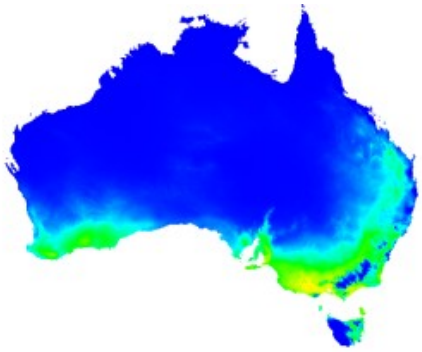

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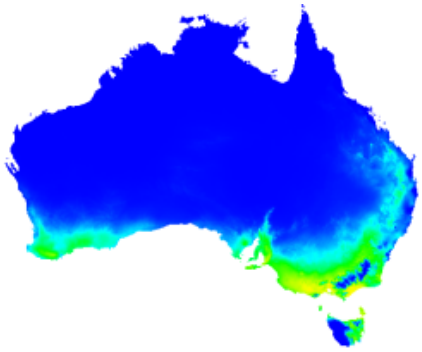


Piptochaetium montevidense

Poaceae

Common name(s): Uruguayan rice grass

National list(s): Alert list

NSW status: Not listed

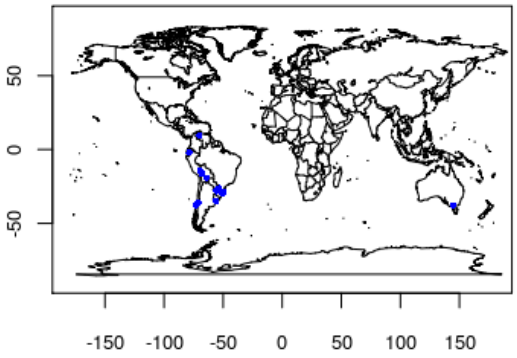
Number of occurrence records used: 20

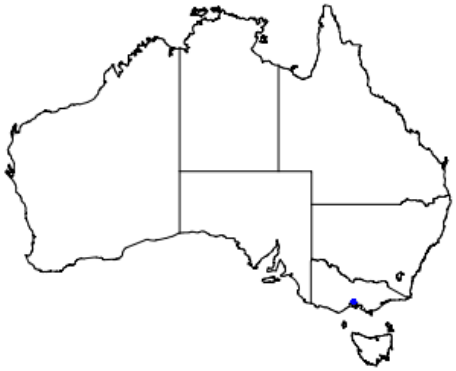
Outcomes

Relative change in overall climate suitability: -34.9%

Spatial trend: South-east

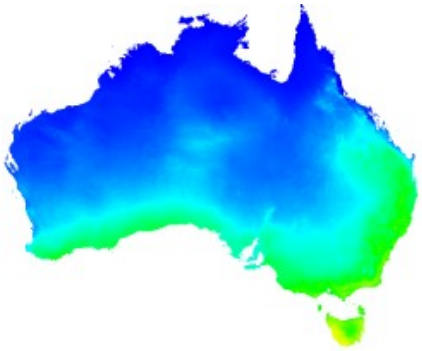
Occurrence distribution





Model results

Current



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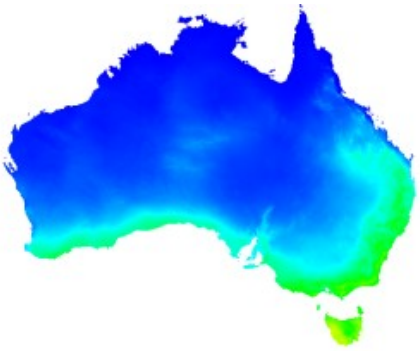
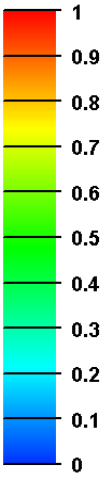
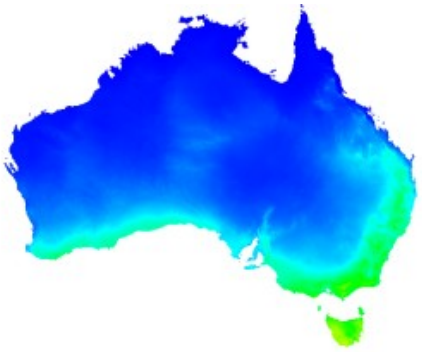
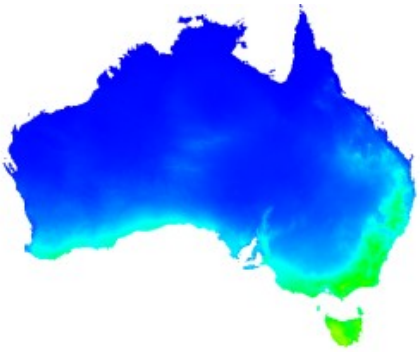








Polygala myrtifolia

Polygalaceae

Common name(s): Myrtleleaf milkwort

National list(s): WoNS shortlist

NSW status: Not listed

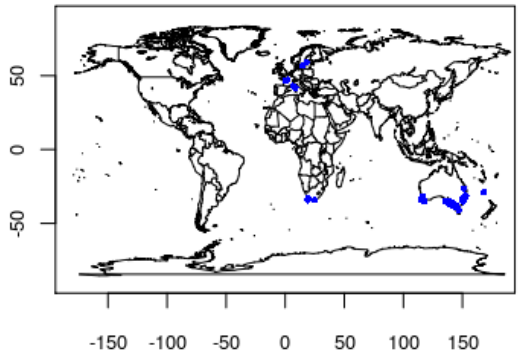
Number of occurrence records used: 134

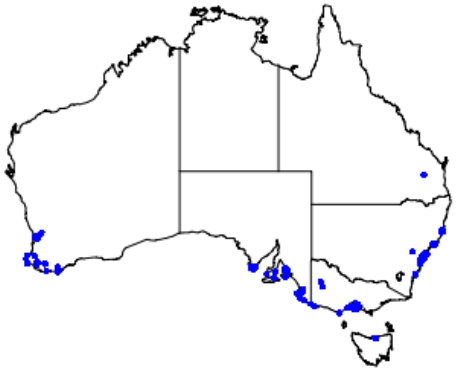
Outcomes

Relative change in overall climate suitability: -37.71%

Spatial trend: South-east

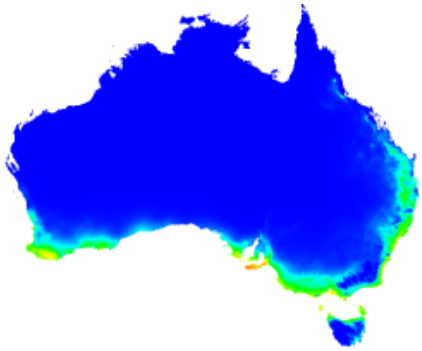
Occurrence distribution





Model results

Current



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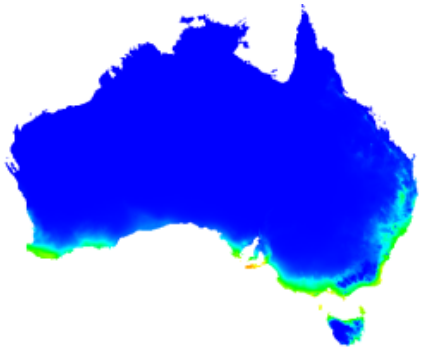
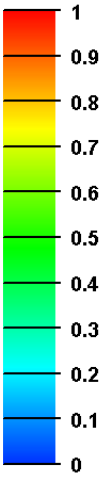
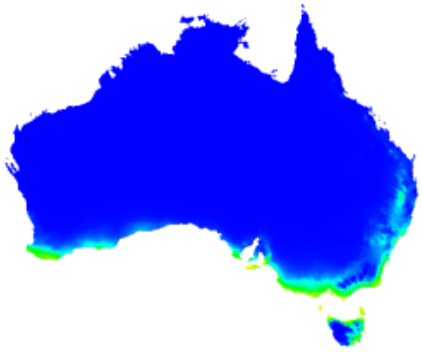
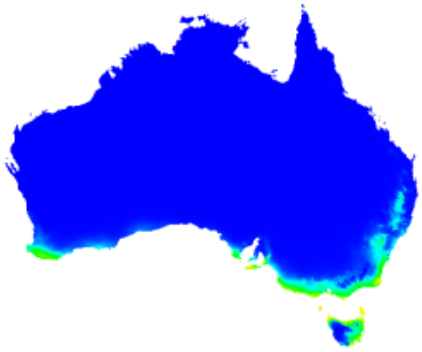




2050



2080



Praxelis clematidea

Asteraceae

Common name(s): Praxelis

National list(s): Alert list

NSW status: Not listed

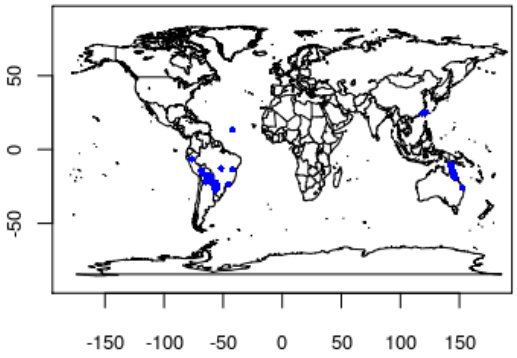
Number of occurrence records used: 153

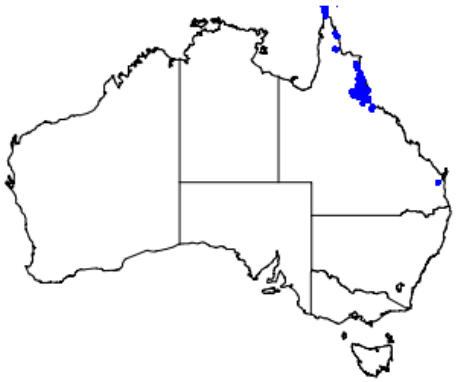
Outcomes

Relative change in overall climate suitability: -46.72%

Spatial trend: South-east

Occurrence distribution

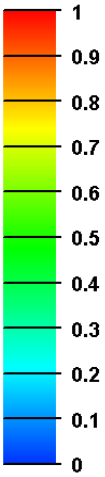




Model results

Current

2020



Prosopis spp.

Fabaceae

Common name(s): Mesquites

National list(s): WoNS declared

NSW status: C2(48)

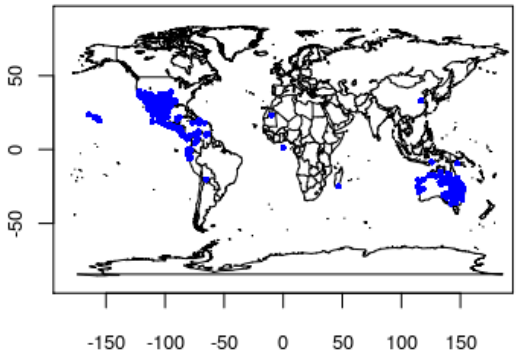
Number of occurrence records used: 899

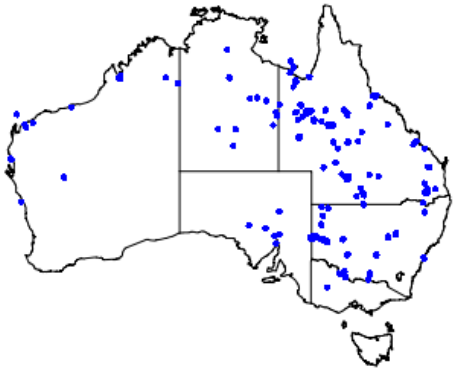
Outcomes

Relative change in overall climate suitability: -30.9%

Spatial trend: South-east

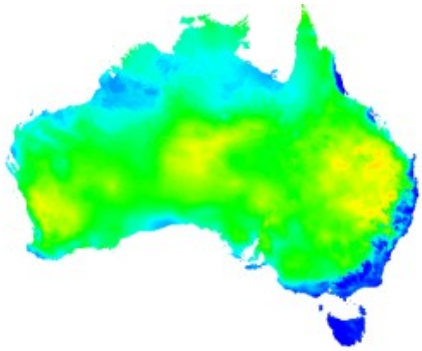
Occurrence distribution



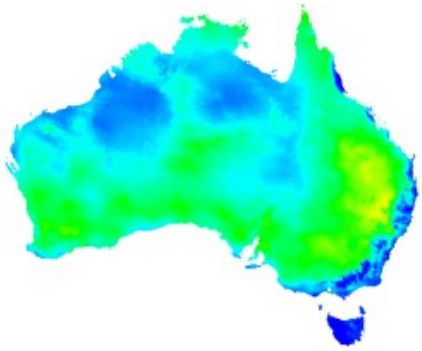


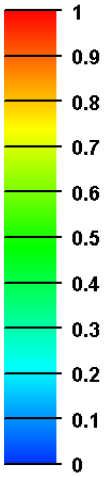
Model results

Current

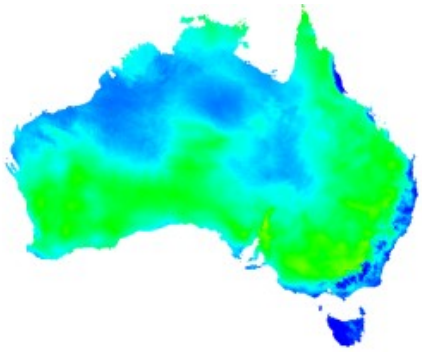


2020





2050



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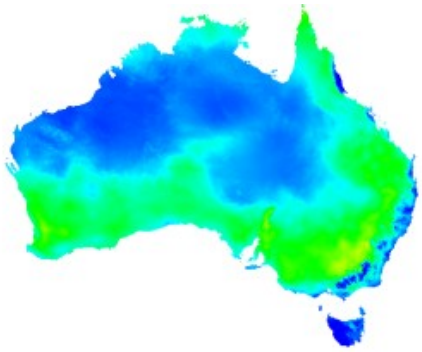


Reseda luteola

Resedaceae

Common name(s): Wild mignonette, Weld

National list(s): WoNS shortlist

NSW status: Not listed

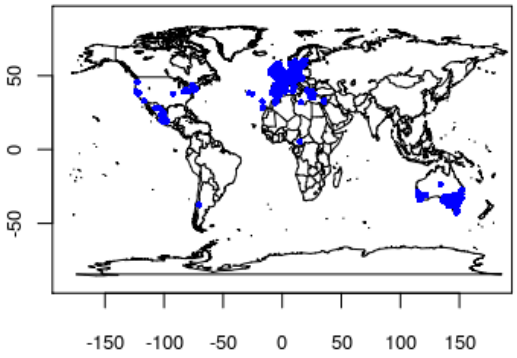
Number of occurrence records used: 5644

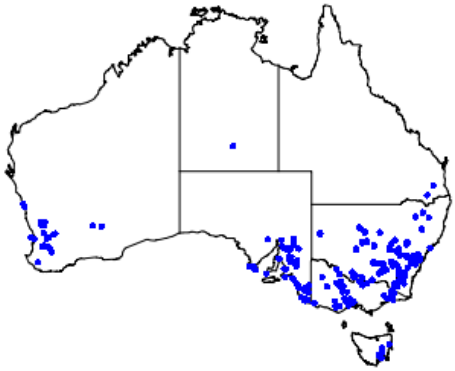
Outcomes

Relative change in overall climate suitability: -40.2%

Spatial trend: South-east

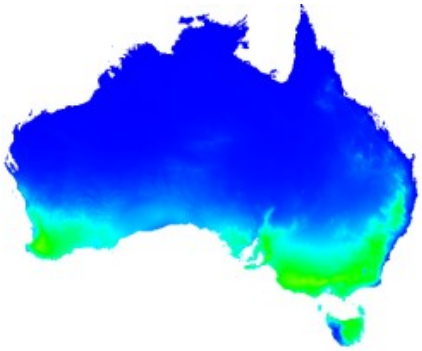
Occurrence distribution



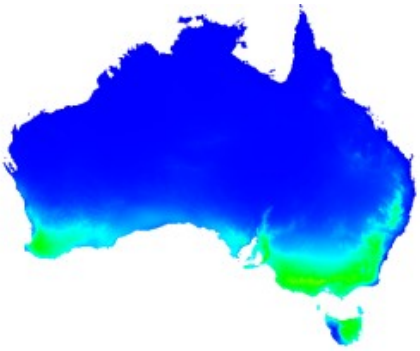


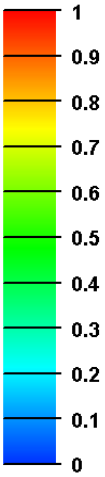
Model results

Current



2020





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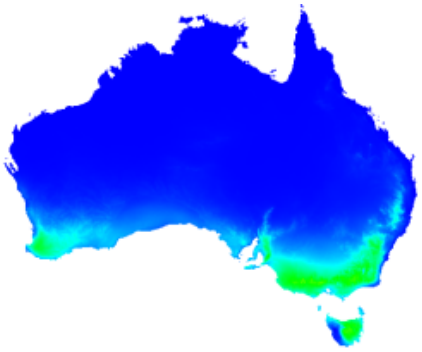

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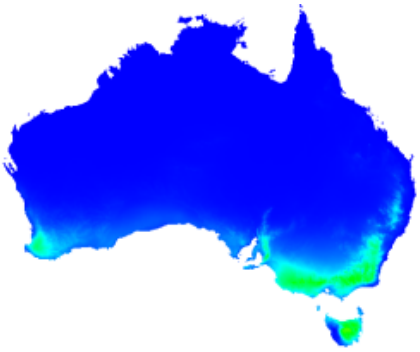


Retama raetam

Fabaceae

Common name(s): White weeping broom

National list(s): Alert list

NSW status: Not listed

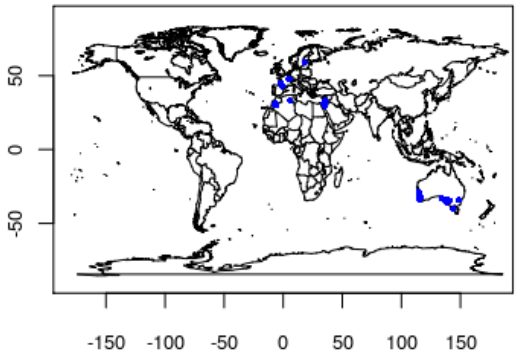
Number of occurrence records used: 197

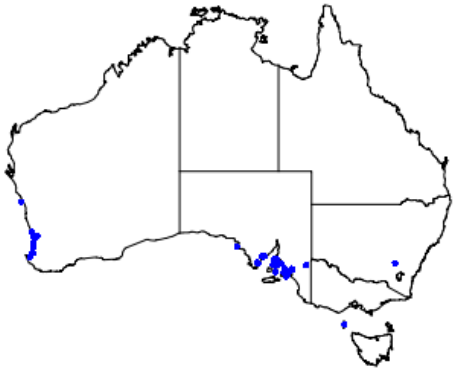
Outcomes

Relative change in overall climate suitability: -14.81%

Spatial trend: South-east

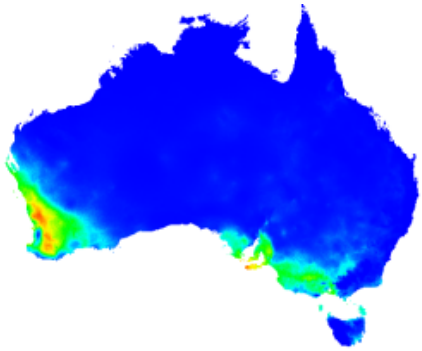
Occurrence distribution



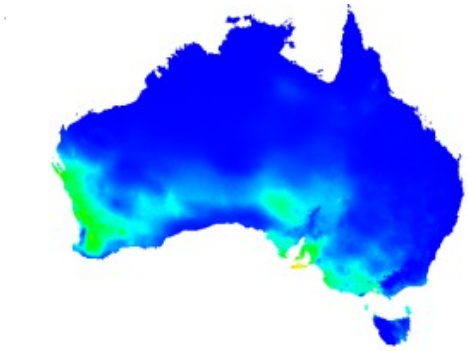


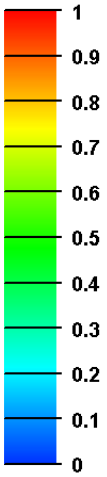
Model results

Current

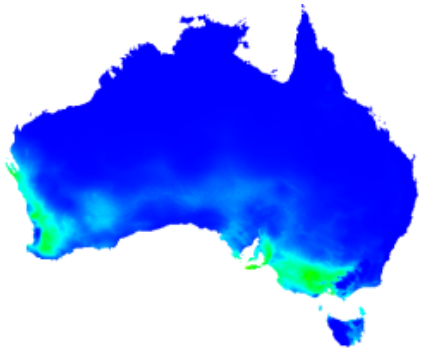


2020

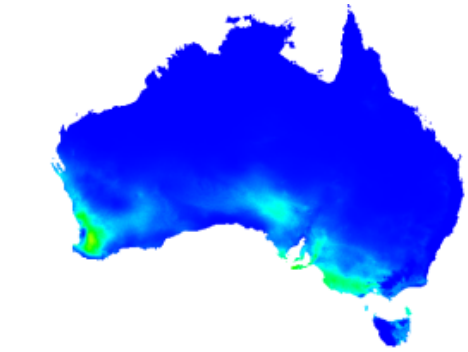




2050



2080



Rubus fruticosus agg.

Rosaceae

Common name(s): Blackberry

National list(s): WoNS declared

NSW status: C4(S)(e)

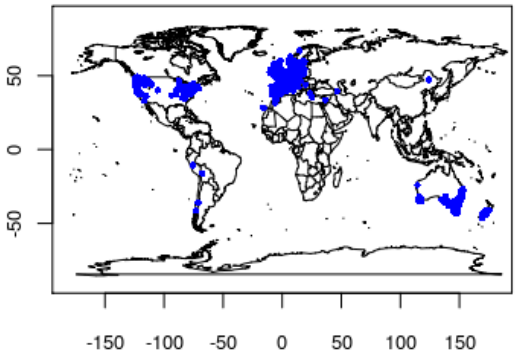
Number of occurrence records used: 5376

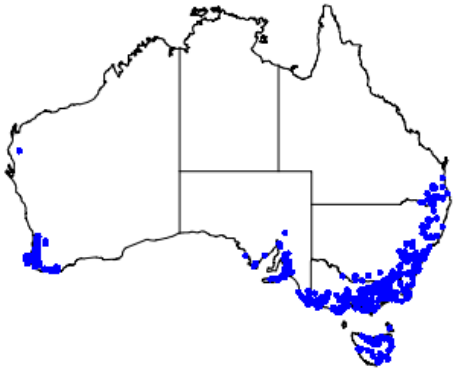
Outcomes

Relative change in overall climate suitability: -24.81%

Spatial trend: South-east

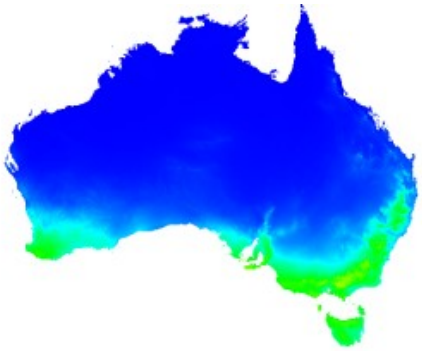
Occurrence distribution





Model results

Current



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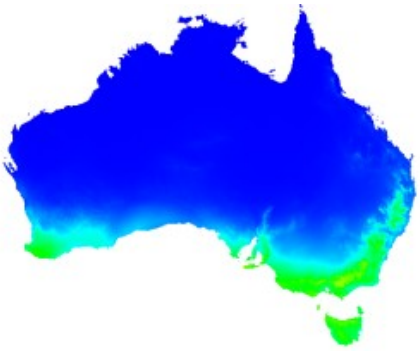

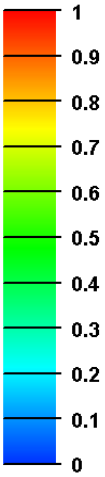

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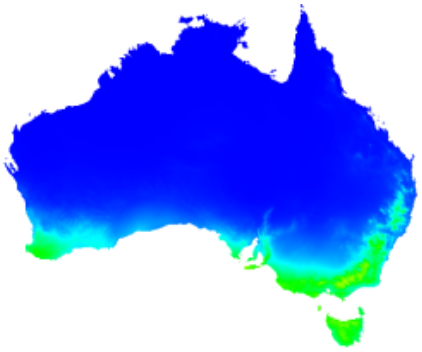

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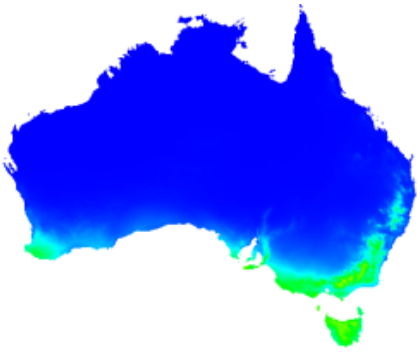


Salix spp.

Salicaceae

Common name(s): Willows

National list(s): WoNS declared

NSW status: C5(S)(f)

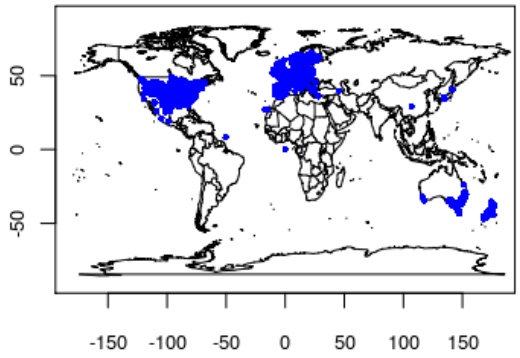
Number of occurrence records used: 13344

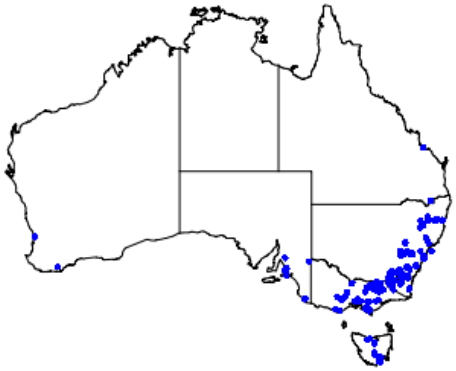
Outcomes

Relative change in overall climate suitability: -33.09%

Spatial trend: South-east

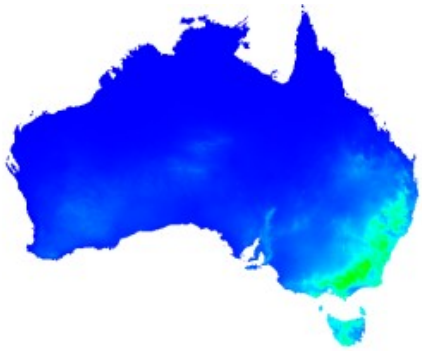
Occurrence distribution



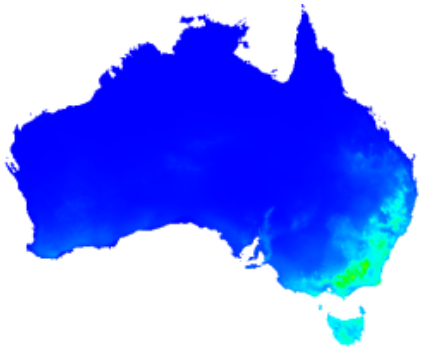


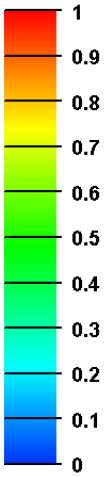
Model results

Current

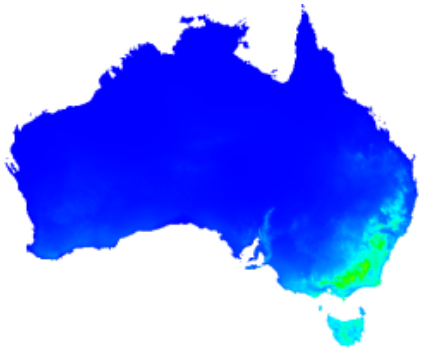


2020





2050



2080

Salvinia molesta

Salviniaceae

Common name(s): Salvinia

National list(s): WoNS declared

NSW status: C2(106)/C3(22)

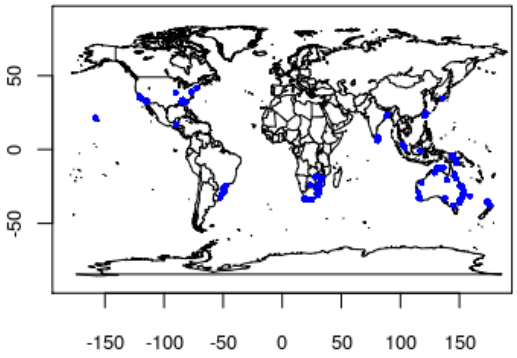
Number of occurrence records used: 207

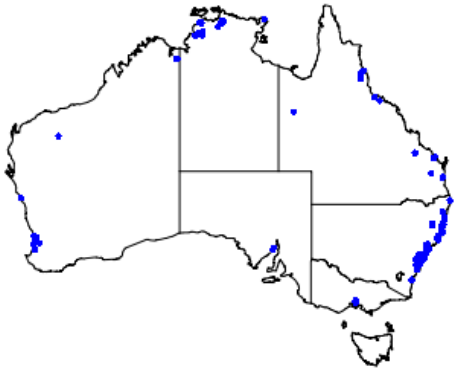
Outcomes

Relative change in overall climate suitability: -30.27%

Spatial trend: North-east

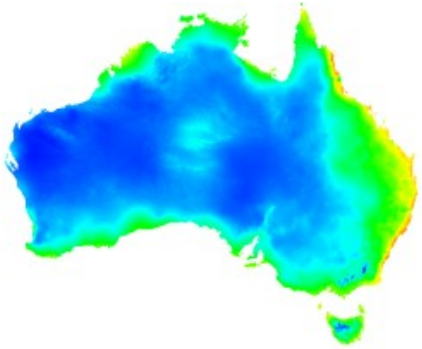
Occurrence distribution





Model results

Current



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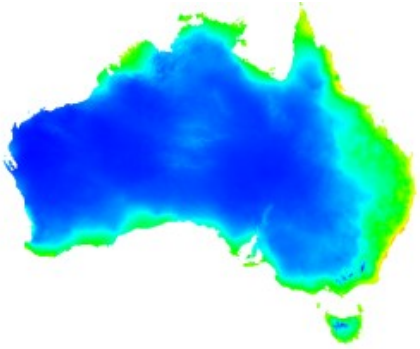

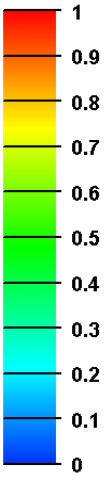

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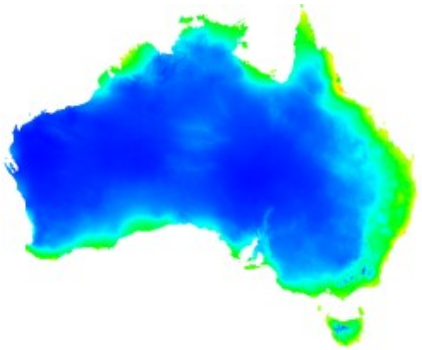
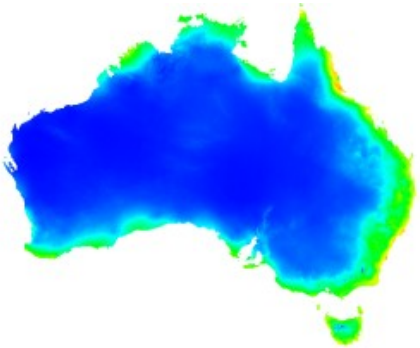


2080



Schinus terebinthifolius

Anacardiaceae

Common name(s): Brazilian creeper, Broadleaf pepper tree

National list(s): WoNS shortlist

NSW status: C3(10)

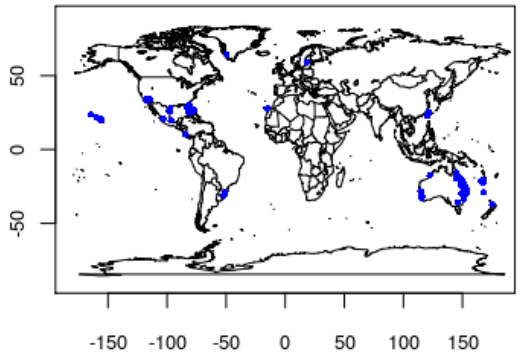
Number of occurrence records used: 163

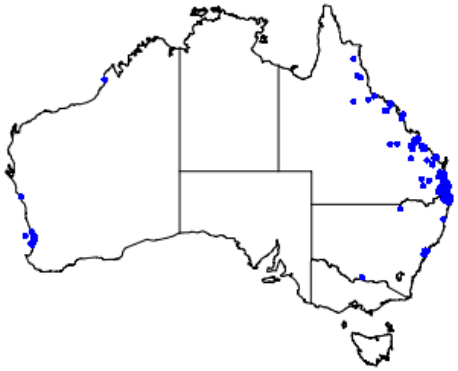
Outcomes

Relative change in overall climate suitability: -23.75%

Spatial trend: South-east

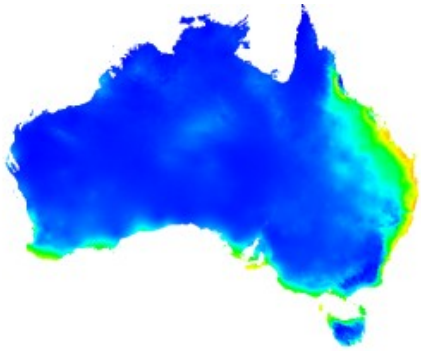
Occurrence distribution



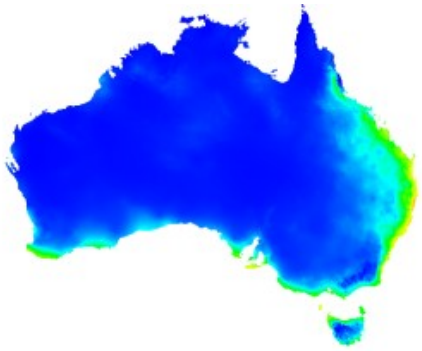


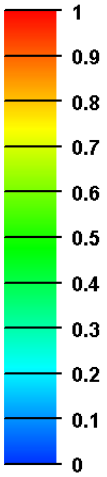
Model results

Current

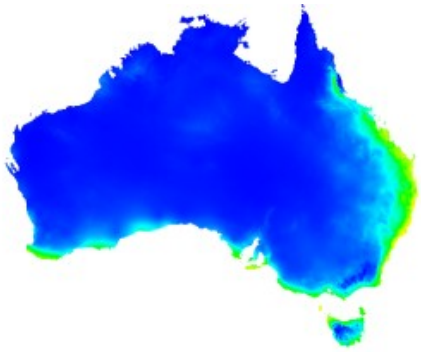


2020

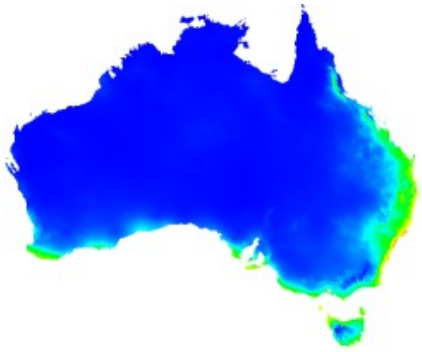




2050



2080



Senecio glastifolius

Asteraceae

Common name(s): Holly-leaved senecio

National list(s): Alert list

NSW status: Not listed

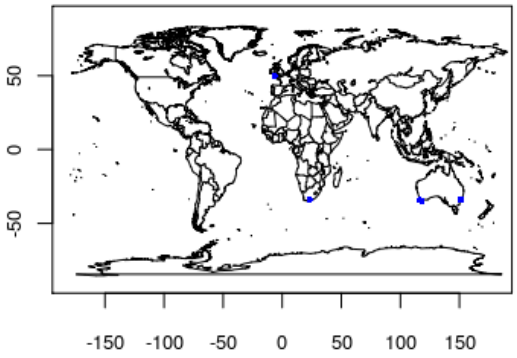
Number of occurrence records used: 9

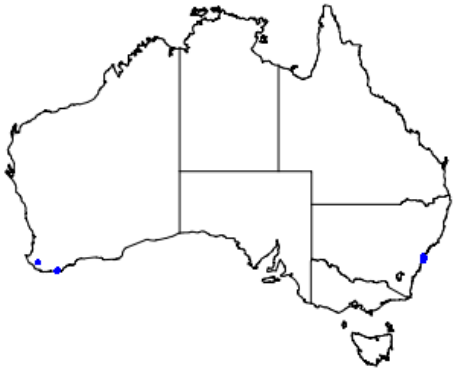
Outcomes

Relative change in overall climate suitability: -26.19%

Spatial trend: North-west

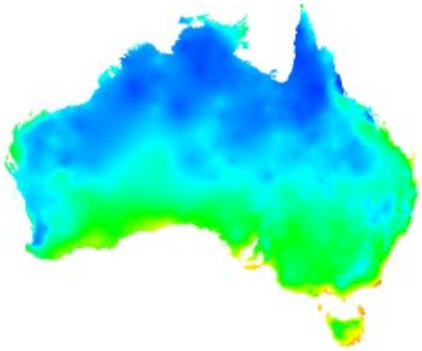
Occurrence distribution





Model results

Current



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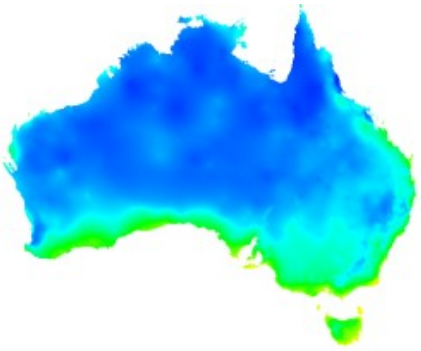

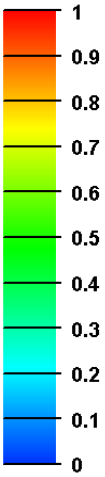

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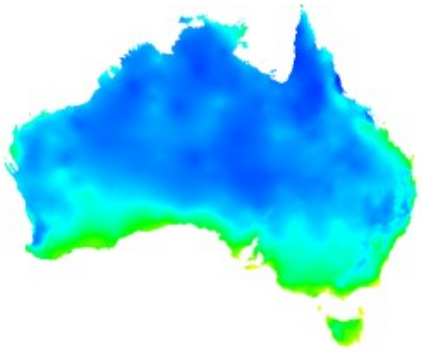
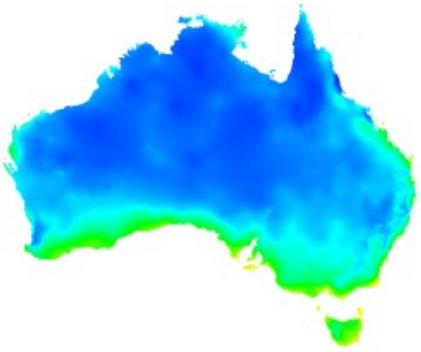


2080



Senecio jacobaea

Asteraceae

Common name(s): Ragwort

National list(s): WoNS shortlist

NSW status: C4(3)

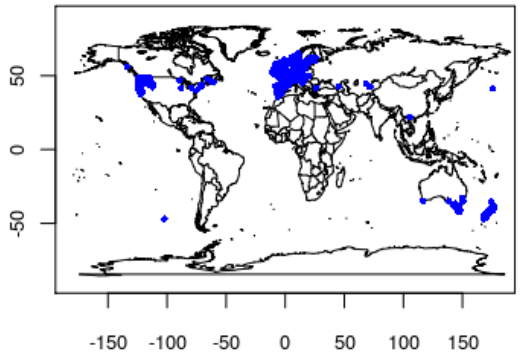
Number of occurrence records used: 9649

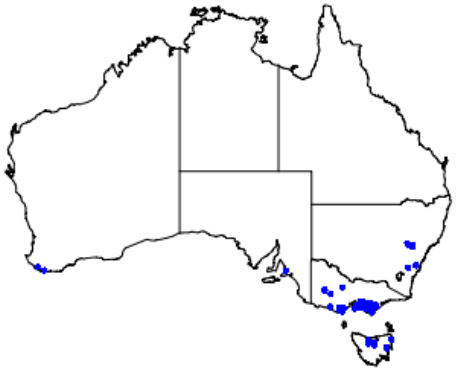
Outcomes

Relative change in overall climate suitability: -32.7%

Spatial trend: South-east

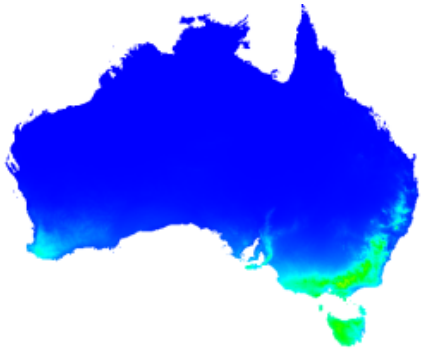
Occurrence distribution



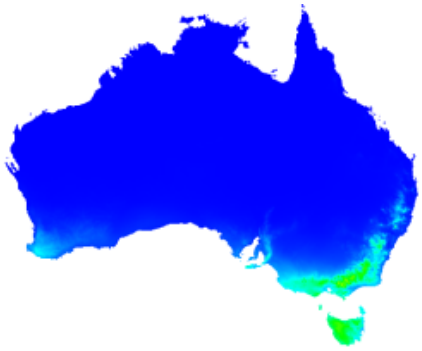


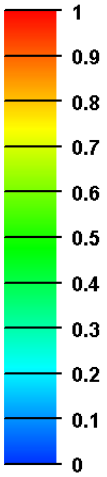
Model results

Current

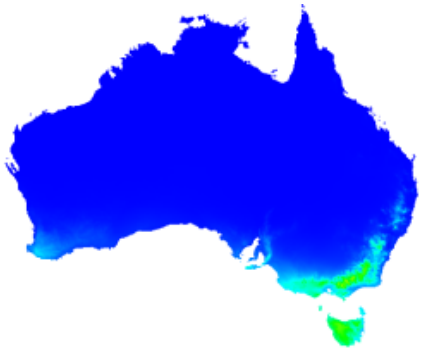


2020





2050



2080

Senecio madagascariensis

Asteraceae

Common name(s): Fireweed

National list(s): WoNS shortlist

NSW status: C4(14)

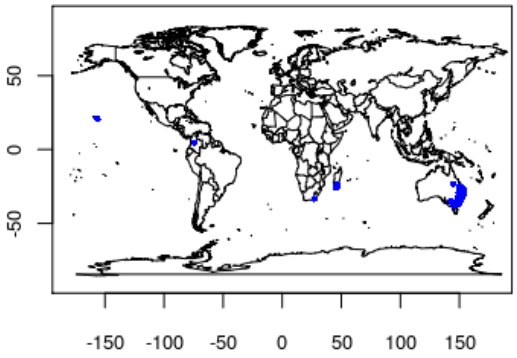
Number of occurrence records used: 302

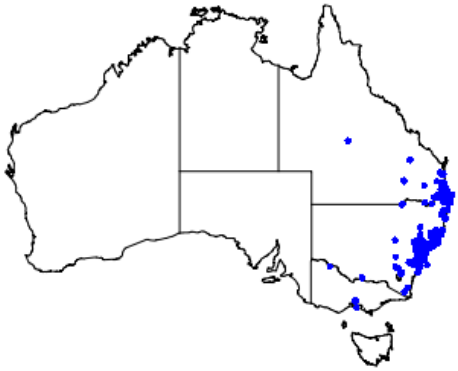
Outcomes

Relative change in overall climate suitability: -62.19%

Spatial trend: South-east

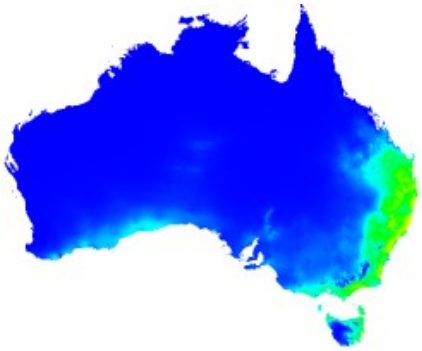
Occurrence distribution



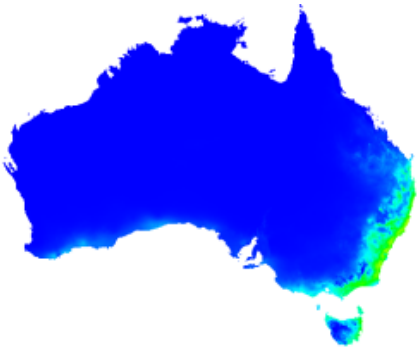


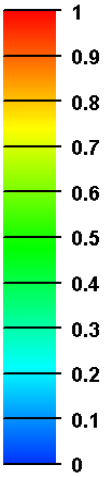
Model results

Current



2020





Senna obtusifolia

Fabaceae

Common name(s): Sickelpod

National list(s): WoNS shortlist

NSW status: Not listed

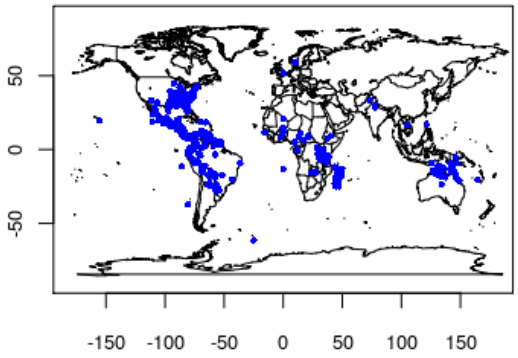
Number of occurrence records used: 813

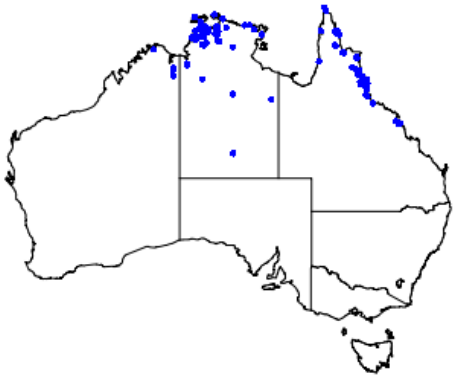
Outcomes

Relative change in overall climate suitability: -13.42%

Spatial trend: North-west

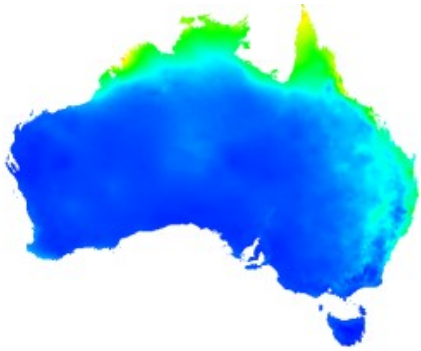
Occurrence distribution





Model results

Current



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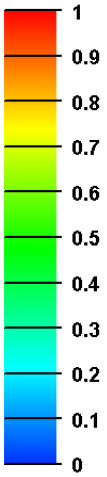

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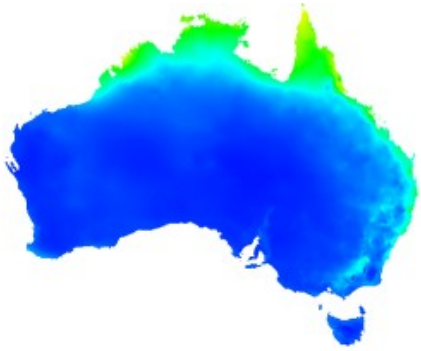

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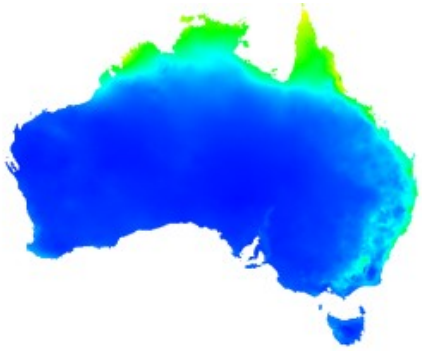


Senna tora

Fabaceae

Common name(s): Sicklepod

National list(s): WoNS shortlist

NSW status: Not listed

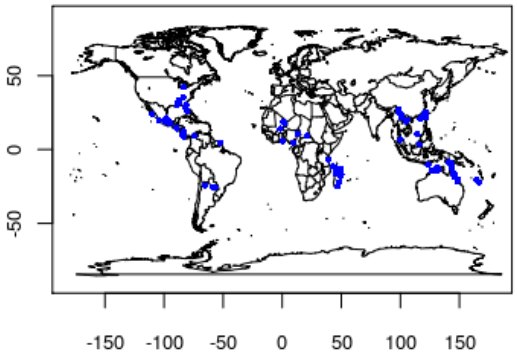
Number of occurrence records used: 144

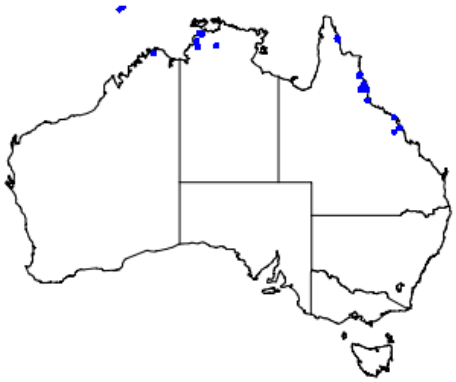
Outcomes

Relative change in overall climate suitability: -3.81%

Spatial trend: South-west

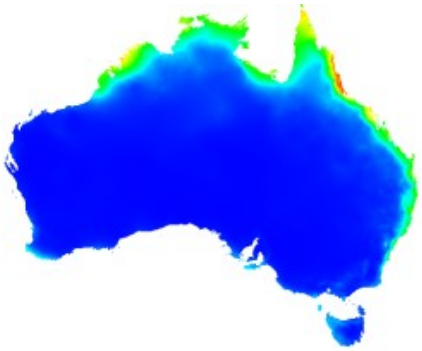
Occurrence distribution





Model results

Current



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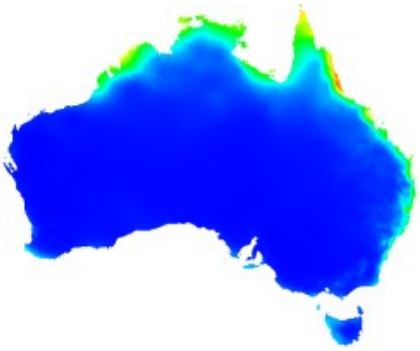

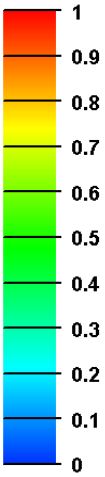

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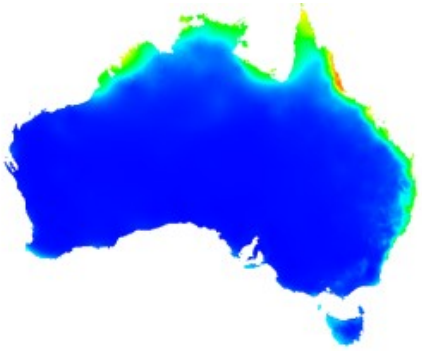
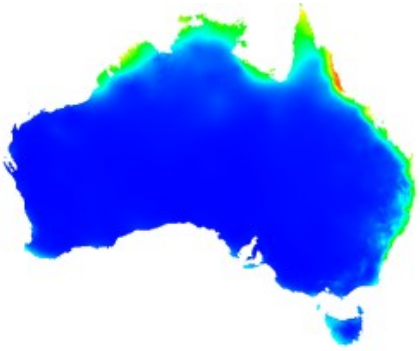


2080



Sida rhombifolia

Malvaceae

Common name(s): Paddys lucerne

National list(s): WoNS shortlist

NSW status: Not listed

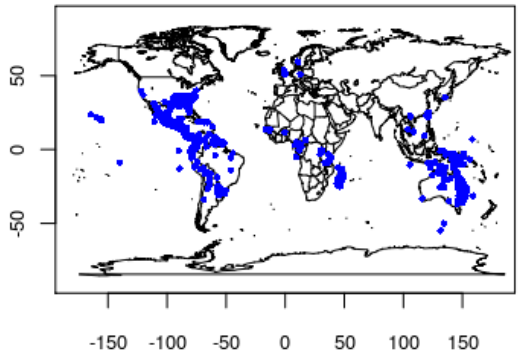
Number of occurrence records used: 1285

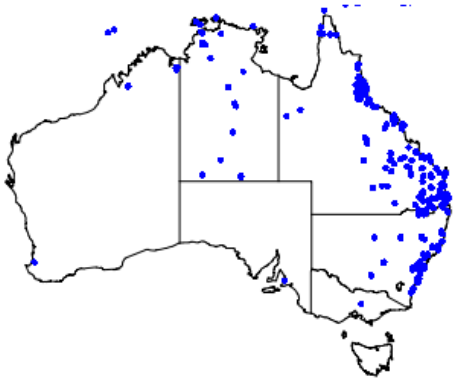
Outcomes

Relative change in overall climate suitability: -30.81%

Spatial trend: North-east

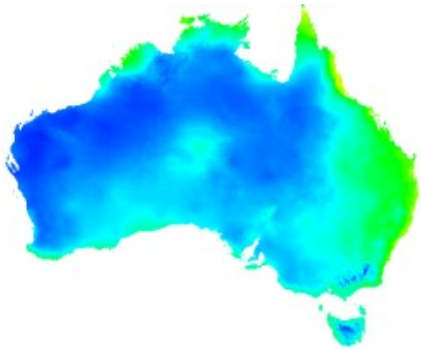
Occurrence distribution





Model results

Current



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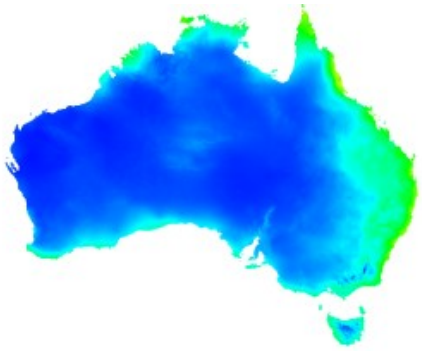
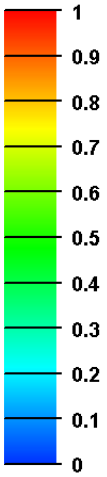




2050

2080

Solanum elaeagnifolium

Solanaceae

Common name(s): Silver leaf nightshade

National list(s): WoNS shortlist

NSW status: C3(8)/C4(36)

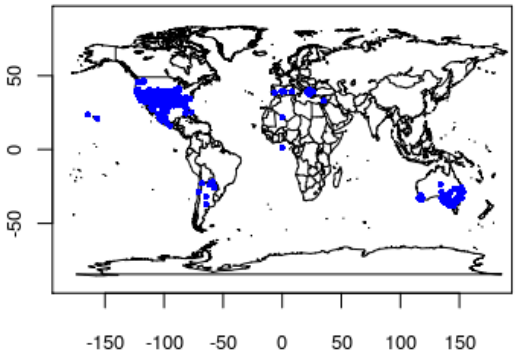
Number of occurrence records used: 983

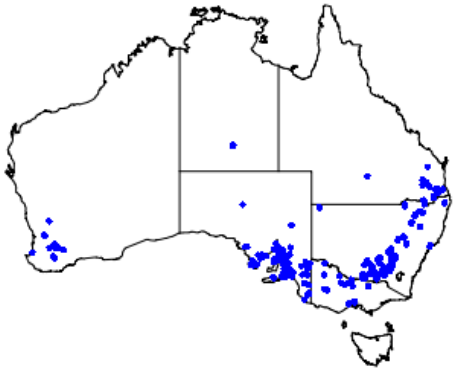
Outcomes

Relative change in overall climate suitability: -30.75%

Spatial trend: South-east

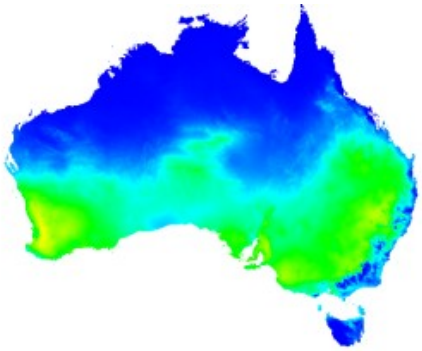
Occurrence distribution





Model results

Current



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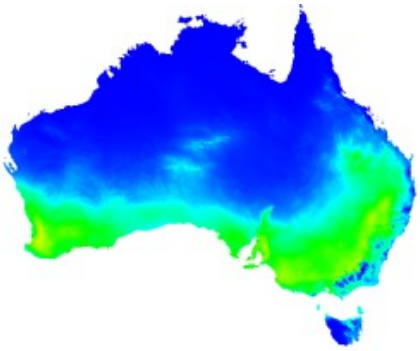

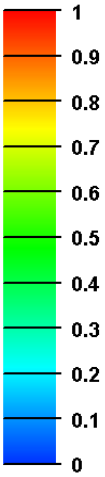

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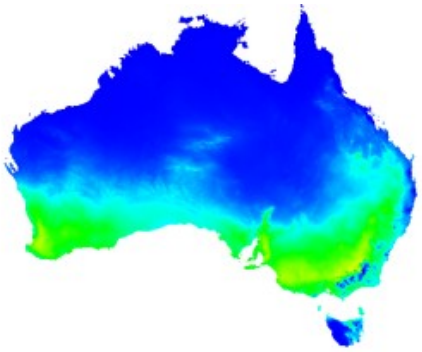

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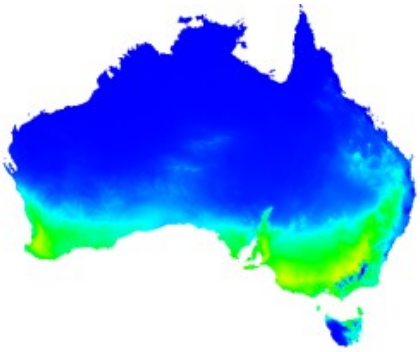


Spartina anglica

Poaceae

Common name(s): Rice grass

National list(s): WoNS shortlist

NSW status: Not listed

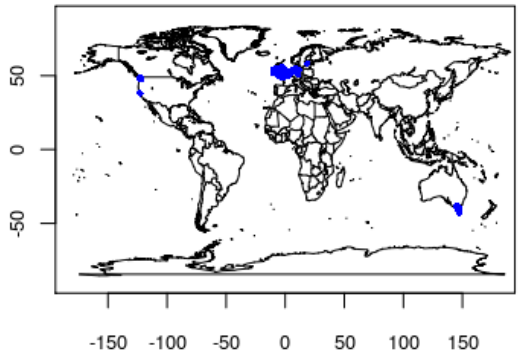
Number of occurrence records used: 460

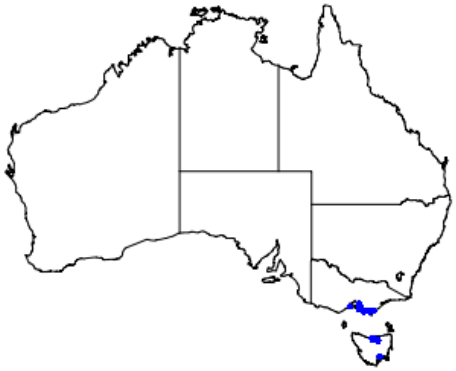
Outcomes

Relative change in overall climate suitability: -31.26%

Spatial trend: South-east

Occurrence distribution

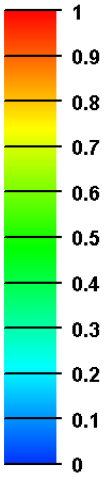




Model results

Current

2020



2050

2080

Sporobolus africanus

Poaceae

Common name(s): Giant Parramatta grass

National list(s): WoNS shortlist

NSW status: Not listed

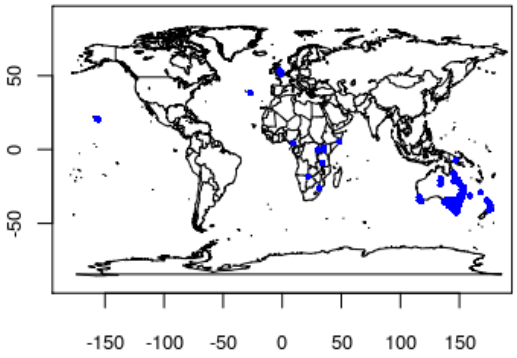
Number of occurrence records used: 399

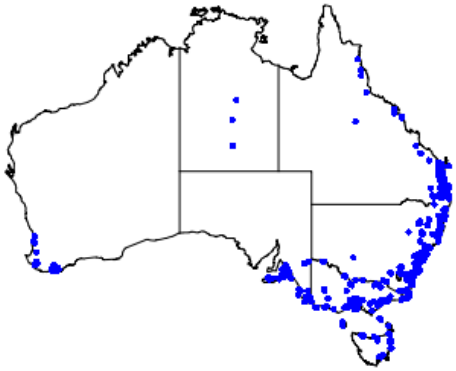
Outcomes

Relative change in overall climate suitability: -45.98%

Spatial trend: South-east

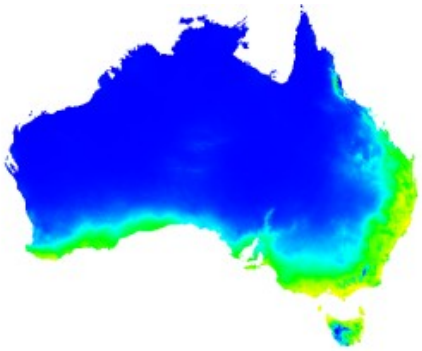
Occurrence distribution





Model results

Current



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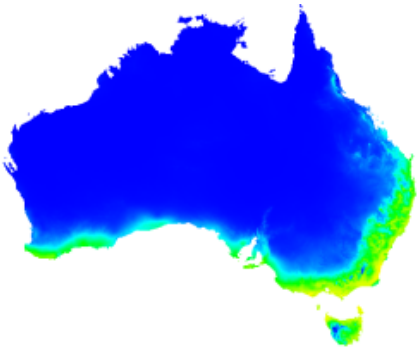

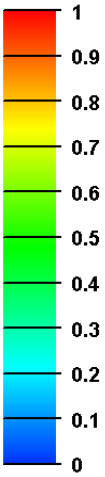

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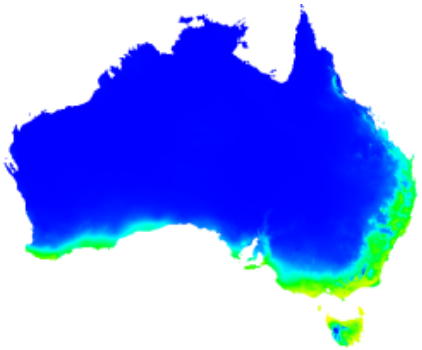

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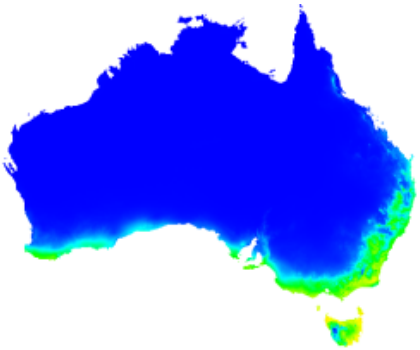


Sporobolus natalensis

Poaceae

Common name(s): Giant rats tail grass

National list(s): WoNS shortlist

NSW status: Not listed

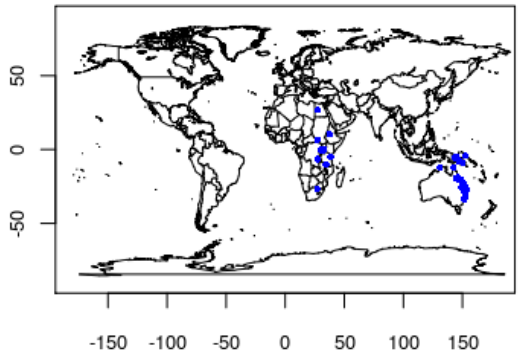
Number of occurrence records used: 87

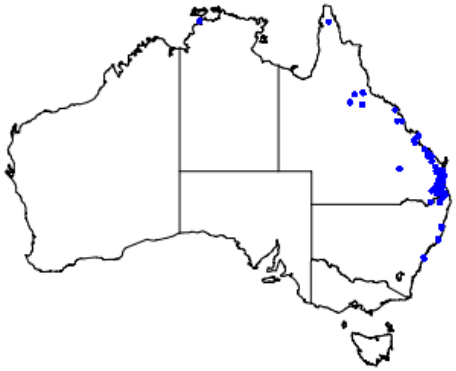
Outcomes

Relative change in overall climate suitability: -25.27%

Spatial trend: South-east

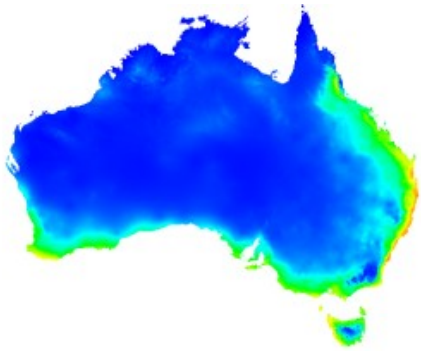
Occurrence distribution



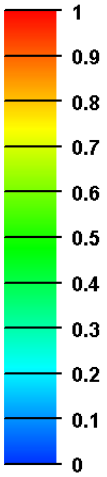


Model results

Current



2020



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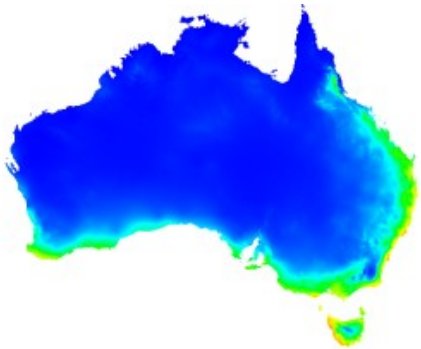

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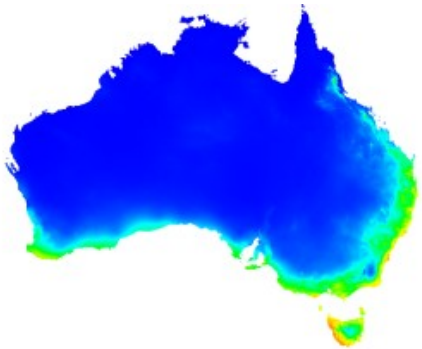


Sporobolus pyramidalis

Poaceae

Common name(s): Giant rats tail grass

National list(s): WoNS shortlist

NSW status: C3(10)

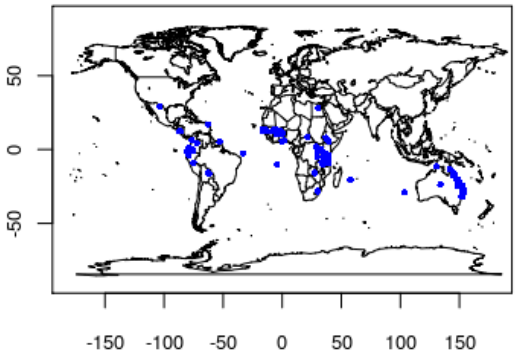
Number of occurrence records used: 243

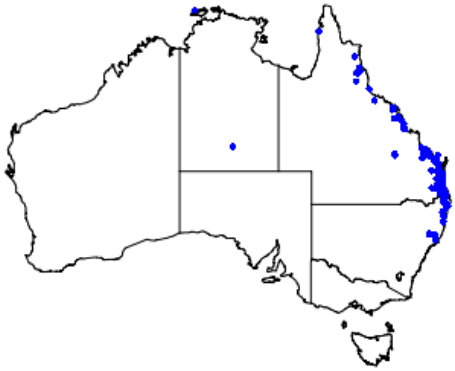
Outcomes

Relative change in overall climate suitability: -38.11%

Spatial trend: North-east

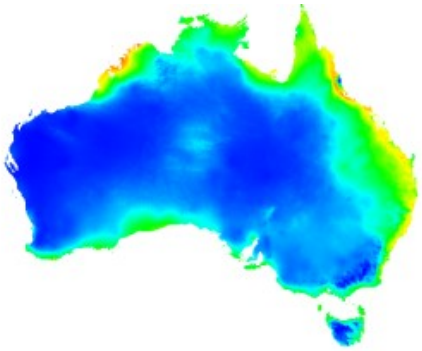
Occurrence distribution





Model results

Current



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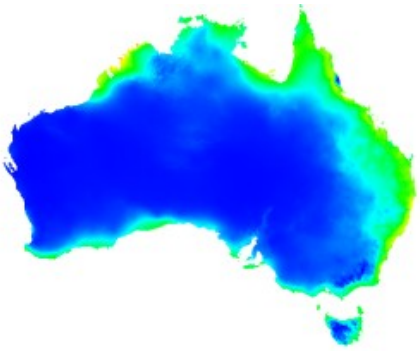

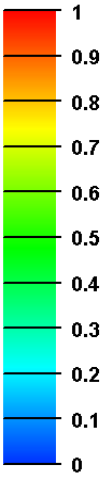

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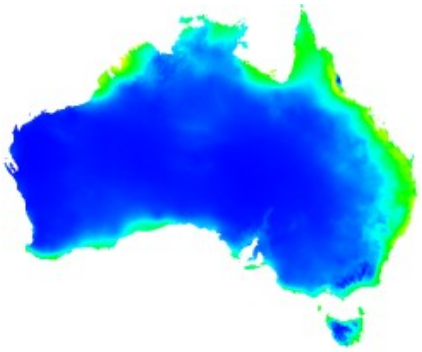
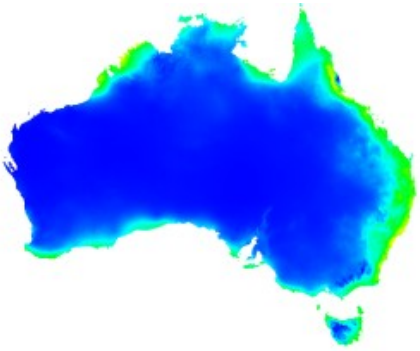


2080



Stachytarpheta jamaicensis

Verbenaceae

Common name(s): Snake weed

National list(s): WoNS shortlist

NSW status: Not listed

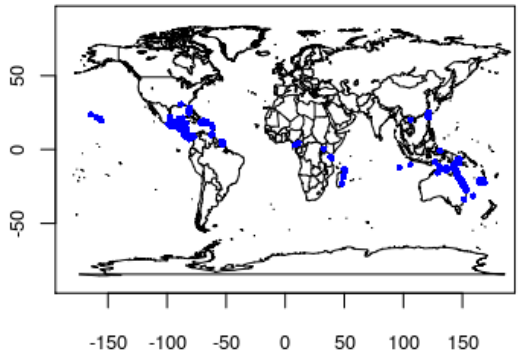
Number of occurrence records used: 335

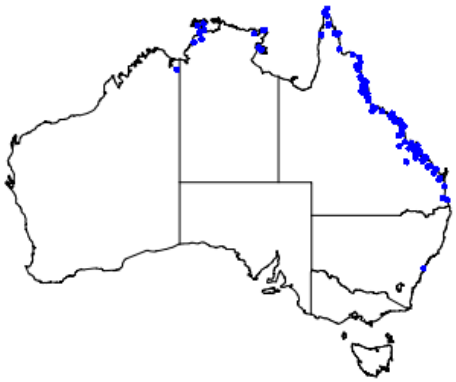
Outcomes

Relative change in overall climate suitability: +0.41%

Spatial trend: South-east

Occurrence distribution

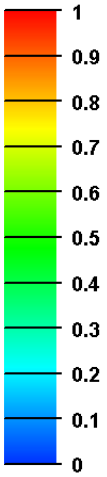




Model results

Current

2020



2050

2080

Stachytarpheta mutabilis

Verbenaceae

Common name(s): Snake weed

National list(s): WoNS shortlist

NSW status: Not listed

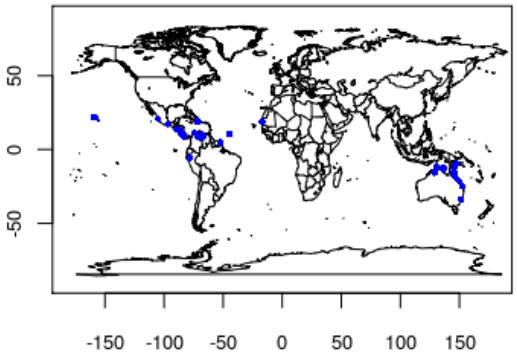
Number of occurrence records used: 65

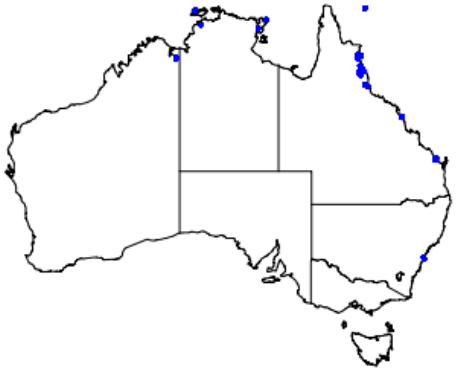
Outcomes

Relative change in overall climate suitability: -5.34%

Spatial trend: South-east

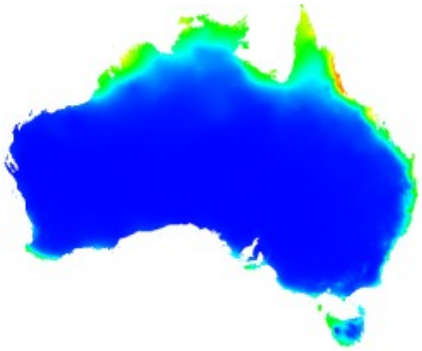
Occurrence distribution





Model results

Current



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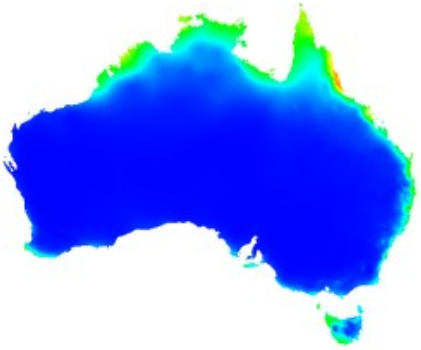

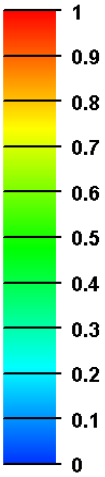

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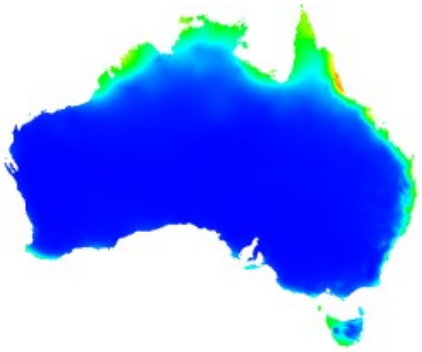
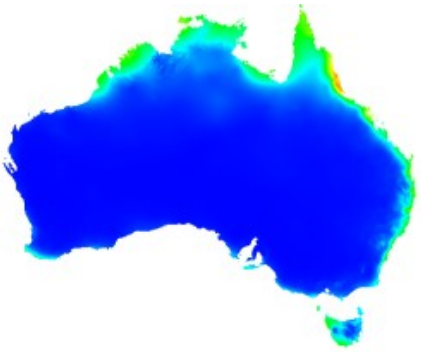


2080



Tamarix aphylla

Tamaricaceae

Common name(s): Tamarisk, Athel pine, Athel tree, Flowering cypress

National list(s): WoNS declared

NSW status: C5(S)

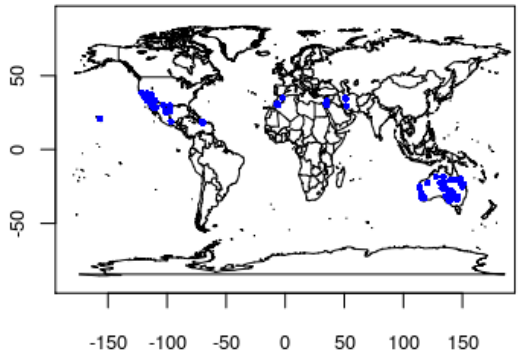
Number of occurrence records used: 153

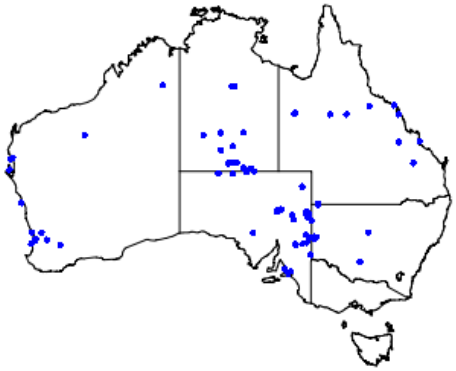
Outcomes

Relative change in overall climate suitability: -30.62%

Spatial trend: South-east

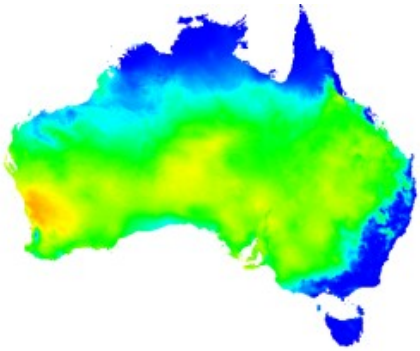
Occurrence distribution





Model results

Current



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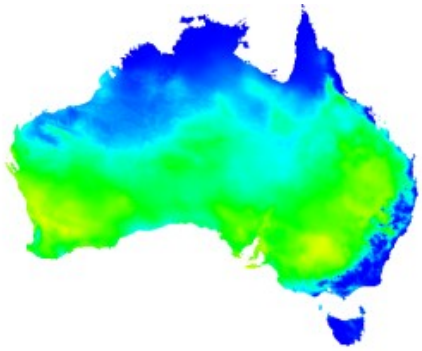

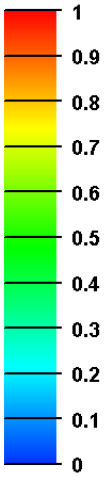

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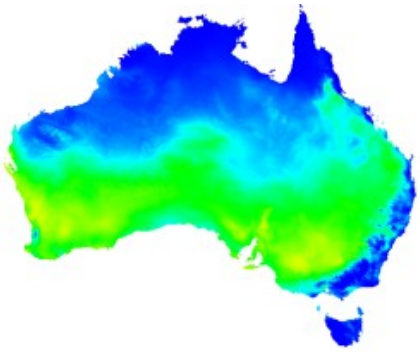
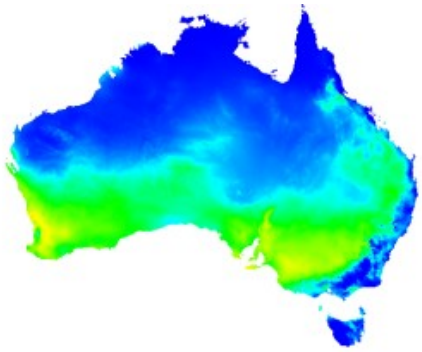


2080



Themeda quadrivalvis

Poaceae

Common name(s): Grader grass

National list(s): WoNS shortlist

NSW status: Not listed

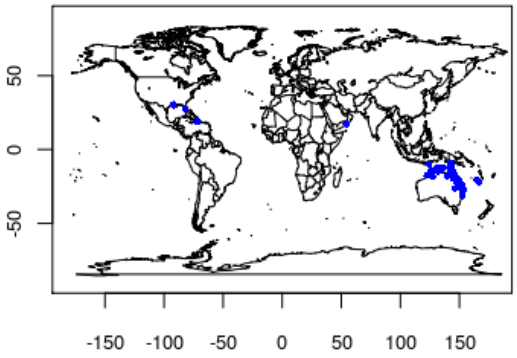
Number of occurrence records used: 217

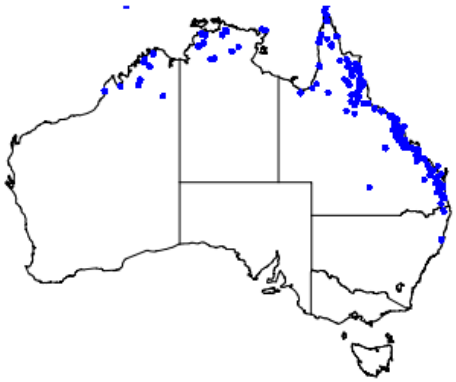
Outcomes

Relative change in overall climate suitability: -31.15%

Spatial trend: South-east

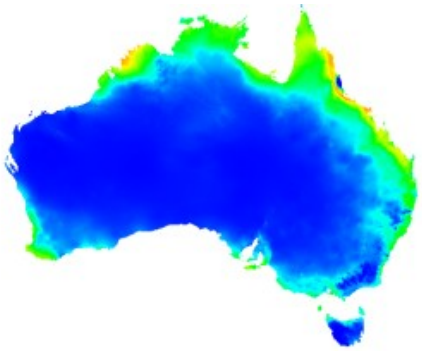
Occurrence distribution





Model results

Current



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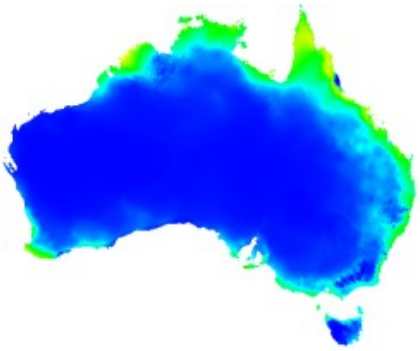

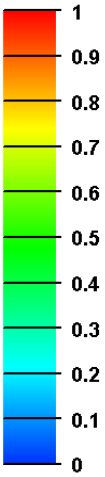

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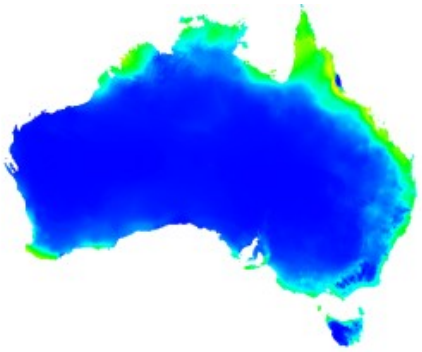

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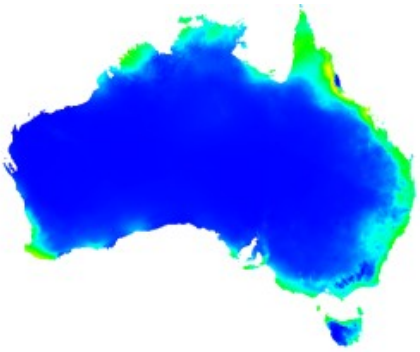


Thunbergia grandiflora

Acanthaceae

Common name(s): Blue thunbergia, Blue trumpet vine, Blue skyflower, Sky vine

National list(s): WoNS shortlist

NSW status: Not listed

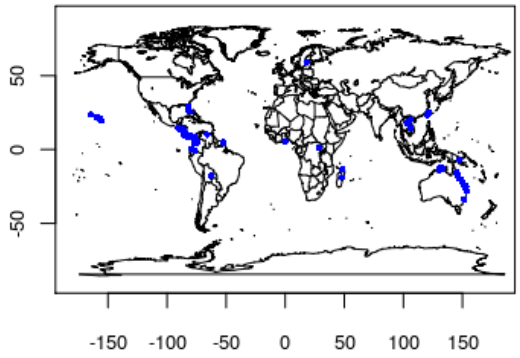
Number of occurrence records used: 90

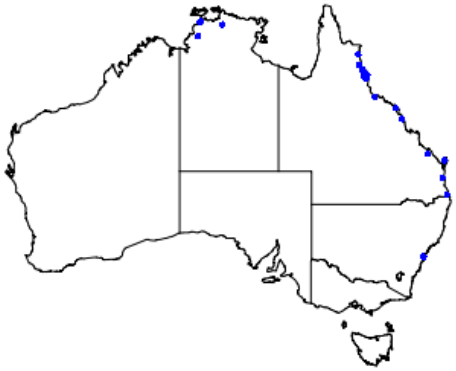
Outcomes

Relative change in overall climate suitability: -7.18%

Spatial trend: South-east

Occurrence distribution

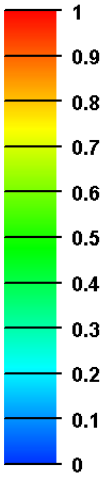




Model results

Current

2020



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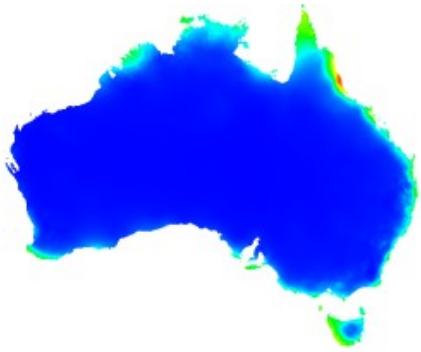

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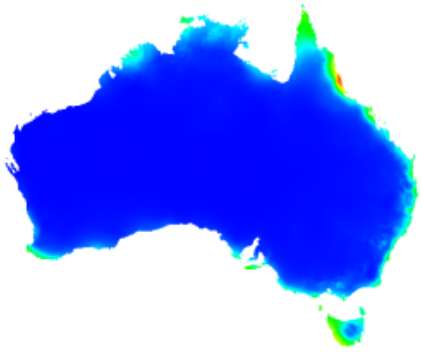


Thunbergia laurifolia

Acanthaceae

Common name(s): Laurel clock vine

National list(s): Alert list

NSW status: Not listed

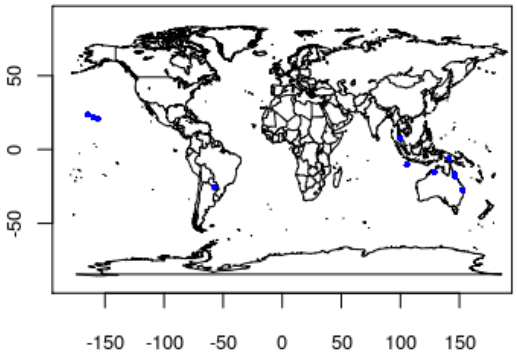
Number of occurrence records used: 17

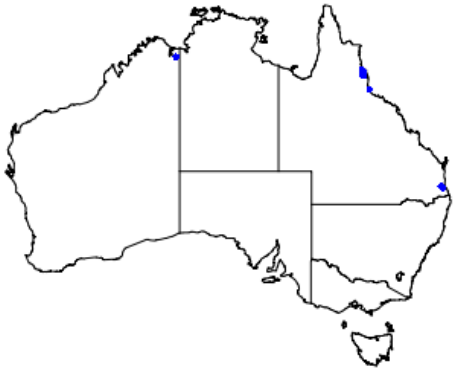
Outcomes

Relative change in overall climate suitability: +12.84%

Spatial trend: North-west

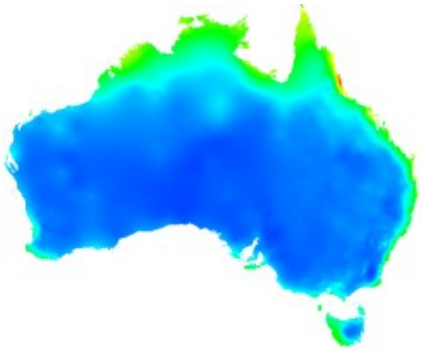
Occurrence distribution





Model results

Current



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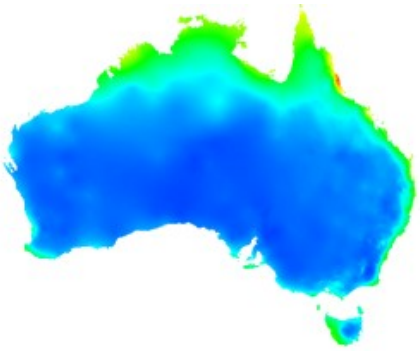

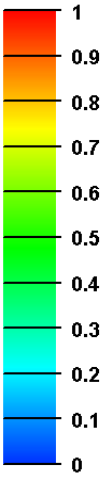

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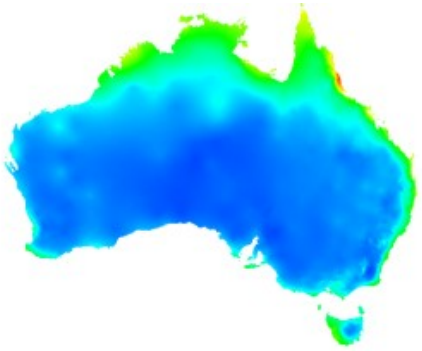

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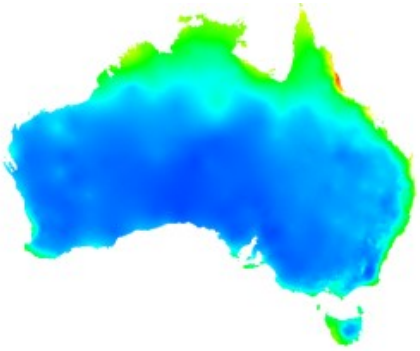


Tipuana tipu

Fabaceae

Common name(s): Rosewood, Pride of Bolivia

National list(s): Alert list

NSW status: Not listed

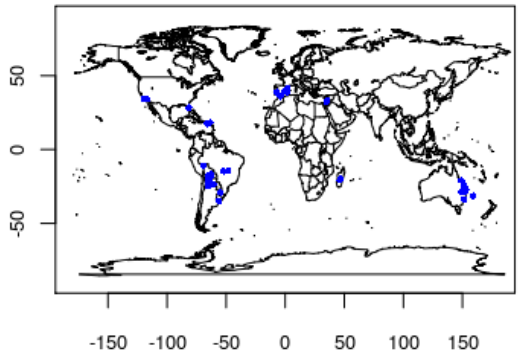
Number of occurrence records used: 75

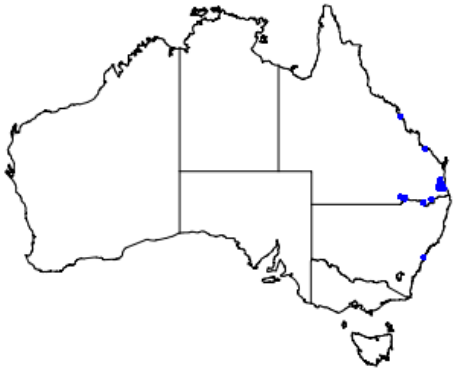
Outcomes

Relative change in overall climate suitability: -26.15%

Spatial trend: South-east

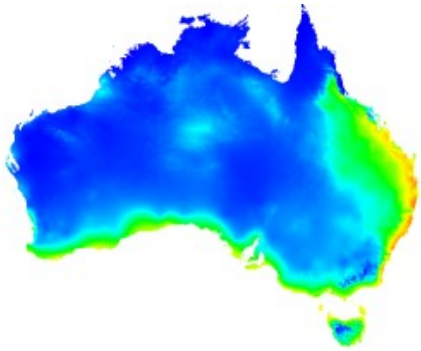
Occurrence distribution





Model results

Current



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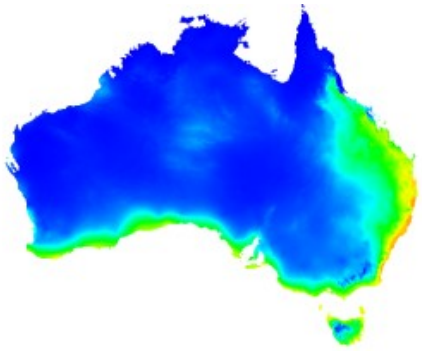

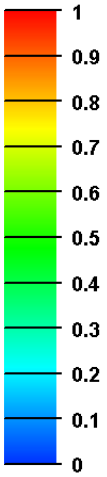

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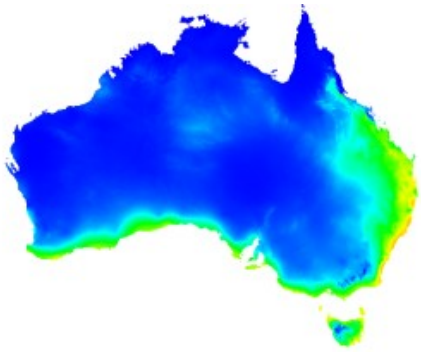

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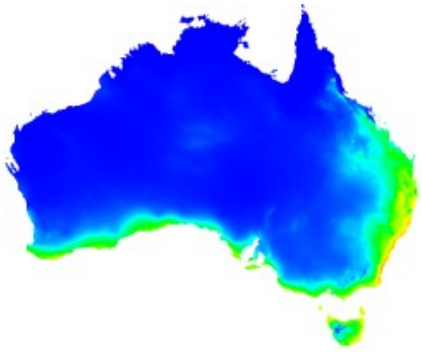


Trianoptiles solitaria

Cyperaceae

Common name(s): Subterranean Cape sedge

National list(s): Alert list

NSW status: Not listed

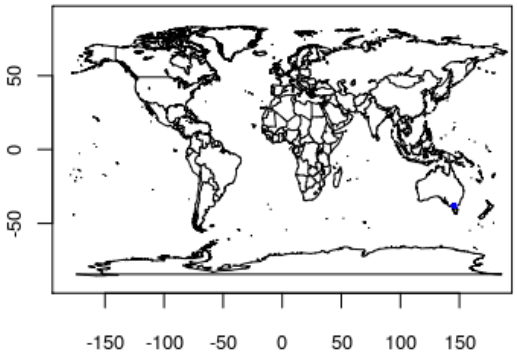
Number of occurrence records used: 3

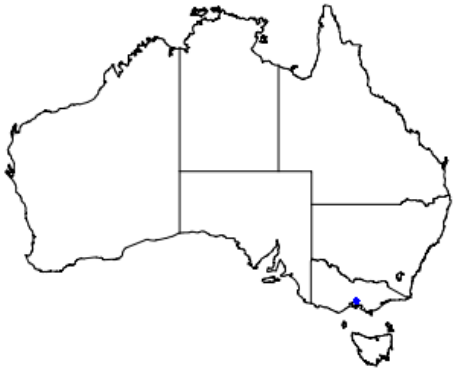
Outcomes

Relative change in overall climate suitability: -92.09%

Spatial trend: South-east

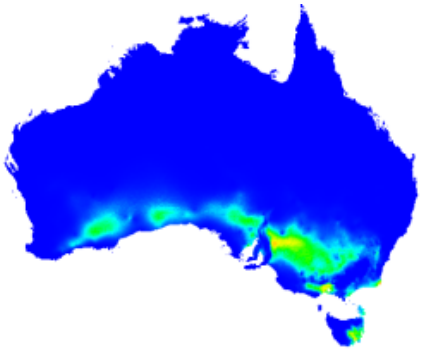
Occurrence distribution





Model results

Current



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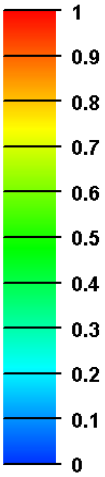


Ulex europaeus

Fabaceae

Common name(s): Gorse, Furze, Whin

National list(s): WoNS declared

NSW status: C2(12)/C3(21)

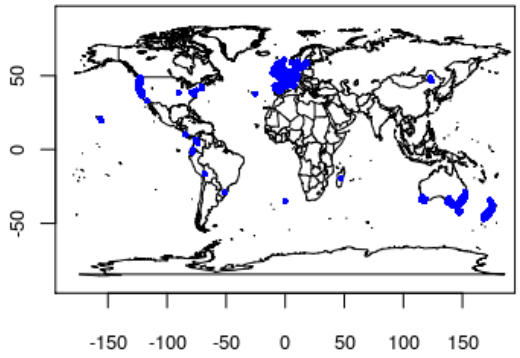
Number of occurrence records used: 5268

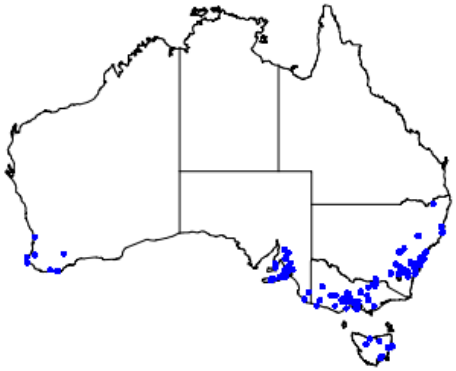
Outcomes

Relative change in overall climate suitability: -34.85%

Spatial trend: South-east

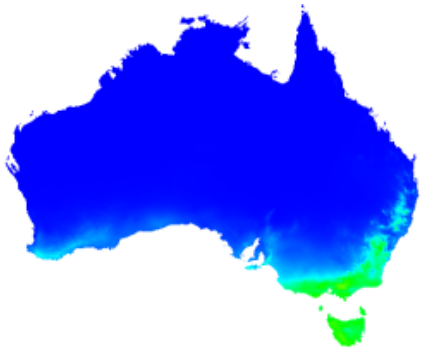
Occurrence distribution



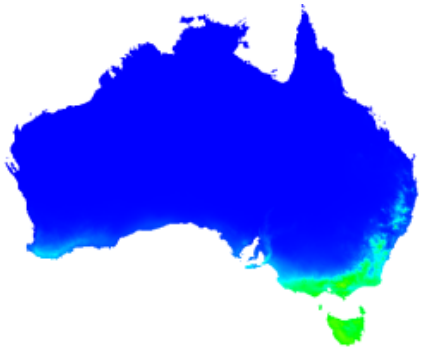


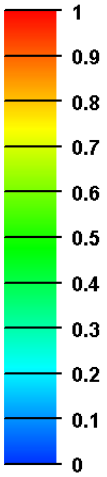
Model results

Current

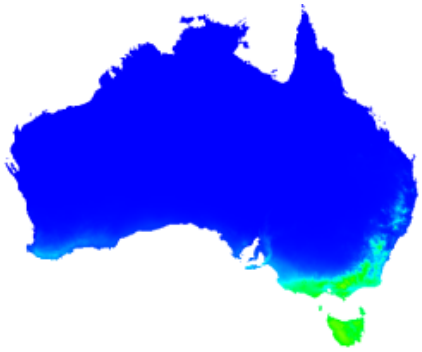


2020





2050



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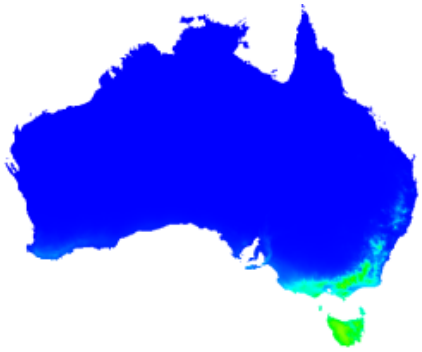


Urochloa mutica

Poaceae

Common name(s): Para grass

National list(s): Not listed

NSW status: Not listed

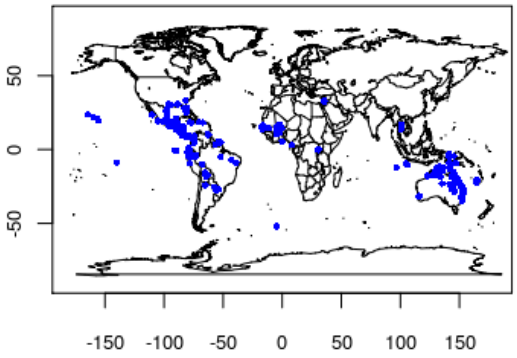
Number of occurrence records used: 343

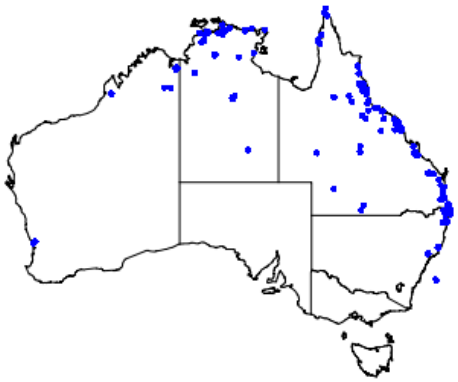
Outcomes

Relative change in overall climate suitability: -2.24%

Spatial trend: North-west

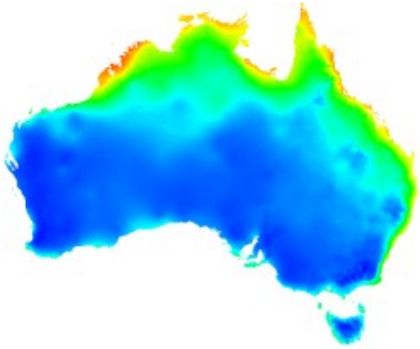
Occurrence distribution



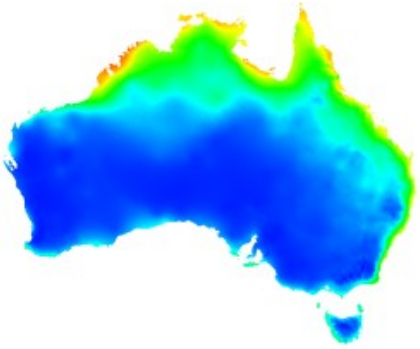


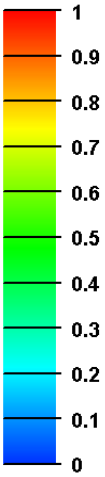
Model results

Current



2020





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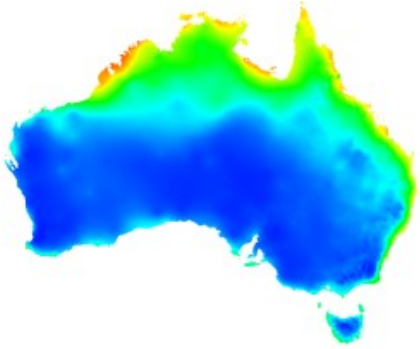
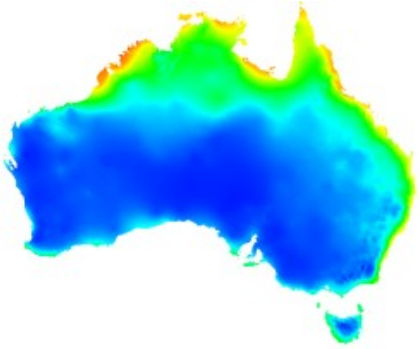


2080



Vachellia karroo

Mimosaceae

Common name(s): Karroo thorn

National list(s): Alert list

NSW status: C1(S)

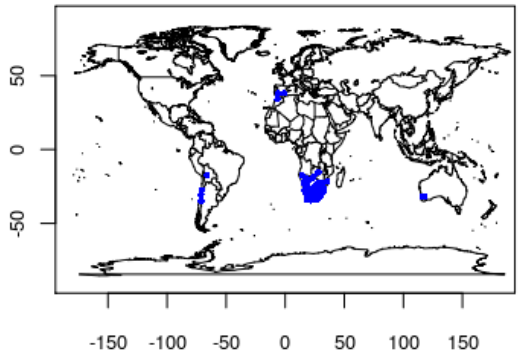
Number of occurrence records used: 314

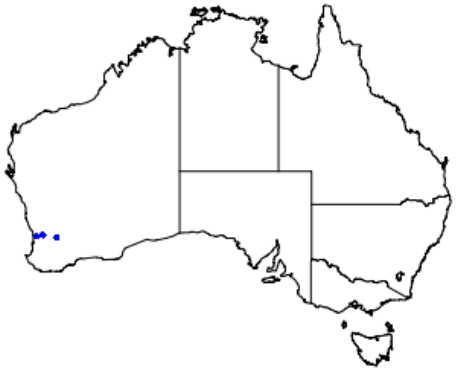
Outcomes

Relative change in overall climate suitability: -45.49%

Spatial trend: South-west

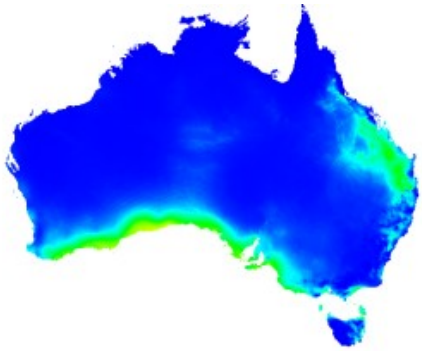
Occurrence distribution



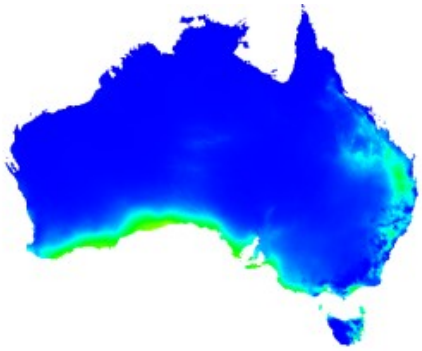


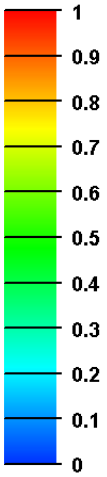
Model results

Current



2020





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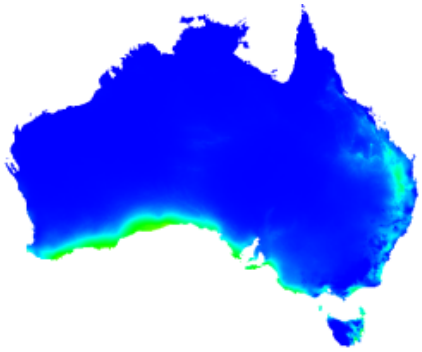
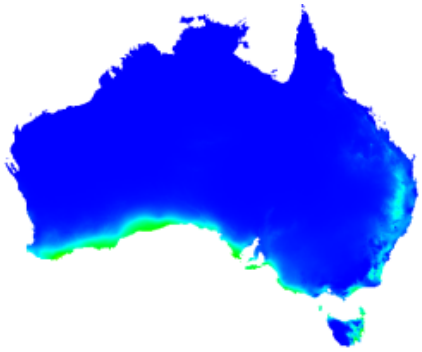


2080



Vachellia nilotica

Mimosaceae

Common name(s): Prickly acacia

National list(s): WoNS declared

NSW status: C1(S)

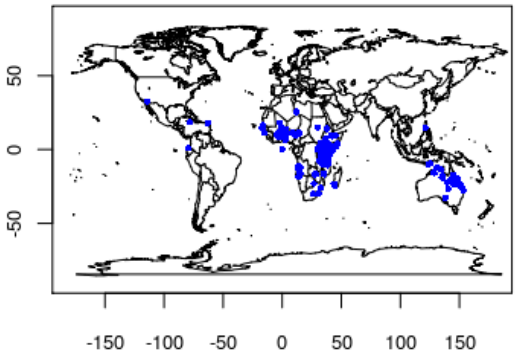
Number of occurrence records used: 319

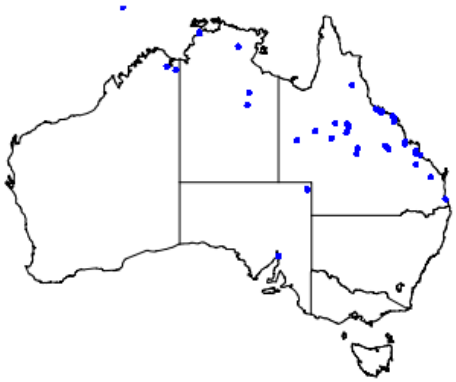
Outcomes

Relative change in overall climate suitability: -9.58%

Spatial trend: South-west

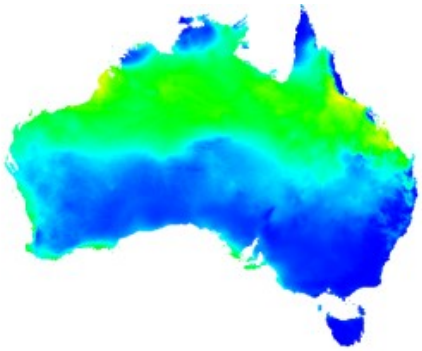
Occurrence distribution



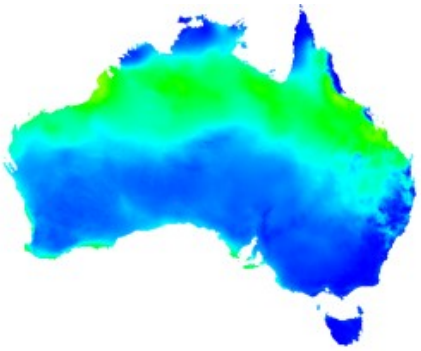


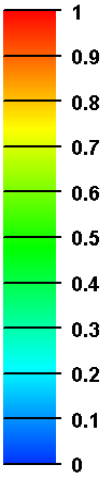
Model results

Current



2020





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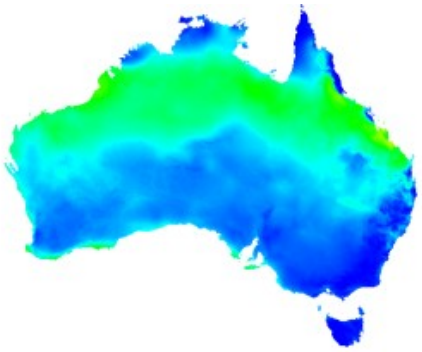
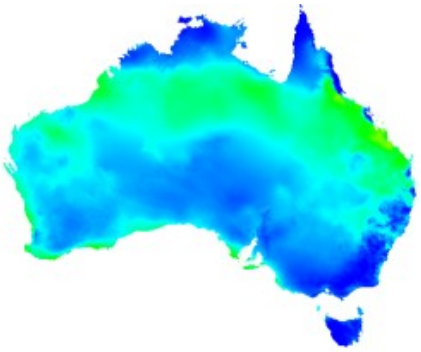


2080



Watsonia spp.

Iridaceae

Common name(s): Watsonia

National list(s): WoNS shortlist

NSW status: Not listed

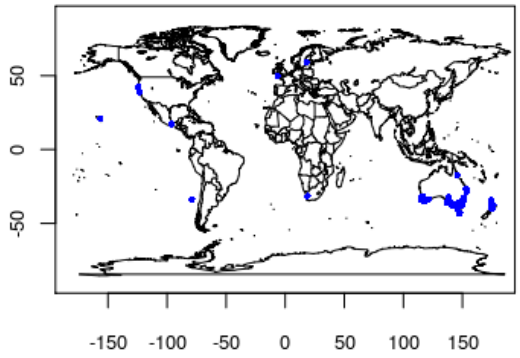
Number of occurrence records used: 184

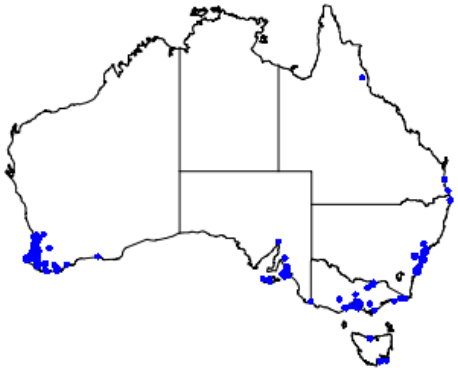
Outcomes

Relative change in overall climate suitability: -26.31%

Spatial trend: South-east

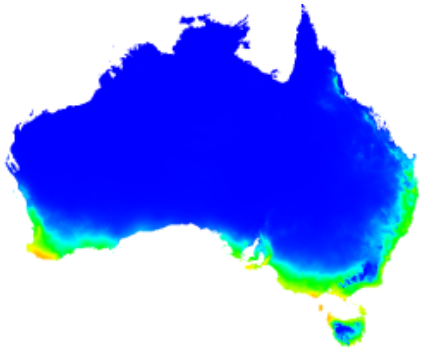
Occurrence distribution



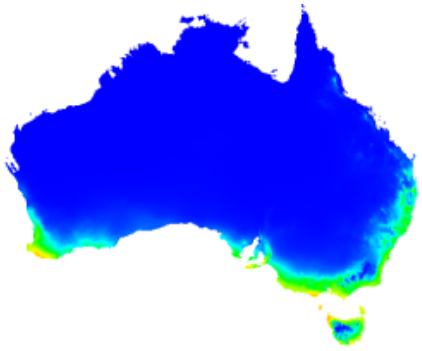


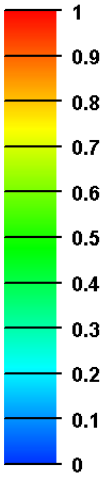
Model results

Current



2020





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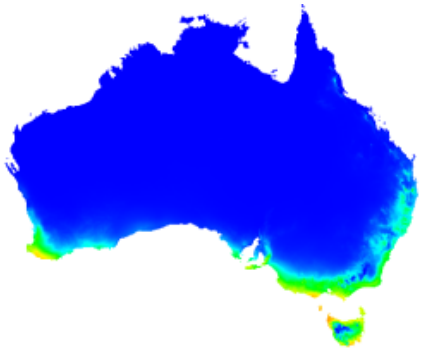

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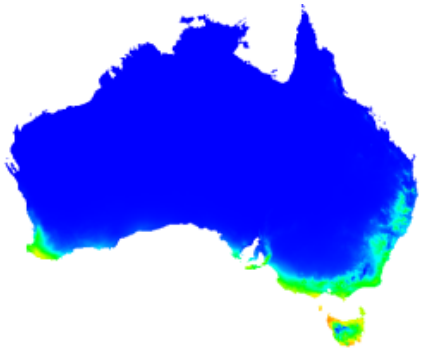


Xanthium occidentale

Asteraceae

Common name(s): Noogoora burr

National list(s): WoNS shortlist

NSW status: C4(86)

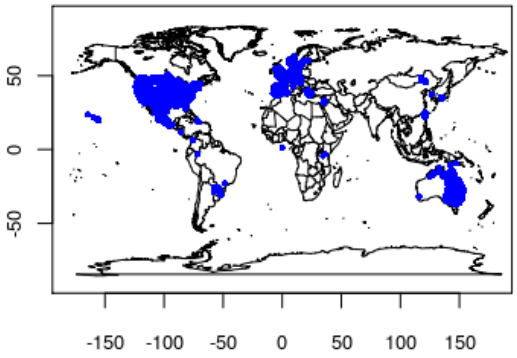
Number of occurrence records used: 2885

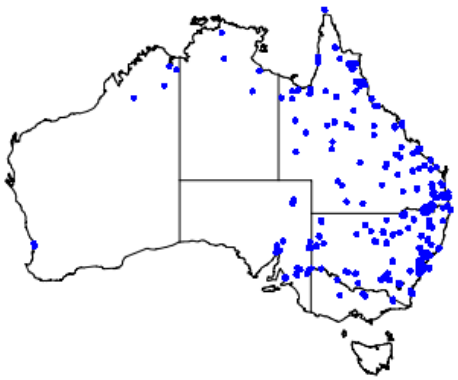
Outcomes

Relative change in overall climate suitability: -26.22%

Spatial trend: South-east

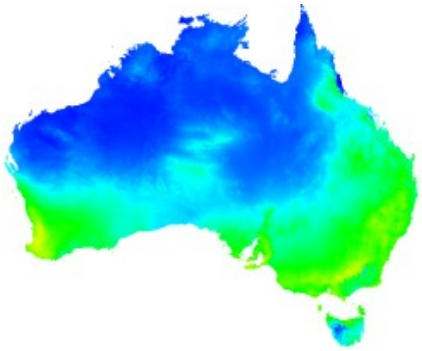
Occurrence distribution





Model results

Current



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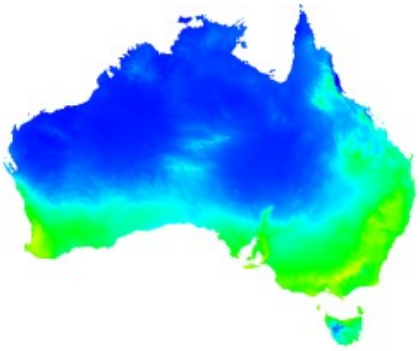
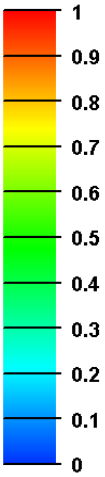
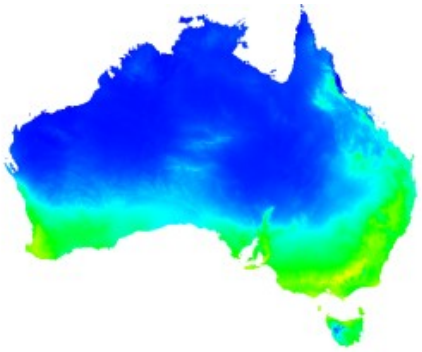
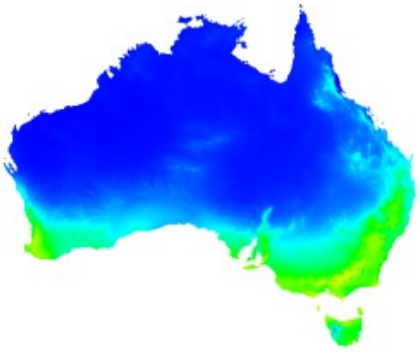




2050



2080



Xanthium spinosum

Asteraceae

Common name(s): Bathurst burr

National list(s): WoNS shortlist

NSW status: C4(86)

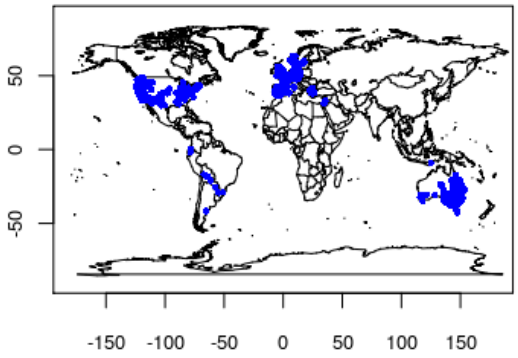
Number of occurrence records used: 994

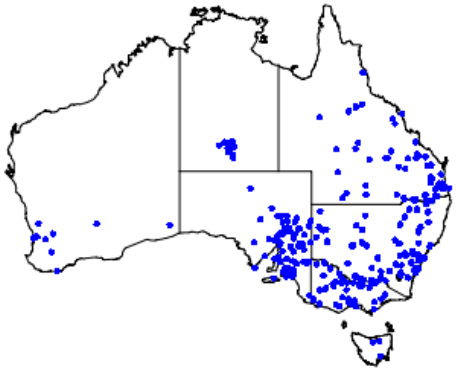
Outcomes

Relative change in overall climate suitability: -37.23%

Spatial trend: South-east

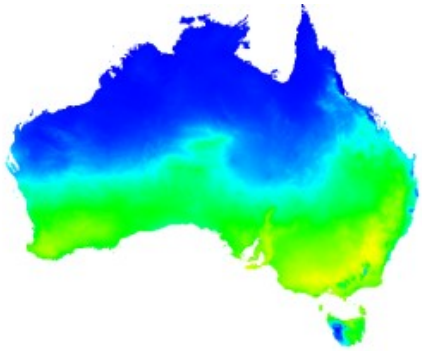
Occurrence distribution





Model results

Current



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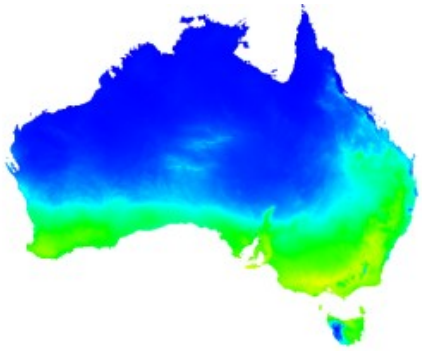
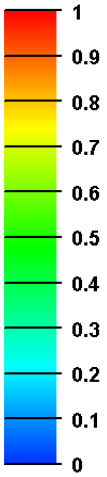
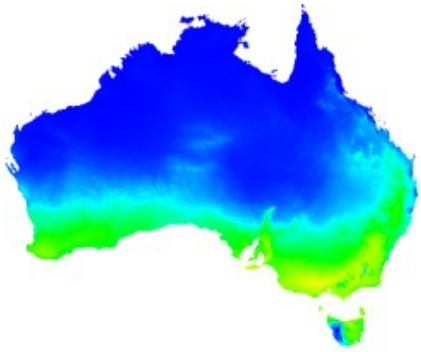
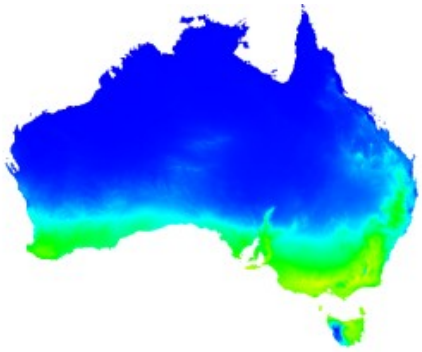




2050



2080



Zantedeschia aethiopica

Araceae

Common name(s): Arum lily, Calla lily

National list(s): WoNS shortlist

NSW status: Not listed

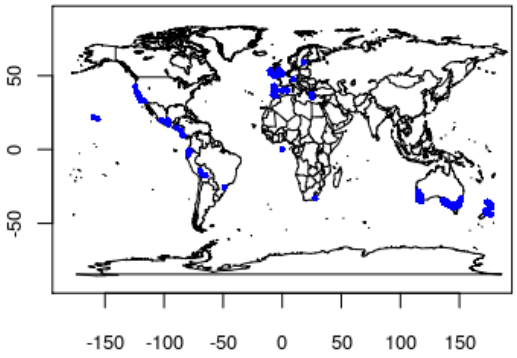
Number of occurrence records used: 199

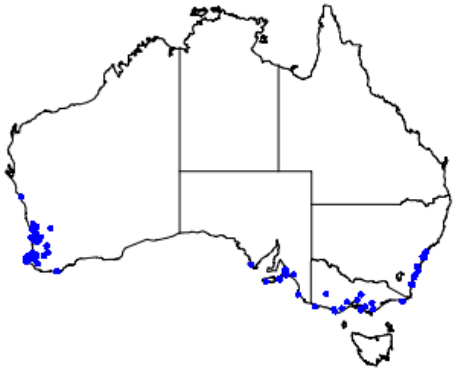
Outcomes

Relative change in overall climate suitability: -25.44%

Spatial trend: South-east

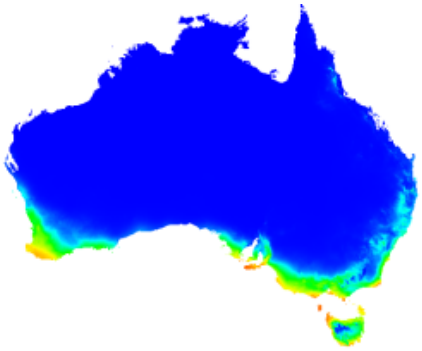
Occurrence distribution





Model results

Current



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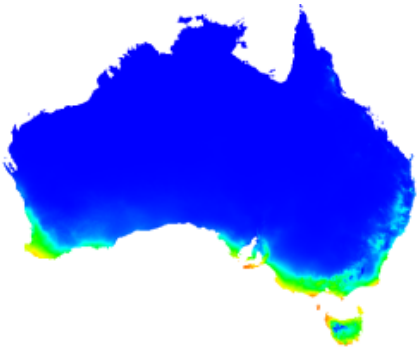

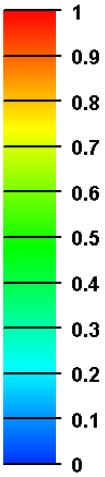

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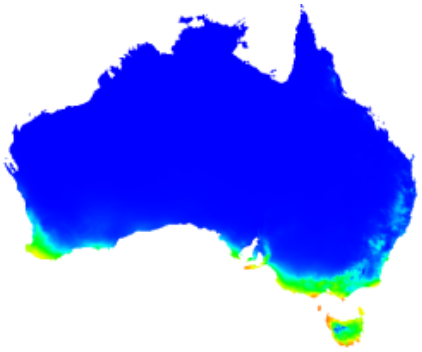

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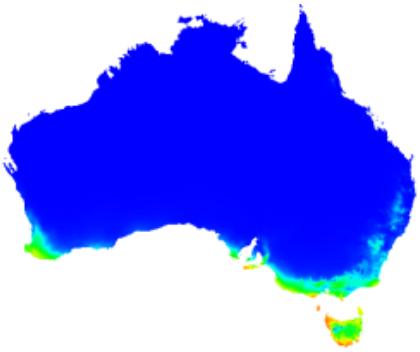


Ziziphus mauritiana

Rhamnaceae

Common name(s): Chinese apple, Indian jujube, Chinese date

National list(s): WoNS shortlist

NSW status: Not listed

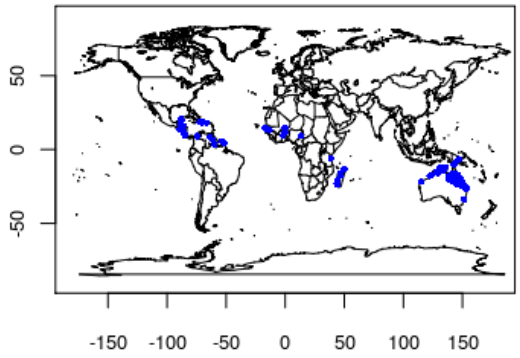
Number of occurrence records used: 159

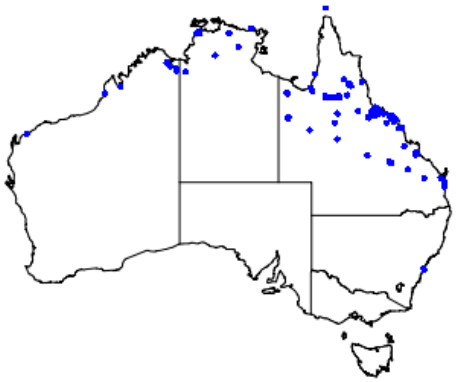
Outcomes

Relative change in overall climate suitability: -11.58%

Spatial trend: South-east

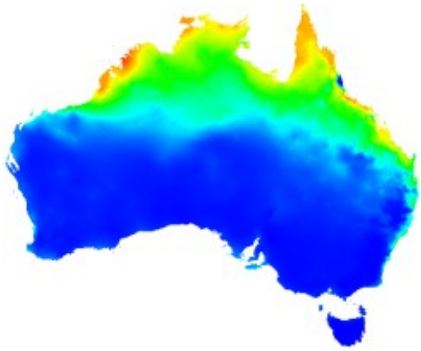
Occurrence distribution





Model results

Current



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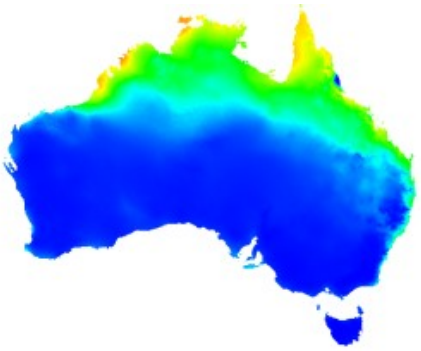

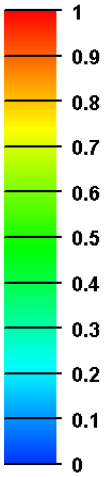

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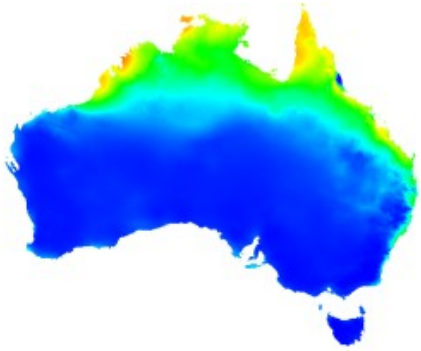

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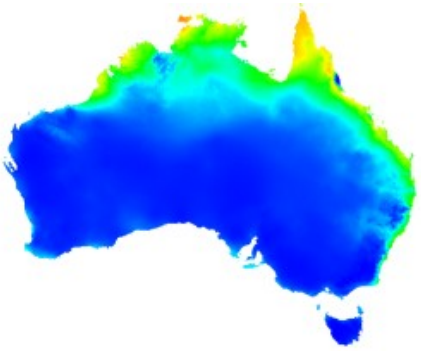

Literature cited

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