Gum tree habitats in decline, study warns

September 20 2016

Corymbia papuana. Credit: Freya Thomas

Australians could see fewer suitable environments for the country's iconic eucalypt trees within a generation, according to a new international research project.

The findings, published today in the journal *Nature Climate Change*, paint a stark picture with the habitat of more than 90 per cent of eucalypt species set to decline, with 16 species forecast to lose their

home environments entirely within 60 years, due to climate change.

The study was led by the University of Canberra and included experts from the University of Melbourne, Colombian Agricultural Research Corporation- Corpoica, National Research Collections of Australia – CSIRO, University of California, Berkeley, University of Grenoble Alpes, France, National Science Foundation in the US, University of New South Wales, The Australian National University, James Cook University, Macquarie University, Griffith University, University of Queensland; and the Australian Museum.

Researchers from the University of Melbourne, Dr Laura Pollock and Dr Heini Kujala led the computer modelling work on eucalypt habitats.

The team used over 260,000 geospatial data points from eucalypt specimens stored in Australia herbaria and accessed through Australia's Virtual Herbarium. This information was used to create models of current locations and preferred environmental conditions for 657 species of eucalypt trees.

"Once we had developed the models, we could then determine which areas in Australia would be climatically suitable for the species in the future, as the climate changes," Dr Kujala said.

"Our study found that the majority of the eucalypt species are predicted to shift towards coastal areas, and further south along coastal regions. Many other species groups, such as birds and mammals, that are dependent on eucalypts, are also likely to follow.

"This will mean that for many rare species, conservation efforts will increasingly focus on coastal regions where human population density is also highest. This may lead to increased conflicts between conservation and different land use needs in the future."

Associate Professor Bernd Gruber of the University of Canberra's Institute for Applied Ecology (IAE), one of the co-authors of the report, said the study was the first to examine the impact of climate change on the distribution of a large group of closely related tree species at a continental scale.

"This study demonstrates the importance of not simply counting the number of species in biodiversity conservation, but also considering their evolutionary history, which determines how closely related species are to each other," Dr Gruber said.

"Using this approach we were able to identify hotspots that will contain high levels of eucalypt diversity under a changing climate, both in terms of the number of species and their reflection of the trees' evolutionary pathways. Protecting these hotspots will be important to ensure we retain biodiversity in the future.

"We predict that a three degree rise in temperature over the next 60 years would see a decline of suitable habitat for 91 per cent of the 657 species of eucalypts we studied.

"As a consequence, the distribution of many species will change, and we expect trees suited to temperate and southern Australia to be hit particularly hard, contracting to more climatically suitable areas further south or at higher elevations.

"At least 16 species would have suitable climatic zones disappear altogether."

The research found that rare, evolutionarily ancient trees which have existed for a long time will feel the brunt of climate change.

"There will be a cascading effect on biodiversity, but the impact of

climate change will certainly be felt by most of these iconic tree species," Dr Gruber added.

"Our analysis suggests that only nine per cent of eucalypt species have the potential to increase their distribution over the same time period."

Dr Gruber and IAE colleague Carlos González-Orozco acknowledged the important collaboration with world leading experts.

"Dr Andrew Thornhill formerly of the National Research Collections of Australia – CSIRO and now based at the University of California, Berkeley, obtained DNA from the leaves of over 700 eucalypt species, many of which are cultivated in Australian Botanic Gardens. This facilitated the task to gather material more easily to create the world's most complete evolutionary tree of Australian eucalypts," Dr González-Orozco said.

"I would also acknowledge Dr Laura Pollock from the University of Melbourne, currently at the University of Grenoble Alpes, France, for her work using super computer infrastructure to enable the modelling of the climatic distribution of all 657 species on a continental scale at a very high level of detail."

More information: Carlos E. González-Orozco et al. Phylogenetic approaches reveal biodiversity threats under climate change, *Nature Climate Change* (2016). DOI: 10.1038/nclimate3126

Provided by University of Melbourne