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GISERA | Gas Industry Social and Environmental Research Alliance

Assessing the risk of forest fragmentation from the Narrabri Gas Project

CSIRO scientists have completed a study using remote sensing and threatened species surveys to better understand the risks of forest fragmentation from coal seam gas activities in the Pilliga Forest, NSW.

Key points

- The Narrabri Gas project (NGP) will result in up to 850 gas wells and the clearance of 1000 hectares (ha) of vegetation in the Pilliga Forest, NSW.
- This study was established to address gaps in our understanding of the environmental impact of forest fragmentation.
- Researchers used remote sensing to quantify the existing level of fragmentation across landscapes with differing land uses.
- Targeted on-ground surveys were used to collect data on threatened plant and animal species and their response to fragmentation.
- The study underscores the importance of managing key threats, including invasive species, habitat loss, and fire regimes, to maintain the ecological integrity of the Pilliga Forest.

This project, conducted through CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA), was developed to address a key community concern about the potential impact of the NGP on ecosystems and their component species in the Pilliga Forest.

In particular, the study focuses on fragmentation – the degree to which habitats like forests form large contiguous blocks or smaller isolated patches, and what impacts this might have on biodiversity.

The research characterises the level of fragmentation in the NGP area and examines whether fragmentation resulting from the NGP will impact biodiversity, including threatened animals, plants and mycorrhizal communities.

The project outcomes support better understanding of the potential environmental risks of the NGP.

The Narrabri region

The Narrabri Shire, in north-west NSW, covers approximately 13,000 square kilometres and is home to around 13,000 people. Within the Shire, the Pilliga Forest covers approximately 535,000 ha. It is the single largest area of inland plains forest and woodland in Australia.

In 2020, the NGP was conditionally approved by the Independent Planning Commission. This Santos-run project focuses on extracting coal seam gas (CSG) from targets in the Gunnedah Basin. The NGP will result in up to 850 gas wells and the clearance of 1000 ha of vegetation in part of the Pilliga Forest (approximately two-thirds of the NGP area is located within the Pilliga State Forest).



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Addressing community concerns

Community and landowner groups have expressed concerns about potential negative environmental impacts from the project. Activities undertaken during the NGP will increase the amount of forest fragmentation in the Pilliga, creating more patches and increasing the degree of isolation of some existing patches. However, it is important to note that the proposed development would take place in a landscape that is already fragmented from more than two centuries of other land uses, particularly activities associated with clearing for agriculture and timber harvesting for forestry.

As part of broader efforts to reduce uncertainty and ensure that any gas development in the region is undertaken with limited environmental impacts, CSIRO researchers have undertaken this project to assess the risk of forest fragmentation.

Research activities

Understanding any potential risks from the NGP requires detailed knowledge of current forest fragmentation and habitat requirements of species, especially threatened animals and plants. In order to gather information and conduct this assessment, researchers used a combination of remote sensing and field-based research. Key research activities included:

- remotely sensed quantification of fragmentation and connectivity metrics across the entire NGP area
- on-ground surveys for occurrence of a subset of threatened plants (five species) and vertebrates (four species)
- on-ground surveys for mycorrhizal symbionts of the threatened plants and subsequent lab-based assessment of diversity
- LiDAR-derived quantification of structural habitat metrics at a subset of survey sites where selected threatened species were present (or absent)
- occupancy modelling of species occurrence based on fragmentation metrics and LiDAR-derived site variables
- consideration of approaches and feasibility of upscaling monitoring to enable remote assessment of environmental variables.

Key findings

This study provides new scientific insights into forest fragmentation and biodiversity in the Pilliga Forest.

However, any ambitions to maintain intact ecosystems in the Pilliga Forest must acknowledge that those landscapes have already undergone intense modification due to agriculture and forestry.

There were several key findings that will support better understanding of potential environmental impacts from the NGP:

- The assessed area has relatively low levels of fragmentation and high connectivity, with no clear evidence that targeted species are currently impacted by fragmentation.

- A severe decline in common ringtail and brushtail possums has been observed, likely due to habitat loss, predation, and competition from invasive herbivores.
- Large-scale wildfires are a major concern for biodiversity persistence, contributing to a young overstorey and dense understorey with limited mature trees.
- The research provided new insights into the biodiversity of the region, including the first recorded ectomycorrhizal association in an Australian Euphorbiaceae species.

The study underscores the importance of managing key threats, including invasive species, habitat loss, and fire regimes, to maintain the ecological integrity of the Pilliga Forest. There should be a focus on ensuring that these threats are not exacerbated by activities associated with the development of the NGP.

In particular, researchers conclude that the cumulative impact of extensive wildfires and the status of arboreal marsupials within the Pilliga Forest should be topics for further research.



Threatened species (vertebrates) studied as part of this research:
A. Eastern pygmy-possum; B. black-striped wallaby; C. pale-headed snake; D. squirrel glider (Photo credit, all images: Stewart Macdonald).

More information

Read more [about this project](#)

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.