



Australia's National
Science Agency

GISERA | Gas Industry Social and Environmental Research Alliance

Progress report

Risks of fragmentation from CSG activities for species and ecosystems in the Pilliga Forest



Australian Government
Department of Industry,
Science and Resources



Supported by
Government of
South Australia



NORTHERN
TERRITORY
GOVERNMENT



QGC

Santos

tamboran
RESOURCES



Progress against project milestones

Progress against milestones/tasks are approved by the GISERA Director, acting with authority in accordance with the [GISERA Alliance Agreement](#).

Progress against project milestones/tasks is indicated by two methods: [Traffic light reports](#) and descriptive [Project schedule reports](#).

1. Traffic light reports in the Project Schedule Table below show progress using a simple colour code:

- **Green:**

- Milestone fully met according to schedule.
- Project is expected to continue to deliver according to plan.
- Milestone payment is approved.

- **Amber:**

- Milestone largely met according to schedule.
- Project has experienced delays or difficulties that will be overcome by next milestone, enabling project to return to delivery according to plan by next milestone.
- Milestone payment is withheld.
- Milestone payment withheld for second of two successive amber lights; project review initiated and undertaken by GISERA Director.

- **Red:**

- Milestone not met according to schedule.
- Problems in meeting milestone are likely to impact subsequent project delivery, such that revisions to project timing, scope or budget must be considered.
- Milestone payment is withheld.
- Project review initiated by GISERA Director.

2. Progress Schedule Reports outline task objectives and outputs and describe, in the 'progress report' section, the means and extent to which progress towards tasks has been made.

Project schedule table

TASK NUMBER	TASK DESCRIPTION	SCHEDULED START	SCHEDULED FINISH	COMMENT
1	Assess fragmentation and connectivity using remote sensed imagery.	10 Jan 2023	30 Jun 2023	Completed
2	Complete on-ground surveys of occupancy of focal threatened species diversity and relative abundance of mycorrhizal fungi.	10 Jan 2023	30 June 2024	Completed
3	Assess structural attributes of habitat currently occupied by each focal threatened species.	1 Sept 2023	30 Sept 2024	Completed
4	Predict potential impacts on habitat suitability of focal threatened species from fragmentation during the NGP.	1 Dec 2023	31 Dec 2024	Completed
5	Explore approaches to upscale monitoring to enable remote assessment of environmental variables during the life of the NGP.	1 Mar 2024	31 Dec 2024	Completed
6	Project reporting	30 Jun 2023	9 Dec 2024	Completed
7	Communicate findings to stakeholders	10 Jan 2023	9 Dec 2024	Completed

Project schedule report

TASK 1: Assess fragmentation and connectivity using remote sensed imagery

BACKGROUND

The development of the NGP requires clearing of vegetation and will increase forest fragmentation. The number of patches in the study area covered by the Environmental Impact Assessment is predicted to increase from 387 to 721. The public has raised concerns over forest fragmentation and potential negative impacts of edge effects on biodiversity including localised population extinctions of species. However, the Pilliga region is already fragmented through a major road network (including the Newell Highway) and the provision of roads and tracks for forestry activities. To date, no research has been undertaken to describe the existing pattern and extent of forest fragmentation in the Pilliga Forest. This task addresses that issue.

TASK OBJECTIVES

To quantify the current levels of forest fragmentation in landscapes of the Pilliga Forest with differing land uses (forestry versus conservation).

TASK OUTPUTS AND SPECIFIC DELIVERABLES

The main output will be a database that for each of approximately 10 landscapes calculates fragmentation and connectivity metrics using the methods of Foreground Area Density, Morphological Spatial Pattern Analysis and Minimum Planar Graph.

The results will be discussed in the final report for the project. There are no specific deliverables for this task; however mapping outputs will be used in subsequent tasks.

PROGRESS REPORT

The task is now complete, fragmentation and connectivity metrics (FAD, MSPA and networks) have been completed, the results will be discussed in the final report for the project.

TASK 2: Complete on-ground surveys of occupancy of focal threatened species and diversity and relative abundance of mycorrhizal fungi.

BACKGROUND

The public has raised concerns over the impacts of fragmentation from the NGP on persistence of 'at risk' species and on ecosystem functioning. The current task is examining whether the fragmentation and connectivity metrics (from task 1) are correlated with patterns of occupancy of focal threatened species and diversity of mycorrhizal fungi. Four species of threatened animals and five species of threatened plants have been chosen as the focal species for the occupancy surveys. These species are: pale-headed snake, squirrel glider, eastern pygmy-possum, black-striped wallaby, coolabah bertya (*Bertya opposens*), spiny peppercress (*Lepidium aschersonii*), winged peppercress (*Lepidium monoplacoides*), *Commersonia procumbens* and *Tylophora linearis*.

TASK OBJECTIVES

- 1) To carry-out on-ground surveys for each of four focal species of threatened vertebrate using appropriate sampling approaches at the appropriate time of year to enhance detection.
- 2) To carry-out on-ground surveys for each of five focal species of threatened plants at the time of year that maximises the presence of individuals above-ground.
- 3) To collect samples of plants and soil for subsequent laboratory analyses of diversity of mycorrhizal fungi.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

The main output will be a spreadsheet of site-specific presence/absence records of the focal threatened plants and animals and alpha diversity measures for fungi.

The results will be discussed in the final report for the project; there are no specific deliverables for this task.

PROGRESS REPORT

This task is complete.

- On-ground surveys to assess relative abundance of mycorrhizal fungi are complete.
- On-ground surveys of focal threatened species were completed along with the final field trip on 28 June 2024.

TASK 3: Assess structural attributes of habitat currently occupied by each of the focal threatened species.

BACKGROUND

Understanding what environmental factors make an area suitable for a species is essential information in order to effectively manage for the species' persistence. LiDAR is a technology that provides an unprecedented opportunity to cost-effectively quantify the structural attributes of an area. Methods have been developed that enable a 3D map of an area to be developed that can then be used to derive variables such as height, volume, foliage cover, and presence of tree hollows. This approach can be applied to understanding the environmental characteristics of the habitat of a species.

TASK OBJECTIVES

The objective of this task is to quantify the 3D structure of habitat occupied by each of the focal species. This will be achieved by using a survey grade UAV LiDAR system to map vegetation structure in high-resolution detail

TASK OUTPUTS AND SPECIFIC DELIVERABLES

The main output will be a database of LiDAR derived structural metrics that represent the habitat structure of each of the focal species.

Deliverables will include geolocated LiDAR point clouds for each study sites, and a short report detailing the analytical workflow and key findings.

PROGRESS REPORT

This task is now complete.

- Database of LiDAR derived structural metrics that represent habitat structure of presence and absence sites of selected focal species is complete.
- Short report focussing on analytical workflow is complete. This content will be included in the final report.

TASK 4: Predict potential impacts on habitat suitability of focal threatened species from fragmentation during the NGP.

BACKGROUND: Tasks 1 and 2 will provide understanding on the degree of fragmentation of the landscapes in which each focal threatened species persists in the Pilliga Forest. Together with the LiDAR-derived data on structural attributes of habitat, this will enable predictions to be made on the likely population-level response of each species to additional forest fragmentation resulting from the NGP. Any focal threatened species, the persistence of which in the region is threatened by this additional fragmentation, will be identified through this qualitative matching of habitat requirements with landscape metrics.

TASK OBJECTIVES: To predict the likely response of each focal threatened species to additional forest fragmentation resulting from the NGP.

TASK OUTPUTS AND SPECIFIC DELIVERABLES: The main output will be the identification of those focal threatened species whose persistence is potentially threatened by forest fragmentation caused by development of an onshore gas industry.

This information will be discussed in a short report. The results will be discussed in detail in the final report for the project

PROGRESS REPORT

This task is now complete.

- The final report discusses each of the focal species and its persistence in relation to forest fragmentation resulting from the Narrabri gas project. The discussion mainly looks at the species that were detected during the project.
- Persistence of these species is also discussed in relation to other threats (non-fragmentation) particularly inappropriate fire regimes. This focus resulted from the evidence of increasing effects of changed weather conditions illustrated by a large fire that burnt the majority of our sampling sites in December 2023.

TASK 5: Explore approaches to upscale monitoring to enable remote assessment of environmental variables during the life of the NGP.

BACKGROUND

LiDAR is a powerful tool for 3D habitat characterisation at plot to landscape scales. Repeat LiDAR provides unique insights into ecosystem dynamics, but the cost and complexity of acquisition hinder its scalability for long-term monitoring. Wall-to-wall mapping from spaceborne satellites is a more cost-effective avenue for habitat monitoring, but the sensitivity of different spaceborne sensors to habitat structural attributes needs verification. This Task will use LiDAR point clouds collected in Task 3 to calibrate and validate structural metrics derived from satellite SAR sensors.

TASK OBJECTIVES

The main objective of this task is to determine how well spaceborne SAR can capture the structural elements of the Pilliga scrub habitat that are important for the focal species.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

GIS layers of SAR derived structural features (GEOTIFF format) will form the primary outputs, together with a short report detailing the workflow and key findings.

PROGRESS REPORT

This task is now complete.

- A short report has been completed and it will be incorporated into the final report.
- Large datasets from the analysis have been saved in CSIRO's database systems.

TASK 6: Project Reporting

BACKGROUND

All aspects of reporting are covered in this task.

TASK OBJECTIVES

To report on the results of the research to relevant stakeholders including the public, GISERA and the Australian government.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

There are three task outputs and deliverables.

- 1) Preparation of a final report outlining the scope, methodology, scenarios, assumptions, findings, and any suggestions/options for future research.
- 2) Following CSIRO ePublish review, the report will be submitted to the GISERA Director for final approval.
- 3) Provide 6 monthly progress updates to GISERA office.

PROGRESS REPORT

This task is now complete.

The final report has been peer reviewed, professionally edited and provided to the GISERA Director for approval of final release (anticipated for late May 2025).

TASK 7: Communicate project objectives, progress and findings to stakeholders

BACKGROUND

Communications of GISERA research are an important component of outreach and dissemination of findings to diverse audiences.

TASK OBJECTIVES

Communicate project objectives, progress and findings to stakeholders through meetings, knowledge transfer session, factsheet and journal article, in collaboration with GISERA Communications officers.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

Communicate project objectives, progress, and results to GISERA stakeholders according to standard GISERA project procedures which may include, but not limited to:

- 1) Knowledge Transfer session with Government/Gas Industry
- 2) Presentation of research findings to regional community stakeholders such as business and/or community groups (e.g. Narrabri CCC) will be invited to a community forum (virtual or face-to-face) to learn of research results.
- 3) Preparation of article for GISERA newsletter and other media outlets as advised by GISERA's communication team
- 4) Two project factsheets: A factsheet, hosted on the GISERA website, will be developed at commencement of project, and another that will include peer-reviewed results and implications will be developed at completion of project.
- 5) Peer reviewed scientific manuscript ready for submission to relevant journal.

PROGRESS REPORT

This task is complete.




- 1) A Knowledge Transfer session with government (state and Federal) and representatives from the gas industry was conducted on 27 February 2025.
- 2) A project fact sheet was developed at commencement of the project and a second fact sheet (based on peer reviewed results) has been prepared with expected release in late-June 2025.
- 3) An article has been prepared for the upcoming GISERA newsletter.
- 4) A manuscript is being drafted and will be submitted to a journal later in the coming months.

Variations to Project Order

Changes to research Project Orders are approved by the GISERA Director, acting with authority, in accordance with the [GISERA Alliance Agreement](#). Any variations above the GISERA Director's delegation require the approval of the relevant GISERA Research Advisory Committee.

The table below details variations to research Project Order.

Register of changes to Research Project Order

DATE	ISSUE	ACTION	AUTHORISATION
15/08/2023	The remote sensing team have requested extra time to enable a site visit in August. they may rerun the analyses with some different settings after the site visit (dependent on woody cover thresholds in the study area).	Milestone 1 extended from June 2023 to August 2023.	
13/02/2024	Due to 80% of field sites burnt in the extensive wildfires of mid to late-December 2023. the study area is currently not open to the public due to ongoing hazards from trees falling post-fire. This has delayed all other milestones.	Milestone 2, 3, 6 and 7 extended by 6 months, milestone 4 extended by 5 months and milestone 5 extended by 4 months.	
19/10/2024	Issues with drone flights because of high winds and rain coinciding with planned fieldwork.	Milestones 4 and 5 extended by a further 2 months.	

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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.