Natural Hazards Research Australia

Call for Expressions of Interest

T8-A3 Remote sensing of grass condition

Expressions of Interest due **5pm AEDT, 4 April 2025**
to research@naturalhazards.com.au

Australian Government

Overview

Natural Hazards Research Australia (hereafter the Centre) is seeking Expressions of Interest (EOI) from project teams for the following project:

T8-A3: Remote sensing of grass condition

Project description	Grass fuel condition is an important metric for grass and crop fire behaviour potential. Key decision tools such as the Australian Fire Danger Rating System (AFDRS) and the Spark wildfire simulation toolkit rely on data-driven knowledge of grass fuel conditions over large areas of the Australian land mass. Grass condition is used for predicting the spread of active fire which directly informs community warning messages and incident management tactics. At present, grass fuel condition is classified as: i) natural/unharvested, ii) grazed/harvested, and iii) eaten out/harvested and baled. With three classes only, this classification provides a limitation to any future improvements to grass fire models. Also, grass fuel condition is commonly estimated and extrapolated from low quality data, there are no standardised and automated ways to detect and account for harvest or other changes to grass fuel condition in pasture and crops and there has been limited engagement between jurisdictions to address this problem. Inaccurate grass fuel conditions lead to misrepresentation of the fire behaviour index and hence fire danger ratings and the issue of appropriate warnings. This impacts the public, agricultural businesses, prescribed burning activities and other land management practices. This project aims to develop a national satellite-based methodology for detecting, attributing and validating changes in grass fuel condition (in near real-time) across a range of soil types in crop and pasture fuel types to increase the realism of fire danger ratings and warnings for fires in such grassy fuel types.
Estimated duration	Two years
Budget	The budget envelope for this project is $250,000 to 300,000 (ex GST) The research team should note that this is a competitive process. Expression of Interest submissions will be assessed on value for money and justification for any funds requested.
Related national research priorities[1]	→ Evidence-informed policy, strategy and foresight → Operational response and innovation → Situational awareness
Related Centre research priorities for 2024–26[2]	→ Understanding and mitigating risk → Next generation capability

1 Natural Hazards Research Australia (2022) National research priorities for disaster risk reduction and community resilience to the impacts of natural hazards, accessible at www.naturalhazards.com.au/sites/default/files/2022-05/NatHazResAus ResearchPriorities FA02.pdf

2 Natural Hazards Research Australia (2024) *Biennial Research Plan 2024–26*, accessible at https://www.naturalhazards.com.au/sites/default/files/2024-07/NHRA%20ResearchPlan24%E2%80%9326%2004.pdf

Supporting organisations	→ Australian Capital Territory Rural Fire Service → Australasian Fire and Emergency Services Authorities Council (AFAC) – Predictive Services Group → Australian Fire Danger Rating System Team → Bushfires NT → South Australian Country Fire Service → Department of Fire and Emergency Services (WA) → New South Wales Rural Fire Services → Rural Fire Service Queensland, Queensland Fire Department → Tasmania Fire Service → Victoria Country Fire Authority
Centre contact	For any questions regarding this Call for EOIs, please email research@naturalhazards.com.au.
Submission of EOI	EOIs must be prepared using the Centre's EOI submission form and Budget Template. EOIs are to be submitted to research@naturalhazards.com.au by **5:00pm AEDT on 4 April 2025**

Statement of requirements

Background and context

Grass fuel condition is not routinely or accurately defined across Australia, yet agencies rely on grass conditions within the Australian Fire Danger Rating System (AFDRS) and simulators such as Spark to prepare and warn communities. Decisions directly and indirectly influenced by grass condition include:

- daily fire danger ratings
- fire spread predictions
- public warning messages
- agency preparedness levels
- aircraft location and preparedness
- total fire bans
- burning permits
- harvest bans
- hospital/education facility closures
- resource allocation

The public visibility and critical importance of these decisions (listed above) leads to the urgent need for an improved national methodology for detecting, attributing and validating changes in grass fuel condition, particularly across Australia's southern agricultural districts. The likelihood of damaging fires in grass and cropping landscapes is highly dependent on the vertical structure of grasslands. Unharvested crops can be considered a vulnerable asset and a highly continuous fuel source. Often the highest fire risk is ignition during harvest, while post-harvest, the risk of fire is greatly reduced. Further, annual pasture grasses can change conditions throughout the season, affecting the risk of fire and current methods do not quantify these changes.

The current AFDRS method is based on the interpolation of visual point observations and the operational methods used to map grass fuel condition and grass fuel load vary between jurisdictions which ultimately manifests as a lack of standardisation in AFDRS ratings and of warnings delivered. As an example, current operational methods of sourcing input grass condition data vary by location and include:

- Local Government Area (LGA)-based fixed values representing grass condition post-harvest or statewide
- Interpolation of visual point observations of grass condition and fuel load
- Default static values (4.5 t/ha for fuel load and a description of 'grazed' for condition) unless alternative data are available. Here, alternative data sources include commercial remotely sensed data, AFDRS point observations, reports and information from agencies such as the Western Australian Department of Primary Industries and Regional Development (DPIRD), Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), The Bureau of Meteorology (BOM), the Australasian Fire and Emergency Services Council (AFAC) and opportunistic regional engagement with farmers.

Noting the current variations in methods as described above, it is the preference of fire agencies to employ a national satellite/field-derived model for grass fuel conditions to standardise AFDRS-derived fire danger ratings and any warning messages. Additionally, while the current grass fire models use three classes of grass fuel conditions, future fire behaviour research will benefit from a continuous 'grass fuel condition index'. Therefore, the preferred approach is to obtain a remote-sensing derived grass fuel condition index with identified thresholds for the three classes in current operational use. Different soils are known to affect satellite indices, so the solution should ensure that the output is valid across a range of background soil colours and types.

Project description

Grass fuel condition is an important metric for grass and crop fire behaviour potential. Key decision tools such as the Australian Fire Danger Rating System (AFDRS) and the Spark wildfire simulation toolkit rely on data-driven knowledge of grass fuel conditions over large areas of the Australian land mass. At present, grass fuel condition is commonly estimated and extrapolated from low-quality data, there are no standardised and automated ways to detect and account for harvest or other changes to grass fuel condition in pasture and crops and there has been limited engagement between jurisdictions to address this problem. Inaccurate grass fuel conditions lead to misrepresentation of the fire behaviour index and hence fire danger ratings and the issue of appropriate warnings. This impacts the public, agricultural businesses, prescribed burning activities and other land management practices. In addition, grass condition is used for predicting the spread of active fire which directly informs community warning messages and incident management tactics.

This project aims to develop a fit for purpose national satellite-based methodology for detecting, attributing and validating changes in grass fuel condition across a range of soil types (in near real-time) in crop and pasture fuel types to increase the realism of fire danger ratings and warnings for fires in such grassy fuel types.

Expected outputs

Core outputs

A satellite-derived model, written in Python, that produces:

- Nation-wide satellite-derived layers (GeoTIFF format) of 'grass fuel condition index' at coarse (1.5km) and fine (20m-30m) resolution.
  - This model should be trained and tested (using a cross-validation technique) in both broadacre agricultural crops and southern pasture grasslands and attribute change due to harvesting, land management practices (e.g. livestock grazing, burning, cultivation) and natural variation.
  - This model should be trained and tested using a range of satellite-derived indices and products with validation against field-based datasets (e.g. grass field samples, AFDRS grass observations, harvest date data collected from combine harvesters and grass fire reconstructions).
  - The model should work on multiple soil background colours (e.g. red, brown, grey, white) and types (e.g. clay, sand, loams).
  - This model should also be evaluated for grass fuel load in crop, pasture fuel types, native grass and savanna fuel types.
  - This model should include identified thresholds to match the three classes: i) natural/unharvested, ii) grazed/harvested, iii) eaten out/harvested & baled). This allows for immediate adoption into AFDRS and Spark.
- Nation-wide satellite observation age layers (GeoTIFF format) at coarse and fine resolution.
  - The age layer of each spatial resolution should identify the age, for each pixel, of the satellite grass fuel condition index observations. As the grass fuel condition index layer will likely be a mosaic of satellite images varying in age, having a spatially explicit age layer will be critical for decision makers.
- A sample package of output layers sent to each jurisdiction (for model evaluation)A final/technical report documenting:
  - The methods used
  - The accuracy of all tested models (nationwide and per jurisdiction)
  - How the model is fit for purpose for proposed system use, in each jurisdiction and across geographical areas and soil types.
  - The accuracy of the best performing model (nationwide and per jurisdiction) for:
    a. grass fuel condition in crop and pasture fuel types
    b. grass fuel load in crop, pasture fuel types, native grass and savanna fuel types
    c. across different soil types (if required)
  - In addition to the outputs described above, a Python code enabling the data products to be routinely produced as a rolling weekly product, with a maximum time lag of two days, and integrated into AFDRS, Spark and the systems of other agencies should be provided.

Additional outputs

- Project plan and plain language statement
- Quarterly progress reports
- Project evaluation report
- Relevant communications outputs including but not limited to a presentation and a poster

Collaborative approach

Researchers are expected to undertake the research using a collaborative approach to assist in the translation and transfer of knowledge to end-users and to ensure the project meets their needs. Researchers are encouraged to outline their approach to ensuring effective collaboration which could include embedding researchers within end-user organisations for a period to time.

Anticipated outcomes

It is envisaged that this work will improve the grass fuel condition and grass fuel load inputs into fire danger calculations across Australia leading to improvements to the realism of the fire danger ratings and warning messages released by agencies for fire danger in grassy fuel types.

Key outcomes include an improved understanding of the effect of grass fuel conditions on fire danger ratings and the sensitivity of systems like AFDRS and Spark to incorrect grassy fuel data.

Ultimately, the outcomes from this work will assist agencies in knowing how conservative to make their fire danger ratings and warning messages for fires in grassy fuel types.

Quality control and reporting

The project will be overseen and supported by a Project Management Committee (PMC) comprising the Principal Researcher, a Centre representative, and at least one stakeholder representative. Composition of the PMC will be determined in consultation with the Principal Researcher.

Reports

The Centre expects that the outputs delivered by this project will meet the highest scientific standards and will be suitable for publication on the Centre website and in industry newsletters, as well as in high-quality scientific journals.

The successful research organisation/s must co-develop with end-users a project plan and project summary using the Centre's templates. The project summary should explain in plain language what the project is about, what questions it intends to answer and describe the expected practical outputs that will make use of the research findings. The project plan must be approved by the PMC and will become an attachment to the contract.

Reports (and any supporting material) must be submitted to the PMC's satisfaction and will be subject to review by PMC members. The project team will be required to ensure an internal peer review process is undertaken prior to the final report being submitted.

Milestone reporting

The project team must report all milestone deliverables and engagement activities into the Centre's Project Management System. This will include sufficient justification for the completion of milestones to the satisfaction of the PMC and the Centre.

Communication

To further assist with quality assurance, it is expected that:

- regular PMC meetings will be held
- the project team will use a consultative approach, documented in quarterly reports
- the Principal Researcher will give periodic presentations to key stakeholder groups to gain critical feedback on project milestones.

Additional quality control processes may be agreed as part of the project planning process.

Contractual arrangements

A copy of the 'Research Services Agreement', the proposed form of contract for the purposes of this project, can be found here.

The Centre reserves its rights to make amendments to the form of contract.

This agreement should be reviewed by applicants as part of the EOI submission.

If you would like to request amendments to any of the terms and conditions set out in the proposed form of contract, details of the proposed changes and the reason the changes are requested must be included in the EOI submission form. Requests for any changes will be at the sole discretion of the Centre.

Selection as a shortlisted or preferred provider does not give rise to a contract (express or implied) between the shortlisted or preferred provider and the Centre for the supply of goods or services. No legal relationship will exist between the Centre and the shortlisted or preferred provider until such time as a binding contract in writing is executed by both parties.

In the case of consortiums, the Centre requests that one consortium member be nominated as Lead Research Provider and take responsibility for subcontracting other parties.

Natural Hazards Research Australia

Submitting an Expression of Interest

Application and review process

Project selection and approval will be a two-stage process. The first stage is evaluation of the EOIs that are received. The second stage is development of a project proposal, where a preferred provider will be selected and offered an opportunity to co-develop a detailed project proposal with input from key stakeholders.

Key dates

6 March 2025	Call for EOIs opens
4 April 2025	Due date for EOIs

Submission requirements for this EOI

Project teams responding to this EOI are required to submit their response using the Centre's EOI submission form and Budget Template. Submissions must include:

- a statement of capability (max 600 words), including the proposed contributions of each research team member to the project
- a statement (max 400 words) about the diversity of the project team
- a statement (max 400 words) about the project's inclusion and respect of First Nations peoples, philosophies, cultures, rights and/or knowledges
- an outline (max 1000 words) describing how the project team intends to approach the project, strategies for effective collaboration and an indicative methodology
- an indicative schedule of work and interim milestones/project outputs as described in this document
- a proposed project budget in line with the budget envelope provided, including details of any in kind contribution from research organisation/s – a detailed budget to be provided using the downloadable Budget Template provided on the Centre's website
- a clear statement (max 400 words) describing the outcomes that will be delivered for this project and how they will be used by stakeholders
- a clear statement (max 400 words) describing the outputs that the proposed approach to this project will deliver and how the findings could translate into practice
- a statement (max 500 words) demonstrating the project team's relevant industry and stakeholder engagement
- a risk management statement (max 500 words)
- any requested changes to the Centre's proposed form of contract
- up to two-page CVs for each proposed project team member.

Additional information

In responding to this Call for Expressions of Interest, advice should be provided on any known or anticipated impacts of COVID or other pandemic restrictions or human resource risks on the timely delivery of the project. Where appropriate, risk management for the impacts of pandemic restrictions should be incorporated into the EOI.

Frequently asked questions

Additional information provided to individual respondents will also be published on the Centre's website to ensure access to all interested parties. Respondents are encouraged to check the website for any additional information via these published FAQs, prior to the closing date.

Online project briefing

There will not be an online project briefing for this project.

Evaluation criteria

After the closing date, the Centre will review submitted EOIs against the evaluation criteria below. The evaluation criteria provide an indication of those matters that should be included in the EOI and supporting material – details are provided in the table below.

The Centre reserves the right not to offer the work, or only allocate a proportion of the available funding, if a proposal does not meet the Centre's needs. The Centre reserves the right to invite any other specific researchers as it sees fit to submit proposals before or after the closing date.

Evaluation criteria	% weighting
Research capability: the capacity and capability to deliver an excellent research project in an Australian environment	20
Project approach: a demonstrated understanding of the project requirements and a proposed project approach and methodology that is appropriate, feasible and robust Relevant outline of a collaborative approach to assist in the translation and transfer of knowledge to end-users and to ensure the project meets their needs.	20
Project outcomes and outputs: demonstrate a high-level understanding of the intentions of the project and how outputs/outcomes translate to practice	25
Industry engagement: strong track record of industry engagement with the ability to support and influence Australian disaster management at a national or state/territory level through interaction with key stakeholders	15
Value for money: delivery of required outcome within available budget along with the ability to leverage the funds provided with in-kind contributions or supplementary opportunities	20