

Land Management Tools:

Cool burning for productive, resilient Country

A practical landholder guide to low intensity fire, soil health, ground cover and resilient landscapes.

Common Questions About Cool Burning

Low intensity fire, in different forms, have been deployed as a land management tool for tens of thousands of years, and it is still used today in cultural burning, savanna fire management and prescribed burning.

We can now support anecdotal benefits with an emerging body of research measuring beneficial results across soils, plants and animals.

Using the terms carefully

This factsheet uses cool burning to describe fire behaviour: low flames, slow spread, a patchy burn, lower soil heating, and usually conducted in mild weather conditions. Cultural burning is a First Nations led practice that may use cool fire, but it also encompasses cultural authority, reading Country, purpose, timing, responsibility and knowledge of place. Much of the published evidence referenced throughout this document is derived from related but distinct fields: studies of cultural burning, savanna fire management, low intensity or low severity fire, prescribed fire comparisons, and wildfire severity research. Where research comes from one of those fields, it is acknowledged in this factsheet and the contextual discussion points.

What is cool burning and how it differs from cultural burning

Cool burning describes the behaviour of a fire: low flame height, slow rate of spread, low residence time, and a patchwork of burnt and unburnt ground. It is typically deployed as a land management tool in cooler months, when appropriate soil moisture is available.

Cultural burning is a First Nations practice that may use cool fire, but is defined by who leads it, why it is lit, when it is applied, and the cultural responsibilities involved. Cultural burning is guided by Country, Traditional Owners and seasonal and ecological signs such as flowering, animal movement, fuel condition, weather and cultural calendars.



Low flame heights and a slow, patchy front.



Mosaic of burnt and unburnt ground after a cool burn.



Native grass shoots emerging after a low-severity burn.

Contextualising Cool Burning and Cultural Burning:

Cool burning describes how a fire behaves. Cultural burning is a First Nations led practice that may use cool fire, but also carries cultural authority, purpose, timing and responsibility to Country. They are related, but they are not the same. Hazard reduction burning, prescribed burning and savanna fire management are other related, but distinct, practices.

We acknowledge, respect and learn from the First Peoples of the 28 Nations in the Southern Queensland Landscapes area and further afield. We pay our respects to the Elders, past, present and future, for they hold the memories, traditions, culture, science & knowledge and hopes of Aboriginal and Torres Strait Island Peoples across our nation.

What the science is telling us about soil health

If you have spent time on country after a slow, low intensity burn, you may have noticed the soil staying soft, litter still in place, and roots looking healthy. Research on cultural burning is starting to put numbers on what that feels like underfoot.

A 2024 University of Wollongong study compared cultural burning, agency prescribed burning and

unburnt areas on Murramarang Country on the NSW South Coast. Both fire treatments increased soil moisture, increased organic matter and minimised tightly packed soil. Cultural burning produced the strongest gains in soil carbon and nitrogen, and the greatest loosening of the soil. The researchers describe the cultural burns considered by the study

as small, slow and cool, guided by local environmental signs. That kind of fire behaviour appears to protect the surface layer that soil life and plant roots depend on. The findings come from cultural burning specifically, so must be taken within that context, but the findings help explain why low intensity fire can be gentler on soils compared to hotter, uncontrolled fires.

What was measured	What the study found	Impact and implication on farm
 Soil moisture	Higher after both cultural and prescribed burns, compared to unburnt areas (Murramarang study).	Moisture supports germination, grass recovery, and pasture response after rain.
 Soil organic matter	Increased after both cultural burning and agency prescribed burns (Murramarang study).	Organic matter feeds soil biology and underpins fertility and structure.
 Soil carbon and nitrogen	Strongest gains under cultural burning (Murramarang study).	These nutrients support plant vigour, ground cover, and long-term resilience.
 Tightly packed soils	Loosened after both burn types, with the largest change under cultural burning.	Looser soil means better infiltration, easier root movement, and less compaction.



Why hot wildfire is a different story

Wildfire severity research helps explain why keeping fire cool matters. Studies of high intensity wildfire show large, long-lasting losses of soil microbial life and surface carbon. One 2024 study reported microbial biomass losses averaging around 44 percent under low severity wildfire and more than 60 percent under high severity wildfire, with poor recovery in the worst burnt areas. Older boreal soil work in interior Alaska found burnt sites carrying around 1,000 to 1,400 grams per square metre less carbon a year after wildfire. These are wildfire studies, not cool burning trials, and the ecosystems are not Australian rangeland. They are useful as a contrast: they show what fire can do when it is hot, dry and uncontrolled.

Productivity pathway: from fire to ground cover

More productive soils are rarely achieved through the utilisation of one land management tool alone. A combined approach will ultimately yield the greatest result.



Skipping any step weakens the outcome.

Land Management Tool	What happens	Management note
 Cool, patchy fire	Low-intensity fire reduces some surface fuel while leaving unburnt patches, litter and refuges.	Aim for a mosaic fire pattern indicative of a cool, low intensity burn
 Soil surface protected	Roots, organic matter and soil structure are more likely to remain functional under cool fire.	Avoid burning when fuels and soils are dangerously dry.
 Response after rain	Where seedbanks and good soil moisture are present, native grass and palatable species can re-establish.	Time the burn so rain is likely to follow within the season.
 Productivity outcome	Ground cover and forage may improve, with reduced bare ground and lower wildfire fuel.	Rest grazing until plants have recovered crown and root reserves.

Weeds and woody thickening

Fire can be a useful tool against woody thickening and some weed species, but it is never a stand-alone solution. The Clean Energy Regulator notes that controlled burns can stimulate grass regrowth and inhibit woody weeds in savanna

country. Research from south eastern Australia, ANU-reported work in Science documents that long-term cultural burning in south-eastern Australia was associated with around a 50% reduction in shrub cover and a lower incidence of high-intensity fires,

partly by limiting the ladder fuels that carry fire into tree canopies. Those results come from cultural burning and savanna management settings, so they apply most directly there, but they point to what cool, well timed fire can do to woody fuels.

What it can help with	What can go wrong	What to plan for
Reducing fine fuels and young woody plants.	Hotter follow up fires or bare ground if too much cover is removed.	Burn under cool, safe conditions and keep unburnt patches and shade.
Encouraging a fresh grass response.	Stock overgrazing new growth before plants rebuild root reserves.	Rest the paddock or manage grazing pressure for weeks to months.
Exposing weed seedlings so you can see them.	Some weeds germinate strongly after disturbance.	Walk the burn 4 to 8 weeks after rain, treat early and follow up.
Slowing woody thickening over time.	A single burn rarely shifts species composition.	Plan a multi-year program with monitoring and adjust the timing.

Biodiversity and habitat

A 2021 review by Hoffman and colleagues screened 861 articles and synthesised 53 studies of Indigenous fire stewardship worldwide. Of those that reported a biodiversity outcome, **79% recorded biodiversity increases** under Indigenous fire stewardship. **63% reported increased habitat heterogeneity**, and **85% reported low-severity fire**. All applicable studies described fire stewardship occurring outside the window of uncontrollable fire activity.

Concept	Description
Pyrodiversity	Variation in fire season, timing, patchiness, intensity and frequency which creates a range of habitat conditions across a landscape. [5]
Habitat heterogeneity	A mix of burnt, lightly burnt and unburnt areas provide shelter, food sources and recovery stages for many species at once. [5]
Low-severity fire	Fire that stays close to the ground and is less likely to remove the canopy, hollow logs and soil cover that animals depend on. [3,5]
Caveat	Not every ecosystem benefits from fire. Fire-sensitive systems, wrong timing or high-severity fire can reduce biodiversity. Site assessment matters.



Smoke staying low, which is typical of cool, slow-moving fire.



Ground cover recovering weeks after a cool burn.



Cultural burning is learned and taught on Country, with permission.

Bushfire risk and fuel reduction

Cool burning is a land management tool that can be deployed to mitigate the effects of wildfire. Utilised correctly cool burning can reduce the amount and continuity of fine fuels and young woody growth that carry a fast-moving fire.

Research from south eastern Australia, reported by ANU, has linked long term cultural burning with around a 50% reduction in shrub cover and fewer high intensity fires. Lower shrub layers mean fewer ladder fuels carrying fire up into tree canopies, houses and

sheds. When fire arrives hot, dry and uncontrolled, the damage to soils, vegetation and structures is significant. Cool burning aims to manage fuel loads to mitigate wildfire risks.

What the evidence shows (and related study)	Impact on country
Cultural burning research (south eastern Australia): linked with around a 50 % reduction in shrub cover and fewer high intensity fires.	Managing ladder fuels reduces the chance of fire climbing into tree canopies, houses and sheds.
Wildfire severity research: hot, uncontrolled fire is associated with large losses of soil microbial life and surface carbon, with poor recovery.	Reducing the chance of a severe wildfire protects soil, ground cover and property at the same time.
Low intensity fire principles: cooler, slower, patchier fire leaves unburnt refuges and protects the soil surface.	A well planned cool burn can lower fuel loads without stripping the country bare.



Cool burning on farm and in practice

Cool burning is one tool, that can be deployed alongside a suit of land management tools to assist in ground cover recovery, regeneration and increased productivity on country.

Deployed effectively and strategically, it can help support soil health, ground cover, biodiversity and assist in bushfire mitigation. Used incorrectly, during undesirable seasonal conditions or without follow up ground management, it alone will prove ineffective. The final result will depend on the situation, the soil, the fuel, the weather, the grazing plan and the people involved.

Research on cultural burning, low intensity fire and wildfire severity is helping explain why low and slow cool burning tends to be gentler on soils and habitat than hot, dry fire. That research aligns with practices that First Nations Peoples have refined over generations, but it does not replace cultural intellectual property of the practice and its placement, they function side by side.

Cool burning is one tool, not your only tool

Placed correctly cool burning can support soil health, ground cover, biodiversity and assist in bushfire mitigation. Contemporary research supports these benefits and aligns with practices that First Nations Peoples have maintained for generations.

Every fire plan needs to fit the site, the season and the rules within your region. Check RFS fire permits, fire restrictions and notification requirements with your local fire authority. Where you can, work with Traditional Owners and cultural fire practitioners as partners. Plan pasture rest periods and subsequent weed management as part of the burn.

References

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