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2025 situational analysis of pasture dieback in eastern Australia

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Key words: Pasture dieback; Eastern Australia; Tropical grasses

Abstract

Pasture dieback affects millions of hectares of highly productive grazing land in eastern Australia, specifically north, central and south-eastern Queensland, and north-eastern New South Wales. The impact to grazing industries, including beef, dairy and sheep, is significant. Improved (or sown) tropical and sub-tropical grass species are predominately affected; very few native grasses are impacted. Affected plants initially exhibit leaf discolouration, which culminates in a mosaic of patches of dead grass across a pasture. Temperate grasses and broadleaf plants including annual and perennial legumes are not affected.

Dieback has occurred previously in tropical pastures across Queensland. A large dieback event happened in central Queensland during the 1990s and a much smaller and shorter event occurred in the mid-1920s in south-eastern Queensland. The leading cause of the current situation is the pasture mealybug bug (*Heliococcus summervillei*), whereas the cause of the 1990s event remains unknown despite research at that time. This indicates potential for a disease complex. Dieback has also been recently reported in tropical pastures across multiple south American countries where varied causes have been purported.

The Department of Primary Industries (DPI) initiated research activities into this condition in 2015 which included: characterising symptom progression, factors affecting disease occurrence, diagnostic pathology, and management options for affected areas. This research has been complimented by similar activities undertaken by other organisations. Research activities were accompanied by an industry engagement program including peer-to-peer learning activities such as group workshops and field days; and published resources including online and print factsheets, articles, videos, podcasts and social media posts. All are available in an online hub (www.futurebeef.com.au/resources/pasture-dieback/).

Background to Pasture Dieback

Pasture dieback is a condition killing productive tropical and sub-tropical pasture grasses in grazed and non-grazed situations. Improved (or sown) grass species are affected, whereas very few native grasses are impacted and temperate grasses and broadleaf plants including legumes are unaffected (Buck 2017; DPI 2024). Currently, pasture dieback is affecting millions of hectares of pastures (AgForce 2021; DPI 2024) resulting in significant productivity impacts to beef, dairy and sheep industries. The concern for pastoralists and agricultural industries is pasture dieback affects the most productive pastures in moderate-high rainfall locations that support most of the beef and dairy cattle herd in Queensland.

Dieback has occurred previously in tropical pastures across Queensland. A large dieback event happened in central Queensland during the 1990s where buffel grass (*Cenchrus ciliaris* cvv. American and Gayndah) was predominantly affected (Graham and Conway 1998; Makiela and Harrower 2008). A much smaller, and shorter duration, event occurred in mid-1920s in south-eastern Queensland where paspalum grass (*Paspalum dilatatum*) was affected (Summerville 1928).

Pasture dieback is reported in other countries. A similar pasture condition was reported in multiple tropical and sub-tropical grasses in New Caledonia during 1998 (Brinon et al. 2004). In south American countries including Brazil, Argentina and Paraguay, pasture dieback has been affecting tropical grass species, namely Panic grasses (*Megathyrus* spp.) (Ribeiro-Junior et al. 2017; A. Radrizzani, pers. comm. 2018). Pathogenic soil fungi are implied in Brazil due to stress from waterlogging (Dias-Filho, 2006), whereas in Argentina or Paraguay there is uncertainty of the cause of dieback (A. Radrizzani pers. comm. 2018).

Where does pasture dieback occur in Australia?

Pasture dieback is currently affecting perennial sown grass pastures in eastern parts of southern, central and northern Queensland, and north-eastern New South Wales (Figure 1). Rainfall in these locations is summer dominated with average annual totals around or above 500mm. The total area affected by pasture dieback is difficult to estimate due to dieback spreading over time and the episodic nature of the condition.

The current outbreak of pasture dieback was first reported during 2014-15 in buffel grass (*Cenchrus ciliaris*) dominated pastures in the Dawson valley area of central Queensland, and in creeping bluegrass (*Bothriochloa insculpta*) dominated pastures in the north-western Burnett region (Buck 2017). Dieback was reported some years later in southern and northern Queensland. Pasture dieback was first reported in north-eastern New South Wales in 2020 and has continued to spread south and south-west (N. Jennings pers. comm.).

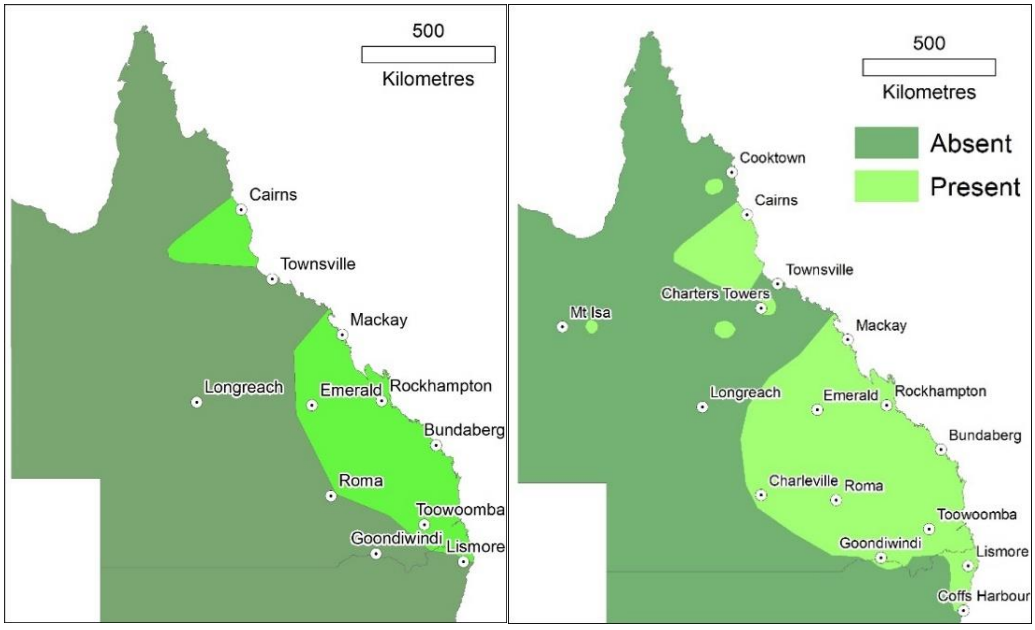

Fig. 1. Pasture dieback location (light green coloured areas). Left: observed 2021. Right: observed 2024.

What does pasture dieback look like?

Plants affected by pasture dieback typically occur in patches but larger areas or whole paddocks can be impacted. Pasture dieback can be challenging to identify. Diagnosis is easiest during the summer growing season where sick or dead patches are obvious amongst green healthy grass. However, similarities occur between dieback and other

plant disorders, for example water or nutrient stress, and so environmental conditions, landscape, soil and pasture management factors need to be considered prior to a positive diagnosis.

Affected plants progress through four stages. 1. Initial leaf discolouration. Depending on the species, leaves can turn yellow/orange, or a combination of red and yellow, or red/purple. 2. Whole plant discolouration, unthrifty growth and sick appearance. 3. Dead patches of grass plants that are characterised by a grey appearance and are easily uprooted. 4. Broadleaf plants colonising and growing in patches/whole paddocks of dead grass.

Fig. 2. Pasture dieback symptom progression. Photos left to right: Stages 1, 2, 3, 4.

What causes pasture dieback?

Over the last ten years, research has been undertaken by multiple organisations to determine the cause of pasture dieback. On-farm characterisation of affected paddocks and properties across Queensland was conducted by DPI between 2015 and 2020. Paddock observations and management, climatic conditions prior to noticing dieback, and other factors were investigated. While results demonstrated pasture dieback was more common in moderate-high yielding pastures, no factors consistently indicated a potential cause (Brazier and Buck 2021).

Research conducted since this time by DPI, Queensland University of Technology and University of Queensland, with financial support of the Australian government through Meat and Livestock Australia (MLA) Donor Company, demonstrate the cause of the current outbreak of dieback as the pasture mealybug (*Heliococcus summervillei)* (Buck et al. 2022; Hauxwell 2022). The pasture mealybug is a sap sucking insect that typically feeds on growing plants between spring and autumn. They over-winter below the ground or around the crown of the plant, under stubble/trash or manure pats and logs. Warmer than average winter night-time temperature and rainfall are potential pre-curser conditions for pasture mealybug populations the following summer (McKenna et al. 2024). Multiple other abiotic (e.g., soil nutrient and chemistry) and biotic (e.g., insects including ground pearl, and nematodes, fungi, viruses, bacteria) factors were also investigated including the potential of secondary infections killing the plant once the pasture mealybug compromises the plants natural defence mechanisms. While results indicate there are some interactions with these organisms, laboratory, glasshouse and field trials demonstrate the pasture mealybug as the main cause.

What can be done about pasture dieback?

There are three options to consider when dealing with pasture dieback, the first is whether dieback can be prevented. Currently there are no known methods to reliably prevent pasture dieback if the pasture contains susceptible grass(es) under conductive conditions with the pasture mealybug present in the local district. Conceivably, graziers could remove susceptible grasses and re-seed with more tolerant types prior to the potential infection. However, this is highly unlikely due to the cost, effort, and unwillingness to remove a healthy and productive pasture on the *potential* of infection. Due to dieback being more prevalent and severe in pastures with moderate-high biomass, another concept is to heavily graze the pasture prior to or when dieback is initially seen. Experience in commercially-grazed paddocks demonstrate this is an unreliable method. Also, there is high risk of significantly reducing pasture biomass which is needed to support stock during the subsequent dry season if sufficient follow-up rainfall does not occur. Appropriate use of biosecurity techniques such as controlling property access, careful movement of people and stock, and diligent farm hygiene (e.g., come clean, go clean) could reduce

the potential of initial infection and subsequent spread on-farm. However, graziers commonly report dieback initially occurring in pastures where stock or humans have not accessed for some time (months) indicating pasture dieback can spread through wind or other environmental factors. Ultimately, implementing biosecurity measures may only delay an inevitable occurrence.

The second option is to eradicate the pasture mealybug once the pasture is affected. Fire has been used in research trials and commercial situations with mixed results. Most graziers report dieback returns, suggesting a positive outcome is temporary at best. To eradicate the pasture mealybug with insecticides the land manager needs to first determine presence in a pasture. Plant damage and death is only caused by juveniles therefore control needs to occur before or at this lifecycle stage. However, finding juveniles without a hand-lens or magnifying glass is problematic due to their minute size. Further, gaining a thorough understanding of location across tens, or hundreds of hectares in some cases, is impractical. Other constraints occur regarding insecticide application: lack of registered products for tropical pastures in Queensland and New South Wales; cost of these, grazing withholding periods, and the impracticalities of application across extensive pastureland; inability to effectively kill all mealybugs with one spray; negative impacts on beneficial insects such as lady-beetles, lacewings and wasps. Due to these reasons the current recommendation is not to use fire or insecticides to eradicate the pasture mealybug.

The third option is to manage pasture dieback. Perennial pasture systems persist through regeneration of new plants from the soil-seedbank. Under dieback conditions, specific practices can assist this process: spraying broadleaf weeds if present in high numbers; regularly assessing pasture growth to match grazing periods to allow seedling survival. Managing for recovery is commonly how graziers are dealing with pasture dieback due to the low direct costs, and the cost, effort and outcome uncertainty of other options. However, risks include not knowing when the pasture will fully recover (may take longer than 12 months), and the potential for noxious weed incursions. For example, African love grass, Giant rats tail grass, or broadleaf weeds such as parthenium have colonised some areas affected by pasture dieback. Another method is through improving the pasture. Effective practices include renovating the paddock through cultivation, and or applying fertiliser. Planting an annual grain or forage crop to provide a disease break and produce short-term feed to transition from the old pasture into the new, is another. However, the most effective long-term option is to re-seed a new pasture with tolerant grasses and resistant perennial legumes and fertilise if required. While this mainly suits arable landscapes and graziers need to source the required machinery, productivity gains are substantial and the likelihood of pasture dieback fully impacting the new pasture into the future is low. Therefore, this option is currently recommended where feasible.

To summarise, Table 1 outlines current knowledge on options and responses to pasture dieback.

Table 1. Options for pasture dieback, likelihood of success, and management practices.

Option	Likelihood of success	Management practice(s)
Prevent	Unlikely	Biosecurity measures slow the spread at best
Eradicate	Unlikely	No insecticide registrations; variable outcomes from fire
Manage	Highly likely	Manage for recovery; or sow new pasture with tolerant grasses and resistant legumes suitable to situation, fertilise

Where to find more information?

Research activities undertaken by DPI are accompanied by industry engagement including peer-to-peer learning activities such as group workshops and field days, and published resources including on-line and print factsheets, articles, videos, podcasts and social media posts. All are available in an on-line hub at www.futurebeef.com.au/resources/pasture-dieback/. MLA also have on-line resources at www.mla.com.au.

Acknowledgements

Information presented in this paper was generated from research funded by the Queensland Government, and Australian Government through the Meat and Livestock Australia Donor Company.

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