AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

Enterprise manual

Northern Australia beef cattle industry

Version 5.0

AUSVETPLAN is a series of response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency management plans.

National Biosecurity Committee

A note on language

Terms including ‘Aboriginal and Torres Strait Islander people’, ‘Aboriginal’, ‘Torres Strait Islander’, ‘Indigenous’ and ‘First Nations’ may be used throughout this document. Using these terms, we seek to acknowledge and honour diversity, shared knowledge, and experiences, as well as the right of individuals and communities to define their own identities.

We recognise the continuing connection of Australia’s First Nations peoples to Country. We acknowledge the Traditional Custodians and their connections to land, sea and community. We pay our respect to Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples**.**

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Contents

1 Introduction 8
1.1 This manual 8
1.1.1 Purpose 8
1.1.2 Scope 8
1.2 Other documentation 9
1.3 Training resources 9
1.3.1 EAD preparedness and response arrangements in Australia 9
1.3.2 Industry specific training 9

2 The northern Australia beef cattle industry 11
2.1 Introduction 11
2.2 Description 12
2.2.1 Climate 13
2.3 Industry operations 16
2.3.1 Structure 16
2.3.2 Beef cattle production regions and enterprise types 16
2.3.3 Enterprise types 20
2.3.4 Markets 21
2.3.5 Production cycle 23
2.3.6 Herd management 25
2.3.7 Land management 29
2.3.8 Infrastructure 31
2.4 Industry organisations and Indigenous participation 36
2.4.1 Cattle Australia 36
2.4.2 Northern Territory Cattlemen's Association 36
2.4.3 AgForce 36
2.4.4 Kimberley Pilbara Cattlemen's Association 36
2.4.5 Indigenous participation in the northern beef cattle industry 37
2.5 Industry regulation, standards and programs 40
2.5.1 Integrity systems 40
2.6 Legislation relevant to the industry 43
2.6.1 Biosecurity legislation 43
2.6.2 Animal welfare legislation 43
2.6.3 Land tenure, native title and heritage legislation 43
2.6.4 Stock reserves and stock route legislation 44
2.7 Animal welfare 45
2.8 Other industry-specific information 46
2.8.1 Land tenure 46
2.8.2 Stock routes 50

3 Emergency animal diseases and the northern beef cattle industry 51
3.1 The risk of an emergency animal disease entering northern Australia 52
3.2 Risk of disease spread from the enterprise 53
3.2.1 Factors to consider in assessing risk of disease spread 54
3.3 Significant issues for the industry in the event of an EAD incident 56
3.3.1 Commercial implications 57
3.3.2 Nature of incurred losses 58

3.3.3 Possible longer-term implications 59
3.4 Diseases of concern for the industry 60
3.5 Work health and safety 60

4 Emergency animal disease management 61

5 Industry preparedness 62
5.1 National-level industry preparedness and response planning 62
5.2 Northern Australia-level industry preparedness and response planning 62
5.2.1 Crisis coordination across the northern Australia beef cattle industry 62
5.2.2 Enhanced surveillance for EADs across northern Australia 63
5.3 Enterprise-level industry preparedness and response planning 65
5.4 Biosecurity measures and the industry 65
5.4.1 General biosecurity 66
5.4.2 Record keeping 67
5.4.3 Tracing 68
5.4.4 Surveillance 68
5.4.5 Vaccine and treatments 70
5.4.6 Feed 70
5.4.7 Equipment 71
5.4.8 Work procedures, staff hygiene and biosecurity 71
5.4.9 Movements 72
5.4.10 Decontamination 74
5.4.11 Disposal 75
5.4.12 Wild and feral animal control 75
5.5 Valuation and compensation 79
5.6 Media and public relations 79
5.7 Recovery 79
5.8 Industry preparedness for an infected premises 81
5.8.1 Overview 81
5.8.2 Biosecurity 82
5.9 Operation of an enterprise classified as an infected or dangerous contact premises 84
5.9.1 Movements 84
5.9.2 Tracing 84
5.9.3 Destruction of animals 85
5.9.4 Disposal 86
5.9.5 Decontamination 86
5.9.6 Media and public information 86

Appendix 1 – EADRA-listed cattle diseases 88

Glossary 90
Terms and definitions 90
Standard AUSVETPLAN terms 90
Manual-specific terms 90
Abbreviations 92
Standard AUSVETPLAN abbreviations 92
Manual-specific abbreviations 92

References 93

Figures

Figure 2.1 Map showing the northern Australia region 13

Figure 2.2 Map showing climate zones based on temperature and humidity 14

Figure 2.3 Map showing climate zones based on vegetation 14

Figure 2.4 Map showing climate zones based on seasonal rainfall 15

Figure 2.5 Map of northern Australia beef regions 17

Figure 2.6 Enterprise types and markets for the northern Australia beef cattle industry 20

Figure 2.7 Northern Australia annual beef cattle production cycle 23

Figure 2.8 Map of the northern Australia road network 32

Figure 2.9 Map of northern Australia showing land tenure 46

Figure 2.10 Map of native title determination outcomes across northern Australia 49

Figure 5.1 Map of the Indigenous Ranger groups undertaking IRBP activity across northern Australia .. 64

Figure 5.2 Map of Australian feral camel distribution and density 78

Tables

Table 2.1 Description of northern Australia beef regions and enterprise types within the region 18

Table 2.2 Description of the northern Australia beef cattle enterprise types 19

1 Introduction

Enterprise manuals provide information and guidance on specific types of enterprises that pose special economic or disease eradication problems or are important in the epidemiology or impact of certain emergency animal diseases (EADs). They provide information and guidance on the structure and operations of the relevant type of enterprise, the key risks to enterprises — and posed by enterprises — in EAD incidents, and how these may be managed in an EAD response.

1.1 This manual

1.1.1 Purpose

This manual outlines the features of the northern Australia beef cattle industry that distinguish it from the southern Australia beef cattle industry, including the scale of operations, climate, production systems, herd management, land management, markets and non-pastoral activities on cattle stations. The low population, geographical challenges and limited road infrastructure that restrict physical access, restricted telecommunications and internet access, complicated business tenure models and cultural considerations may significantly impact EAD response arrangements in the north.

The enterprise manual targets personnel who are:

- involved in EAD response and decision-making but may be unfamiliar with the operations of the northern Australia beef cattle industry
- working in the industry and seeking guidance on the:
  - operational procedures that may be used in an EAD incident to exclude, contain or eradicate a disease
  - development of EAD preparedness, including contingency plans.

1.1.2 Scope

The livestock species considered in this manual are beef cattle in northern Australia. The manual does not cover dairy cattle, buffalo, goats, pigs or camels, which may be present in both managed commercial herds and feral populations in northern Australia.

This enterprise manual is aimed at EAD response personnel and northern Australia beef cattle industry personnel who may be involved in EAD preparedness and response activity. For response personnel, including those not familiar with the industry, the manual brings together, from many sources, operational guidelines, plans of action and other resources for dealing with EADs. For industry personnel, including owners or managers, the manual provides guidelines on their responsibilities during an EAD outbreak, as required by the relevant government authorities, and strategies that may be adopted to improve preparedness for, or to handle, a suspected EAD. Managers should include elements of this manual in the operational manuals of their enterprises.

Export yards (registered premises) and transit yards are also an integral part of the supply chain in northern Australia. The **AUSVETPLAN** ***Enterprise manual: Beef cattle feedlots*** and **AUSVETPLAN** ***Enterprise manual: Saleyards and transport*** provide additional information and guidance for these yards on preparing for and managing risks in an EAD response.

1.2 Other documentation

This enterprise manual should be read and implemented in conjunction with:

- other AUSVETPLAN documents, including disease-specific manuals, operational, enterprise and management manuals; and any relevant guidance and resource documents. The complete series of manuals is available on the Animal Health Australia website[1]
- relevant nationally agreed standard operating procedures (NASOPs). These procedures complement AUSVETPLAN and describe in detail specific actions undertaken during a response to an incident. NASOPs have been developed for use by jurisdictions during responses to EAD incidents and emergencies
- relevant jurisdictional or industry policies, response plans, standard operating procedures and work instructions
- relevant Commonwealth and jurisdictional legislation and legal agreements, such as the Emergency Animal Disease Response Agreement (EADRA),[2] where applicable.

1.3 Training resources

1.3.1 EAD preparedness and response arrangements in Australia

The EAD Foundation Online course[3] provides livestock producers, veterinarians, veterinary students, government personnel and emergency workers with foundation knowledge for further training in EAD preparedness and response in Australia.

1.3.2 Industry specific training

Meat and Livestock Australia (MLA) offers a range of training programs for northern Australian beef producers including:

- Profitable Grazing Systems Program[4]
- EDGEnetwork (EDGE)[5] provides 1-3 day practical workshops in business management, breeding, grazing land management, ruminant nutrition and carbon
- Environmental Credentials platform[6] provides a way for producers to show how their on-farm practices result in maintained or improved environmental sustainability
- BeefUp Forums[7] showcase the latest research, trial, tools and technology
- More Beef from Pastures (MBfP) online manual[8].

Some TAFE colleges offer vocational education and training (VET) courses focused on northern Australia beef cattle operations including:

- Certificate II, III and IV in Agriculture
- Certificate II and III in Rural Operations.

1 https://animalhealthaustralia.com.au/ausvetplan/
2 https://animalhealthaustralia.com.au/eadra/
3 https://animalhealthaustralia.com.au/online-training-courses/
4 www.mla.com.au/pgs
5 www.mla.com.au/extension-training-and-tools/edge-network-hub/
6 www.mla.com.au/extension-training-and-tools/environmental-credentials-platform/
7 www.mla.com.au/extension-training-and-tools/beefup-forums/
8 https://mbfp.mla.com.au/

Some agricultural pastoral companies provide specific training courses to employees. Government and industry provide collaborative, jurisdiction-specific rangeland management courses delivered to industry stakeholders on pastoral properties.

2 The northern Australia beef cattle industry

2.1 Introduction

The Australian beef cattle industry is broadly divided into the northern and southern production systems. The northern Australia beef cattle industry spans northern Queensland, Northern Territory and the Kimberley and Pilbara regions of Western Australia. Approximately 60% of the land in this region is used for grazing over 60% of Australia's beef cattle herd (Bell & Sangster 2023).

The northern Australian pastoral lands and its beef enterprises have diverse climate, soils, vegetation, cattle genotypes, scale of enterprise, management systems and business ownership. However, some general features and challenges clearly distinguish northern production systems from southern production systems.

These include often-extreme variation in weather within and between the wet (November to April) and dry (May to September) seasons, which significantly influences the available feed base. Feed generally consists of lower-quality native perennial grasses and few legumes, which, along with widespread phosphorus-deficient soils, can limit cattle growth rates, reproduction and carrying capacity. Large-scale extensive operations lend themselves to a lower degree of stock control. *Bos indicus* (zebu) breeds are predominant in northern beef cattle herds because of their disease resistance, lower mortality and ability to perform in harsh environments, grazing native pastures with low nutritional value. However, these breeds generally have lower fertility and to some extent meat quality leading to selection of crossbreeds and composite breeds, particularly in areas which do not have a live export market focus. *Bos taurus* (European-origin breeds), crossbreeds and composite breeds remain prominent in herds in the central Australian and central Queensland regions. Heat stress and other factors limit stockwork during the summer in the arid and central Queensland beef regions of northern Australia and during the wet season in the Far North, Lower North, Barkly Tableland and tropical Northeast Coast beef regions of northern Australia. This presents challenges, especially for the management of breeding herds.

Other challenges include access to markets, which can be constrained by distance and transport infrastructure, and supply chains, which are vulnerable to external factors including the geopolitical environment. These challenges are most notable for the live export market on which much of the industry in Far North Queensland, the Northern Territory and northern Western Australia are focused. A strength of the northern Australia beef industry is its low-input, low-cost model; however, it is vulnerable to climate variability, particularly drought. The combination of climate, remoteness and scale, cattle breeds and genotypes and market access, together with the need to protect against endemic cattle ticks and vector-borne diseases, has resulted in unique production systems.

Property sizes are large, ranging from approximately 45,000 ha (450 km^2) to 1,600,000 ha (16,000 km^2) with an average size of approximately 250,000–300,000 ha (2,500–3,000 km^2). Paddock sizes vary from 2,000 ha (20 km^2) to 60,000 ha (600 km^2) with an average size of approximately 15,000–30,000 ha (150–300 km^2). Herd sizes range from 3,000 to 80,000 head of cattle. McLean (2023) indicated the average herd size for the northern industry was less than 3,000 adult equivalents (AE); however, this analysis included all Queensland beef herds. Pastoral property ownership varies regionally between family-owned, corporate agricultural companies and Indigenous land trusts (Bortolussi et al 2005a, McLean et al 2014, NTG DPIF 2015); however, there is integration of enterprises under the same ownership across the northern jurisdictions and various stages of the beef cattle production cycle.

Supply chains involve long-distance transport almost exclusively by road, with Queensland having some rail networks. There are approximately 5.3 million cattle movements a year in northern Australia between 2.4 million properties with 1 million cattle movements to export alone.

The pastoral industry is the largest agricultural industry in northern Australia, worth approximately $5.6 billion to the economy. More than 10,000 people (6,500 full-time equivalents) are employed in the northern Australia cattle industry. In the Northern Territory, First Nations peoples' employment on pastoral properties accounted for 8.8% of the total employment in 2021, while in north-west Western Australia, the figure was 16.2%. Northern Australia contributes 70% of cattle to the live export trade (Chilcott et al 2020, ACIL Allen 2022, LiveCorp & MLA 2024).

The northern Australian cattle herd has been estimated at between 9.4[9] and 12.5[10] million head. Northern Queensland cattle account for 63% (5.9–7.9 million head) of the northern herd, while the Northern Territory makes up 23% (2.2–2.9 million head) and northern Western Australia accounts for 14% (1.3–1.7 million head). Fordyce et al (2023), suggest that the size, performance and productivity of the northern Australian cattle herd may differ from those described by survey data and that cattle populations are significantly underreported in survey and statistical data collected by Australian Bureau of Statistics (ABS) and Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES). Modernisation of the agricultural statistics system may improve the quality of statistics. An accurate estimate of the cattle population is critical during an EAD response, in terms of planning for modelling disease spread, implementing disease control measures including the resources required for surveillance, diagnostics, vaccination, destruction and disposal activity and budgeting for response measures and compensation.

2.2 Description

Northern Australia encompasses all of the Northern Territory, and the regions of Western Australia and Queensland that intersect with or are above the Tropic of Capricorn (at the latitude approximately 23˚27'S of the equator; Figure 2.1).[11] It covers 53% of Australia's mainland, spanning 4,100,000 km^2 with a coastline exceeding 10,000 km. Despite its geographical size, northern Australia is not densely populated: only 5.1% (1.4 million people) of Australia's population reside in northern Australia.

The proximity of northern Australia to our northern neighbouring countries — Indonesia, Timor-Leste and Papua New Guinea — provides potential pathways for emergency animal diseases (EADs) to enter, establish and spread in our cattle population. West Timor (part of Indonesia) and Timor-Leste are approximately 450 km from the northern Australian border, with Papua New Guinea only 3.8 km from Saibai Island, Torres Strait, and approximately 155 km from mainland Australia.

Of the 1.4 million people residing in northern Australia, 17.4% (244,000 people) are First Nations people, compared with 3.1% nationally (Office of Northern Australia 2024). There are approximately 200 Aboriginal communities and 600 outstations or homelands across northern Australia, many of which are located within the boundaries of northern Australian pastoral properties that share access roads into the community. For example, in the Northern Territory, areas of land known as Aboriginal Community Living Areas (CLAs) have been legally excised from pastoral leases and the title of each is held by an Aboriginal community corporation or association.

[9] https://crcna.com.au/resources/publications/state-north-2020/

[10] www.csiro.au/en/research/animals/livestock/livestock-logistics

[11] ABARES may use the entire state of Queensland in some statistical reports for northern Australia, including in its Australian Agricultural and Grazing Industries Survey (AAGIS).

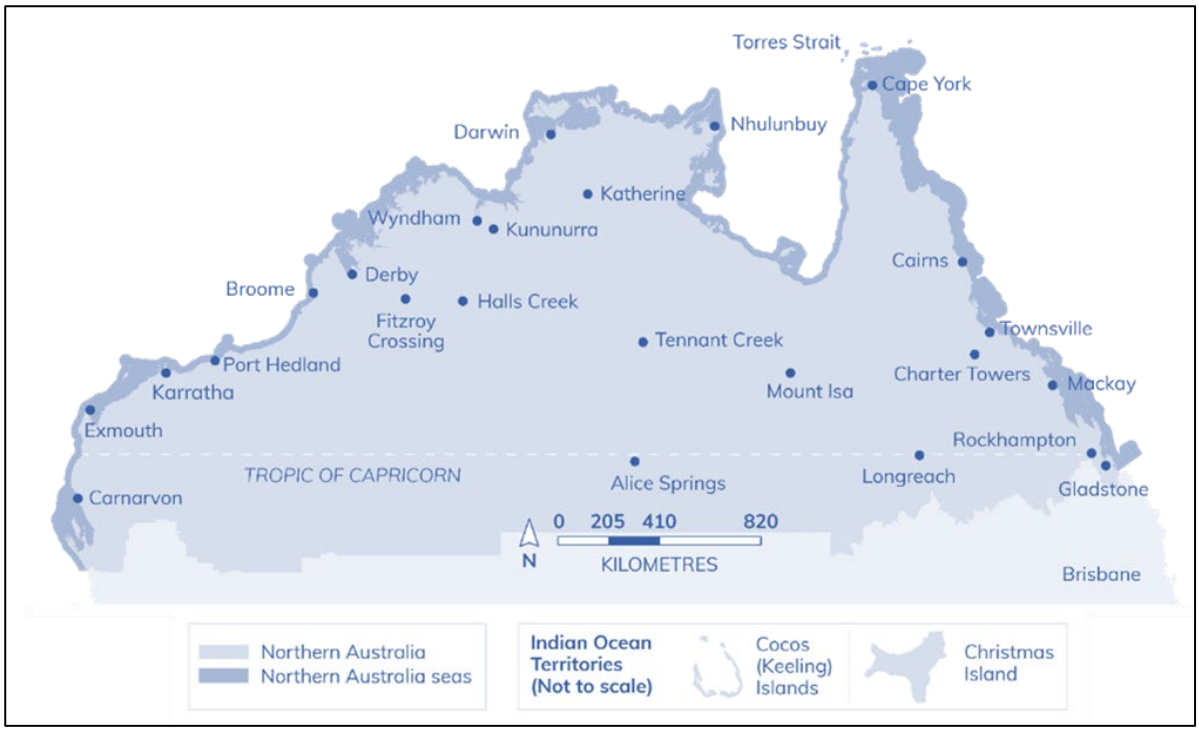

Figure 2.1 Map showing the northern Australia region

Source: Northern Australia Action Plan 2024-2029, Office of Northern Australia (2024)

2.2.1 Climate

Beef production across northern Australia covers a diverse range of grazing ecosystems in tropical, subtropical, grassland and arid desert climates. These range from high-rainfall monsoonal properties in the Far North to low-rainfall areas on the edges of arid deserts in central Australia. The immense variability in climate throughout northern Australia is due to its vast area and diverse geography. There are 3 main methods of classifying climate: temperature and humidity (Figure 2.2), vegetation (Köppen; Figure 2.3) and seasonal rainfall (Figure 2.4).[12]

Northern Australia is predominantly tropical in the north, grassland in the central region and desert to the south with a sub-tropical region along the eastern coast. These regions can generally be described as:

- tropical (monsoon) — found across the Kimberley, Top End, Northern Gulf and Cape York Peninsula and characterized by a hot, humid wet season with summer-dominant rainfall and a dry season winter with no rainfall
- sub-tropical — found along the east coast of Far North Queensland and characterized by a hot, humid and wet summer and no or low winter rainfall
- grassland — found across the Central Kimberley, Victoria River District, Barkly Tableland, Southern Gulf and north-western Queensland and characterized by a hot, dry summer and a mild winter
- arid (desert) — found in the southern parts of northern Australia (Central Australia) and characterized by a hot, dry summer and a cold winter with low rainfall.

[12] www.bom.gov.au/climate/maps/averages/climate-classification/

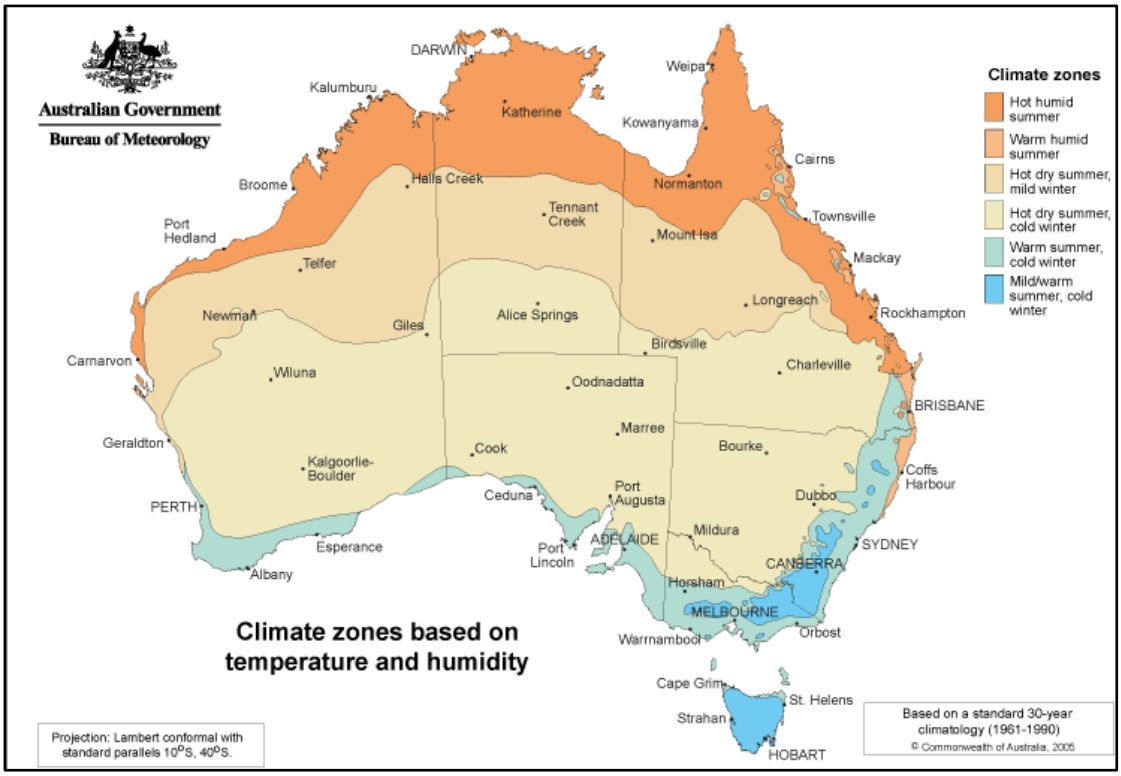

Figure 2.2 Map showing climate zones based on temperature and humidity

Source: BOM (2024)

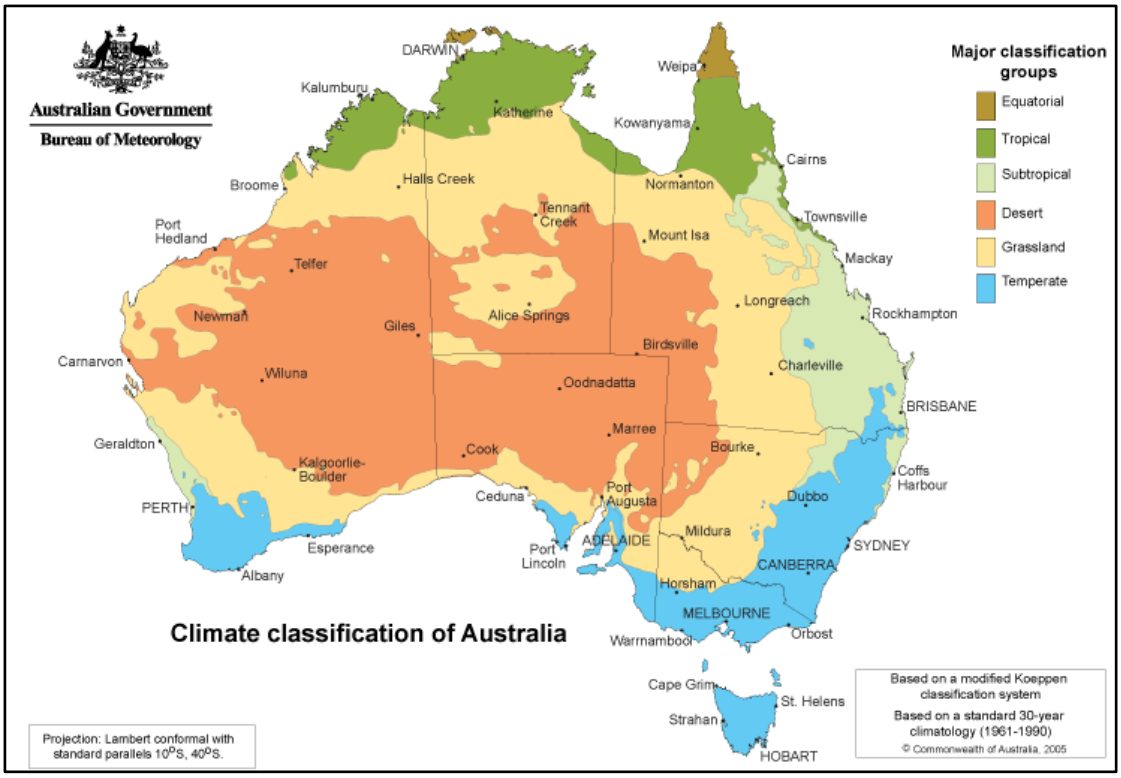

Figure 2.3 Map showing climate zones based on vegetation

Source: BOM (2024)

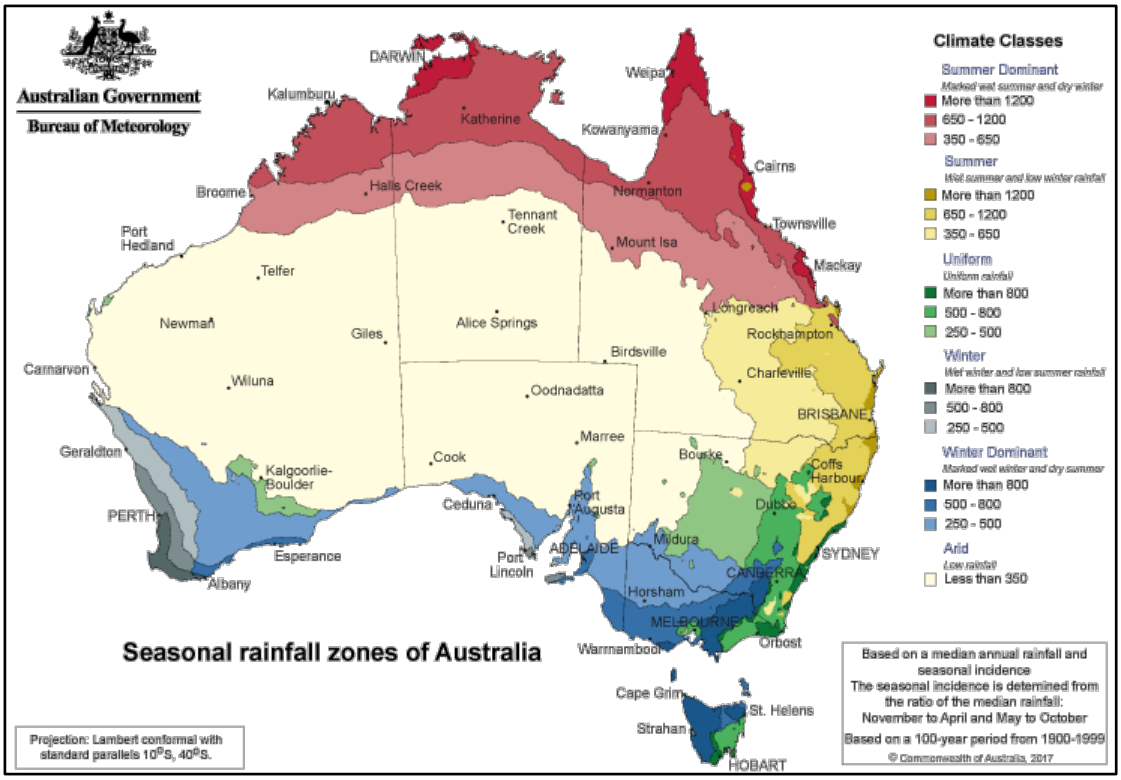

Figure 2.4 Map showing climate zones based on seasonal rainfall

Source: BOM (2024)

The pastoral industry in the northern region of northern Australia generally operates across 2 main seasons: the wet season and the dry season. Beef cattle properties in the Far North, Lower North, Barkly Tableland and Tropical North-east Coast beef regions use the wet and dry seasons to describe their rainfall seasons generally. Most of the rainfall is associated with active phases of the monsoon, occurring during the northern wet season (November to April). The remainder of the year remains dry with little to no rain (May to October).

On the other hand, the pastoral industry in the southern region of northern Australia operates across summer and winter seasons. Beef cattle properties in the Arid Zone and Central Queensland beef regions use the summer and winter seasons to describe their rainfall generally. Cattle management operations are minimal over the wet season in the north and the summer in the south of northern Australia.

2.3 Industry operations

2.3.1 Structure

The structure of the northern Australia beef cattle industry has been described vastly differently by industry, researchers and government in terms of regions, production systems, land management, supply chain markets and services. The description of the northern beef industry and stakeholders understanding of industry operations are especially important in terms of how the industry, government and other stakeholders will interact and coordinate response planning actions and communicate with industry and the public during an EAD response.

2.3.2 Beef cattle production regions and enterprise types

Beef production in Australia includes pasture-based cow-calf systems, a backgrounding or grow-out period on pasture, and feedlot or pasture finishing (Greenwood at al 2018). Northern Australia beef cattle operations are generally built around a self-replacing breeding herd. There are regional differences in the scale of operation and the ability of the enterprise to economically finish stock for various markets. Generally, Northern Territory, Western Australia, north-western Queensland and Southern Gulf beef cattle properties are considerably larger than the beef properties in the remainder of Queensland. The distinct differences between the pastoral industry in the northern and southern regions of northern Australia are the agroclimatic conditions, predominant cattle breeds and markets.

In the northern beef regions of northern Australia (Far North, Lower North, Barkly Tableland and Tropical North-east Coast), the cattle breeds have predominantly comprised a high *Bos indicus* breed content with heat and cattle tick tolerance; however, there is an increasing *Bos taurus* influence over *Bos indicus*, crossbred and composite breeds. Cattle are sold into 3 different markets. These include live export, backgrounding enterprises for preparation of cattle entering fattening systems, and manufacturing beef. Backgrounding properties allow weaners to grow out to a larger size prior to entering more intensive finishing systems.

In the southern beef regions of northern Australia (Arid Zone and Central Queensland), the beef cattle breeds have predominantly comprised a high *Bos taurus* breed content or *Bos indicus* cross and composite breeds focused on fattening cattle for processing within Australia and for export as boxed beef.

Six beef regions (Figure 2.5) and six enterprise types (Table 2.1 and 2.2) were described by Ausvet Animal Health Services (2006) to assist in understanding the northern Australian beef industry and planning for disease control at the regional level. The beef regions reflect similar industry practices and movement patterns and have been used in decision support tools, including disease models such as Auspread (Roche et al 2014), to test the effectiveness of different disease control strategies to assist with EAD planning and preparedness.

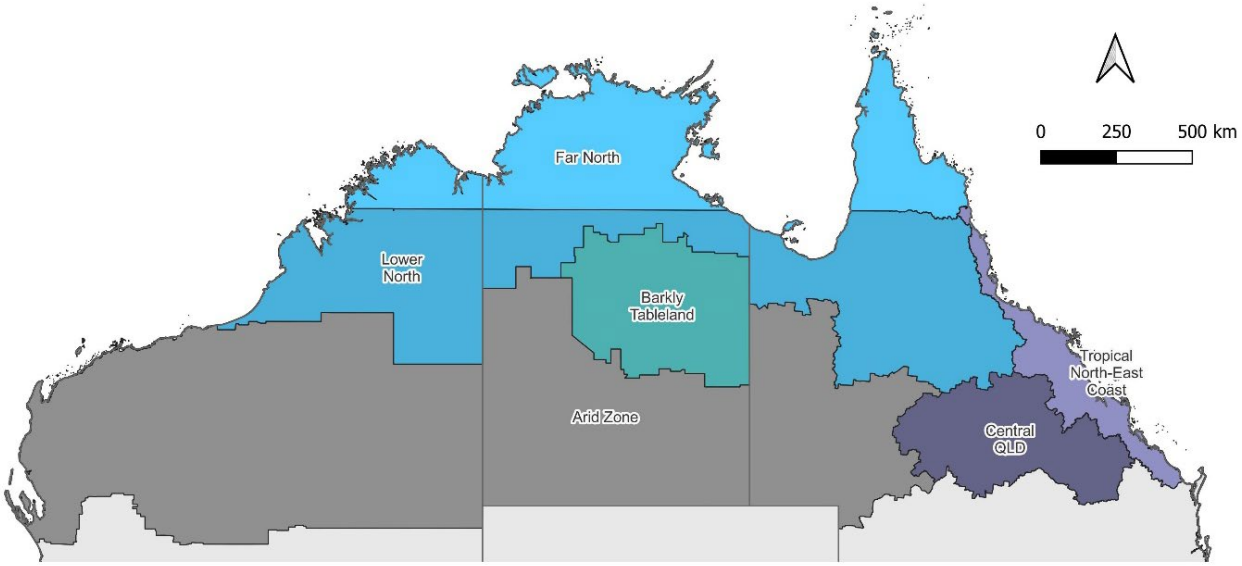

Figure 2.5 Map of northern Australia beef regions

Source: NTG DAF (2025)

Table 2.1 Description of northern Australia beef regions and enterprise types within the region

	Australian beef region	Geographic description	Enterprise type
1	Far North	Northern Kimberley, far Top End (Darwin, Katherine, Arnhem Land, Roper Gulf) and Cape York	Breeding and growing Growing and backgrounding
2	Lower North	Central Kimberley, Victoria River District, Stuart Plateau, Northern Gulf, Southern Gulf, northwest Queensland	Breeding Breeding and growing Breeding and finishing
3	Arid Zone	Pilbara, central Australian desert (northern Alice Springs, southern Alice Springs and Plenty), central west Queensland	Breeding and growing
4	Barkly Tableland	Central Northern Territory (Barkly and Tennant Creek)	Breeding
5	Tropical Northeast Coast	East coast Far North Queensland	Breeding and growing Breeding and finishing
6	Central Queensland	Fitzroy	Breeding and growing Breeding and finishing Finishing on pastures Finishing in feedlots

Table 2.2 Description of the northern Australia beef cattle enterprise types

	Enterprise type	Enterprise description
A	Breeding	Enterprises breeding cattle destined for sale at weaning
B	Breeding and growing	Enterprises breeding cattle that are carried beyond weaning and destined for sale as store yearling cattle to be finished at a feedlot or specialist finisher
C	Breeding and finishing	Enterprises breeding cattle that are carried beyond weaning and finished for sale for slaughter, generally for the domestic market
D	Growing and backgrounding	Enterprises that purchase or transfer in weaner or yearling steers for growing out to weights required by specialised finishers or lot feeders
E	Finishing on pastures	Enterprises that purchase store stock for the purpose of finishing them to domestic or export market specifications off pasture
F	Finishing in feedlots	Enterprises that purchase or transfer in cattle for the purpose of finishing on high-energy grain-based diets to meet domestic or export market specifications

The opportunity for an enterprise to shift between the different production activities and markets is limited, heightening their potential vulnerability to changes in markets or short-term trade disruptions.

2.3.3 Enterprise types

Beef production stages correspond with key enterprise types across northern Australia. Breeding enterprises dominate the sector with fewer growing or backgrounding enterprises who primarily supply the live export market. There are very limited fattening or finishing enterprises to supply cattle to abattoirs for the domestic or international export market (Figure 2.6).

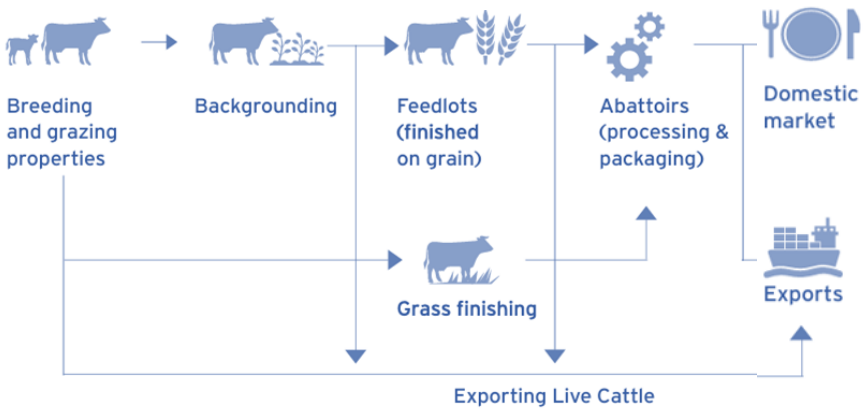

Figure 2.6 Enterprise types and markets for the northern Australia beef cattle industry

Source: Adapted from Ernst and Young (2018)

2.3.3.1 Breeding enterprises

Beef production systems in northern Australia are dominated by cow-calf breeding operations that breed and raise weaner cattle. The size and structure of breeding herds are especially dynamic over time based on management decisions of genetic composition, reproductive performance, health and the implementation of sustainable land management practices. The beef breeding herd consists of beef cows, beef bulls, beef calves, and replacement heifers and bulls.

Breeding enterprises can also grow and finish cattle on pasture on the same property. There has been a recent movement towards diversification within the enterprise on large northern Australian properties. The breeding enterprises may be classified as:

- breeding — breeding and weaning for sale as weaners
- breeding and growing — breeding, weaning and growing for sale as yearlings
- breeding and finishing — breeding, weaning, growing and finishing for sale into the domestic market.

2.3.3.2 Backgrounding enterprises (growing)

Backgrounding is the growing process for feeder cattle from the time calves are weaned to finishing or fattening and typically occurs until the cattle reach the live weight required for entering the next stage of the supply chain. There are limited backgrounding properties in northern Australia for cattle entering the domestic supply chain, with most properties focused on growing cattle to meet the live export specifications. Backgrounding properties group and acclimatise cattle prior to entry to a feedlot or intensive pasture finishing system. Backgrounding and involve managing the health of cattle, including pasture feeding, watering and supplementation, and implementing sustainable land management practices.

Yearlings and 2-year-old feeder cattle from northern Australia are exported live primarily through the northern ports to a variety of countries in Asia (DAFF 2024). Indonesia accounts for most of the live export cattle (MLA 2024).

A small number of cattle are exported through the southern Australian ports to the Middle East (DAFF 2024). Weaners are generally moved to better grazing land with more rainfall, a longer growing season and improved pastures. Queensland is the main destination for weaners, with most going to central and southern Queensland and a few into the crop livestock systems of New South Wales, Victoria, South Australia and Western Australia. Weaners moved to backgrounding pasture-based systems are then moved into feedlots, usually in southern Queensland or northern New South Wales.

2.3.3.3 Finishing enterprises (fattening)

Finishing systems are the method of fattening cattle before they are processed. Cattle are finished either on improved pastures, creating grass-fed beef, or in feedlots, creating grain-fed beef. Cattle generally go through a finishing system before processing.

Bos indicus cattle from northern Australia are predominantly finished in Indonesian feedlots, whilst *Bos taurus* cattle go to southern Queensland where there is greater access to grain and higher-quality pastures. Properties from the more productive areas in northern Australia, including the Arid and Central Queensland beef regions, may finish *Bos taurus* cattle to heavy steers.

Finished cattle may be sent to southern Australian and eastern Australian abattoirs for processing. The live export market has posed a long-standing challenge to the viability of northern abattoirs.

Finishing systems help to create consistency in product and cater for the high-value domestic and export markets.

Grass-finishing enterprises

Grass-finished cattle are fattened on pasture prior to sale for processing. Pasture finishing is generally conducted on more productive land as an alternative to feed lotting. Grass finishing takes longer than grain finishing to fatten cattle for processing.

Feedlot-finishing enterprises

There are no large-scale feedlots in northern Australia. Feedlots are used to finish cattle on grain prior to sale for processing. Feedlots fatten cattle on grain for a specific period of time or until a target weight is reached. Weights required for cattle entering the feedlot depends on the market that the cattle will be sold to. Feedlots are typically located close to grain-producing areas. Northern cattle are primarily finished in feedlots in Indonesia or south-east Queensland. The **AUSVETPLAN *Enterprise manual: Beef cattle feedlots*** provides further information on the operations within feedlots.

2.3.4 Markets

The northern Australia beef cattle industry and its markets have changed significantly over the past 50 years, largely due to disease eradication, increased population of environmentally adapted *Bos indicus* breeds, genetic selection for meat quality, improved infrastructure and transportation, land development, integration of large cattle enterprises across the north and the expansion of live export markets (Wiedemann et al 2023).

Cattle in northern Australia are targeted for a range of market specifications. Market specifications commonly relate to weight (live or carcase), age (determined via dentition), sex, and muscle and fat depth. Because of the land types and climate in the Far North, live weight growth rates are less than 150 kg/year (Bortolussi et al 2005c). This makes northern cattle enterprises more suited to breeding herds that turn off lighter feeder bulls, steers and heifers. In more productive areas there are opportunities to target other markets.

The Meat and Livestock Australia (MLA) BeefSpecs calculator[13] is an electronic tool that assists producers to meet target market specifications on time. Current market specifications for beef cattle are primarily based on carcase weight and rump (or P8) fat thickness. The MLA market indicators outline the specifications, including live weight range, for national markets.[14] The MLA Prices and Markets report[15] provides a comprehensive report on Australian markets.

2.3.4.1 Live export

The northern beef cattle herd from across northern Queensland, Northern Territory and northern Western Australia supplies nearly 90% of Australia's live export cattle. The scale of the live cattle export trade for the northern Australia beef cattle industry has expanded significantly over the past 30 years in response to opportunities provided by South-east Asian markets close to the northern Australian ports. South-east Asian markets continue to dominate exports from the ports in Broome, Wyndham and Port Hedland, Western Australia; Darwin, Northern Territory; and Townsville, Queensland. Smaller numbers of northern Australian cattle are also exported to the Middle East through southern Australian ports in Fremantle, Western Australia, and Portland, Victoria.[16]

The live export trade has restrictions on individual animal weight; however, since cattle do not need to be finished, the market aligns with the current northern production systems.

2.3.4.2 Live export feeder cattle

Feeder cattle are typically steers, heifers and young bulls between 280 and 480 kg live weight and finished for slaughter at their destination country. The majority of live export feeder cattle are destined for Indonesia. Other key markets include Vietnam and the Philippines. After weaning, animals are held with minimal supplement for a dry season, gain weight over a wet season and then are in the market weight range to be sold at the start of the following dry season. Wet season live weight gains or annual live weight gains are low in these situations (Bortolussi et al 2005a, 2005b and 2005c). *Bos indicus* breeds are preferred for several live export markets out of northern Australia.

2.3.4.3 Live export slaughter cattle

Slaughter cattle are typically cows and bulls but also include steers and heifers between 420 and 800 kg live weight. Markets in South-east Asia include Brunei Darussalam, Malaysia, the Philippines, Sarawak and Vietnam, and markets in the Middle East include Egypt, Israel, Jordan, Kuwait and the United Arab Emirates. Central Australia and the Pilbara occasionally have a niche live export market for *Bos taurus* breeds including mickey bulls to Turkey.

2.3.4.4 Store cattle

Store cattle are cattle suitable for breeding or finishing but not for slaughter. Store cattle are typically weaner steers and heifers between 200 and 330 (or greater) kilograms live weight and yearling steers and heifers between 330 and 400 (or greater) kilograms live weight. Store cattle may also include cows pregnancy tested in calf (PTIC) for breeding. Store cattle can be described by fat score, live weight, sex and dentition. Other descriptions that may be used include breed content, frame score, muscle score and pregnancy status. Store sales are held at saleyards for cattle from Central Australia and Central Queensland.

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13 www.mla.com.au/extension-training-and-tools/tools-calculators/beefspecs-calculator/

14 www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/minlrs-information-brochures-etc/nlrs-market-indicators.pdf

15 www.mla.com.au/prices-markets/

16 www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/live-animal-export-statistics/livestock-exports-by-market#collapsible_inner_link_excelspreadsheet

2.3.4.5 Finished cattle

If cattle can gain 150 kg per year or more, the Japanese ox market can be targeted. For the domestic and European Union (EU) markets, annual weight gains of 180 kg or better are required to produce cattle with the required weight and dentition. Transport distances can restrict access to the domestic Meat Standards Australia (MSA)[17] market. Dry seasonal conditions, especially in Central Australia, may necessitate turning off growing out cattle, to be finished in southern grazing areas or feedlots that are closer to the markets.

2.3.4.6 Slaughter cattle

Slaughter cattle for the domestic supply chain from the north mainly comprise cull cows and small numbers of heavier steers, cull heifers and bulls. With limited and transient operational meat processing facilities in northern Australia, slaughter cattle are often transported long distances to southern and eastern Australian abattoirs. These animals are usually processed for manufacturing meat with only small quantities of higher-value cuts going to other markets.

2.3.5 Production cycle

Beef cattle production in northern Australia relies on an extensive grazing system in a geographical region dominated by prolonged periods of dry seasonal conditions and variable rainfall (Mwangi et al 2022). The production systems fall into three general categories: breeding, backgrounding and finishing.

Beef cattle will move through different production stages within the system depending on where they are in their life cycle. The annual production cycle for beef cattle in northern Australia consists of 4 periods (MLA 2023a): joining, calving, weaning, and animal development and turn-off (Figure 2.7).

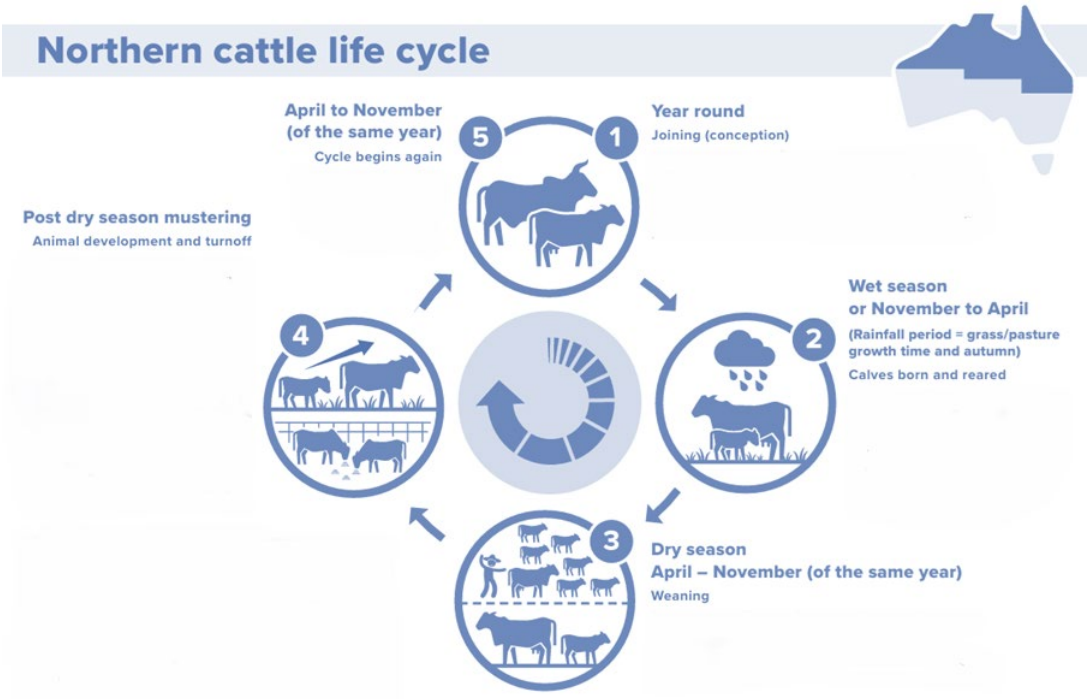

Figure 2.7 Northern Australia annual beef cattle production cycle

Source: Adapted from MLA (2023a)

[17] www.mla.com.au/Marketing-beef-and-lamb/Meat-Standards-Australia

2.3.5.1 Joining

Due to the expansive nature of land and properties in northern Australia, continuous joining is common in beef herds. Bulls are run with breeding cows year-round and calves are born throughout the year. This differs from southern Australian production systems where bulls will only be joined with breeder cows and heifers during certain times of the year, typically autumn and spring.

Controlled, restricted or segregated joining[18] may be used where specific management targets are a focus and infrastructure allows. Controlled joining ensures the annual calf drop occurs at a specific time each year. The joining period is determined by the ideal time for calving and weaning and varies in length. The longest controlled mating is 7 months. Five months may allow mating after first weaning. Three months enables most calving to be complete before the next mating. Restricted joining is where bulls are removed to prevent calving at particular times of the year, usually the middle of the dry season. Segregated breeder management is practised where it is difficult for most breeders to achieve a 12-month calving cycle, where there is high rainfall variability and in herds where pregnant within 4 months of calving rate is between 40 and 70%.

Bull or joining percentage is the number of bulls as a percentage of the number of cows and heifers in the herd. The typical bull percentage for northern Australian beef herds is approximately 3.5%; however, 2.5% can be achieved with bull breeding soundness examination. Herd bulls are generally sourced directly from studs or bull sales, primarily from Queensland stud breeders. Some pastoral properties breed and select their own herd bulls. Mickey bulls or feral rangeland bulls are a significant problem and may account for between 0.5 and 7% of bulls in the breeding herd.

Replacement heifers are commonly first joined at 18 to 24 months of age depending on their level of sexual maturity. *Bos indicus* breeds mature later than *Bos taurus*, crossbreeds and composite breeds.

2.3.5.2 Calving

The majority of northern Australia's beef calves are born during the northern wet season, which occurs between November and April, a period that includes Australia's summer. In Central Australia, where climate is less predictable, calving is dictated by rainfall events that stimulate pasture growth, which provides a rising plane of nutrition that stimulates ovulation. Higher conception rates occur during the summer months. Conception can, however, occur at any stage of the year, so calves are born and raised year-round.

Most cow-calf breeding enterprises have a single calving peak, demonstrating a seasonal calving pattern, even for extensive regions with continuous mating. The calving period typically occurs over a 5–7 month period demonstrating a strong climate influence where conception aligns with pasture growth periods (Costa, Poppi & McLennan 2012).

Calf loss ranges from 2 to 15% and is generally higher than southern Australian beef production regions. Predation, mismothering and heat stress are major contributing factors to losses.

2.3.5.3 Weaning

Weaning is a crucial management practice in northern Australia to ensure the body condition of breeders is maintained. Weaning increases the ability of the breeder to maintain sufficient body condition to re-conceive and decreases the risk of mortality at the end of the dry season. The timing and frequency of weaning may vary between properties according to the nutrition available.

[18] www.mla.com.au/globalassets/mla-corporate/research-and-development/documents/what-joining-system-should-i-use.pdf

Northern Australian properties will typically muster twice a year during the dry season. When this is done, calves will be weaned from their mothers, grouped together and either grown out on the same property or transported to another location to gain and reach saleable weights.

Most cattle are weaned at 150–180 kg live weight; however, weaning down to 100 kg can occur with good-quality hay or native pasture and a high-energy, high-protein supplement with low levels of urea. Early weaning gives the breeder cows in lighter body condition an opportunity to gain condition to get back in calf and reduces breeder deaths, particularly during dry seasonal conditions and drought.

Top-performing northern Australian beef enterprises achieve weaning rates of 75–80% (McCosker et al 2023), but others can be as low as 50% (McGowan et al 2014), largely as a consequence of land types and not aligning periods of high nutritional demand (lactation) with high feed supply.

2.3.5.4 Animal development and turn-off

All bulls and heifers not being kept to join the breeding herd as replacements, and steers, will transition into yearling cattle as they grow and increase weight. The end market will determine their turnoff weights.

Most yearlings that are destined for the live export market will be grown out on the same property they were born, or on others specifically utilised for growing out young cattle. Turnoff into the live export market occurs year-round, although typically, the higher points of the year are during the dry season when mustering and processing of sale cattle occurs.

Most cattle that are not sold into the live export market will be transported to other eastern and southern feedlots or properties to mature on pasture.

2.3.6 Herd management

Herd management has a significant impact on the viability of northern Australia beef cattle enterprises. There is a 10-fold difference in long-term profit between the average and the top 25% of beef cattle production enterprises. The profit drivers of the northern beef industry are reproduction, mortality, annual weight gain and cost of production (McLean & Holmes 2015). Reproductive rate is twice as important as mortality rate and turn-off weight in determining profitability (Holmes & McLean 2017).

2.3.6.1 Breeds

Early development of the northern Australia beef cattle industry was based on *Bos taurus* breeds, particularly the Shorthorn breed due to its adaptability to the northern Australian conditions. The hot, dry and rugged pastoral regions of north-western Queensland, the Northern Territory and the Kimberley region of Western Australia could be economically grazed by the Shorthorn. *Bos indicus* breeds, predominantly Brahman with genetic resistance to cattle ticks and tolerance to the hot and humid climate, gradually replaced *Bos taurus* breeds following the Brucellosis and Tuberculosis Eradication Campaign (BTEC), as herds were restocked with replacement breeders, and with the expansion of the live cattle export market.

Today, the most common cattle breeds in northern Australia remain *Bos indicus* or composite breeds, predominantly Brahman (40%) with Droughtmaster (15%), Brangus (9%), Charbray (8%), Santa Gertrudis (6%), Charolais (1%) and other tropically adapted breeds. A smaller proportion of *Bos taurus* breeds — Wagyu (8%), Angus (6%), Hereford (2%), Shorthorn (1%) and others (MLA 2024) — are present in the southern regions of northern Australia.

2.3.6.2 Pregnancy testing

Some breeding enterprises pregnancy test cows and heifers to target management practices. Corporate properties are more likely to utilise veterinarians or pregnancy testing contractors, and privately owned properties are more likely to pregnancy test their own cattle. Corporate properties are more likely to test

all cows, and privately owned properties are more likely to pregnancy test only dry cows and sale or cull cows. Some properties do not pregnancy test cattle and some properties do not keep pregnancy testing records. Where contract musterers are used, pregnancy testing is less common practice with a focus on weaning and processing for efficiency.

Cows are pregnancy tested at the first-round muster and culled if empty and dry. Some producers may pregnancy test again at the second-round muster to ensure cows can be spayed to sell the following year.

Pregnancy testing cattle for live export is managed by the state, territory or industry body under the Australian Standards for the Export of Livestock.[19]

2.3.6.3 Culling

Culling practices vary immensely between properties. Cows may be culled for low fertility, age, temperament or physical problems. Some properties cull breeders after 10 years of age as mortality rates increase when cattle lose teeth and are unable to maintain condition. Some properties retain productive cows after 10 years of age in the breeding herd.

2.3.6.4 Spaying

Spaying is a management practice that involves the surgical removal of the ovaries or the disruption of the function by the removal of part of the fallopian tubes from cows and heifers to prevent oestrus cycles and pregnancy. Spaying allows the cows and heifers to increase condition for sale. The Willis Dropped Ovary Technique (WDOT) of spaying involves using a surgical instrument to sever the ovaries internally. Webbing is a method used to remove a short length of the fallopian tubes, which spares the ovaries and any existing pregnancy is usually maintained. Spaying is largely restricted to northern Australia in situations where bull control is difficult.

2.3.6.5 Castration

Castration is a management practice that involves the removal of the testes by surgical excision or by constriction and/or crushing of the testicular blood supply (using a rubber ring, tension band or Burdizzo clamp). While it is preferable to perform castration as young as possible, in northern Australia it may be performed on males at first muster which may be up to 12 months of age. The demand for entire males in the South-east Asian live export market lends itself to castration not being performed on male Bos indicus breed calves destined for the live export markets.

2.3.6.6 Branding

Branding is a management practice commonly used in northern Australia to place a permanent identifying mark on the hide of cattle by destroying the hair follicles and altering hair regrowth. Branding is considered a reliable and permanent method of identification for proof of ownership. From a welfare perspective, identifying livestock with National Livestock Identification System (NLIS) devices, ear tags and ear marks is preferred over branding.

Legislation relating to branding requirements varies across the northern jurisdictions. The Northern Territory, for example, requires mandatory branding of cattle over 8 months of age that are being moved off a property. In northern production systems, NLIS devices may not be applied to cattle until they leave the property or as otherwise prescribed by relevant legislation. Branding is a visual identifier and can be effective as a method of identification during natural disasters, disease control programs and chemical residue traceback investigations where NLIS devices have not yet been applied or have been dislodged.

[19] www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/australian-standards-livestock

2.3.6.7 Segregation

Segregation may be used to target specific management practices. Breeders may be segregated on lactation status (wet or dry cows), pregnancy status or calving period, condition score, age, breed, or for culling. Segregation on pregnancy status (or calving date) may allow for better management of 'out of season' calvers, and match calving groups and lactation periods with the expected green feed available.

Replacement heifer selection is primarily done at weaning and prior to joining, however some producers extend this to pregnancy testing at first joining, pregnancy status of second joining and weaning the first calf.

2.3.6.8 Mustering practices

Two rounds of mustering are most commonly practiced in northern Australia during the dry season. Some isolated enterprises do conduct only 1 round of mustering whilst some corporate properties conduct 3 rounds annually. Depending on the seasonal conditions, the first-round muster usually occurs during April–May and the second round occurs during September–October. Earlier mustering in March may take place during drier wet seasons. Larger properties may muster over a 3-month period each round, however most second-round mustering is finished by November to avoid the extreme weather conditions that make mustering and processing distressing for cattle and stock workers.

Helicopters, fixed-wing aircraft, horses, quad bikes, motorcycles, vehicles, drones (e.g. SkyKelpie) and dogs are used for mustering cattle. Trapyards are commonly used to trap cattle for processing or movement to a main set of yards.

Most pastoral properties have one main set of yards, often located near the station homestead, and may have a number of other yards strategically located across the property. Additional yards may be close to main roads or bitumen for transport, dip yards for treatment of cattle tick prior to movement or centrally located to multiple paddocks on the property. Temporary yards are commonly erected to muster cattle for transport to a main set of yards.

Most paddocks can be mustered within a day, however some paddocks with difficult terrain may take 3 days and exceptionally large paddocks may take up to 7 days. Most properties muster greater than 95% of cattle in the paddock, and considerable effort is taken for clean musters when property ownership is exchanged or when new land is leased. Cooler areas close to yards are especially important on larger properties because they allow cattle to settle for a period and recover from the stresses of mustering or handling in the yards. During this cooling period, calves are able to 'mother up' and calf losses can be reduced. After the cooling or settling periods, cattle can then be more easily handled in yards, moved back to pasture and loaded onto transport.

Most musters of paddocks along boundary fences contain stranger cattle from neighbouring properties. Stranger cattle may account for up to 50% of cattle mustered into the yards depending on infrastructure, terrain and time between musters. Paddocks with waterways are prone to wet season flooding which affects the fencing and floodgates, enabling cattle access between paddocks and properties.

2.3.6.9 Cattle health monitoring

The frequency of inspection of cattle on pastoral properties varies significantly depending on the seasonal climate, size of the property, paddock accessibility and terrain, and management practices, such as supplement and bore runs and fencing maintenance. In the wet season in the north where there is sufficient groundwater and feed, cattle may not be inspected for several months.

Properties across the north routinely monitor watering points in paddocks weekly to bi-weekly when paddocks are accessible by vehicle. Where a property has access to aerial monitoring of cattle, it is usually the most economical alternative to ground vehicle monitoring when paddocks are inaccessible.

2.3.6.10 Cattle disease, vaccination and treatments

A range of vaccines are available for herd management in northern beef herds (MLA 2022), some of which are relevant for prevention and management of endemic diseases in all Australian beef herds. These include: 7 in 1, for leptospirosis and clostridial diseases; 5 in 1, for clostridial diseases; vibriosis; bovine pestivirus; and pinkeye.

Three diseases more relevant for the northern beef cattle industry for which vaccines are available are botulism, tick fever and bovine ephemeral fever. Botulism caused by *Clostridium botulinum* toxin is the most significant disease that causes mortality in northern beef herds, especially in regions with acute phosphorus deficiency. There is no treatment for the disease, so vaccination is the only way to protect the herd against the impact of the toxin. Most producers vaccinate the breeder herd for botulism.

Tick fever is caused by infection with the parasites *Babesia bovis*, *Babesia bigemina* and *Anaplasma marginale*, which are transmitted by the cattle tick (*Rhipicephalus australis*). *Bos indicus* cattle are more resistant to tick fever and also have increased resistance to cattle ticks, reducing their risk of infection. The major risk of tick fever is to stock introduced from tick-free areas, or those located in marginal tick areas where the prevalence of cattle ticks may be significantly reduced during dry seasons. Vaccination against tick fever is important for producers who move or buy cattle, especially naive bulls, from tick-free areas to north of the cattle tick line. Cattle should be vaccinated at least 4 weeks prior to movement into the cattle tick endemic parts of northern Australia to allow time for protective immunity to develop.

Bovine ephemeral fever (BEF or three-day sickness) is a viral disease in cattle that is transmitted by biting insects, primarily mosquitoes and midges, and is endemic in northern Australia. The distribution and spread of the disease are dependent on seasonal conditions. Although vaccination is the only means of preventing the disease in regions outside the endemic area, it is not commonly practised except for high-value stud herds.

Trichomoniasis is a venereal disease that can cause infertility through early embryonic death and abortion. The disease is caused by a protozoan parasite, *Tritrichomonas foetus*, which are found in the genital tracts of cattle and are transmitted during mating. The disease is endemic in northern Australian beef herds where cows and bulls can remain carriers. There is no treatment or vaccine.

Cattle tick is an endemic pest in northern Australia. Control strategies include regulation of cattle movements, to prevent the spread of cattle ticks into tick-free areas, and the management of tick-related disease. Movement restrictions apply to cattle movements between cattle tick zones within Queensland,[20] the Northern Territory[21] and Western Australia[22] and between states. Movement restrictions for endemic pests and diseases are an important consideration during EAD response planning arrangements.

Buffalo fly (*Haematobia irritans exigua*) is a significant pest of cattle in northern Australia.[23] Buffalo fly bites are extremely irritating to cattle, leading to vigorous tail flicking, head tossing and kicking at the ventral abdomen. Buffalo fly infestations may reach several thousand flies per animal, each biting 20–40 times per day, and occur throughout the year. The bites are painful and cause production loss and welfare impacts. Back-rubbers and insecticidal ear tags are used to treat buffalo fly infestation.

Internal parasites are less of a problem in northern Australian beef herds; however, weaner cattle and first-calf heifers can be predisposed to clinical infestation of barber's pole worm (*Haemonchus placei*)[24] in tropical floodplain areas in northern Australia and are more likely to require anthelmintic treatment to manage worm burdens.

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[20] www.arcgis.com/home/webmap/viewer.html?webmap=2498f88a4aea447786c4ab6bc1ad4c87&extent=134.3187,-29.8425,166.7723,-13.0066

[21] https://nt.gov.au/__data/assets/pdf_file/0016/205306/map-of-nt-cattle-tick-areas.pdf

[22] www.dpird.wa.gov.au/businesses/biosecurity/animal-biosecurity/western-australian-cattle-tick-control-program/

[23] https://flyBoss.com.au/seasonal-distribution-of-buffalo-fly/

[24] https://wormBoss.com.au/roundworms/barbers-pole-worm/

2.3.6.11 Mortality and calf loss

Cattle mortality is the most significant limitation to beef cattle production in northern Australia (Fordyce et al 2021). Estimated breeder mortality rates vary considerably between properties and regions within northern Australia. Some properties have relatively low breeder mortality rates (under 2%) while others are much higher (over 10%). Higher mortality rates can be expected in cows aged 10 years or older and those subject to severe drought. Factors likely to increase mortality risk include poorly conditioned cows that are heavily pregnant or in early lactation during the late dry to early wet seasons (Henderson et al 2013).

A high level of calf wastage in the northern beef herds was highlighted by the CashCow project (McGowan et al 2014). Calf loss occurs between pregnancy and weaning (McGowan et al 2017) and includes losses due to abortion, premature birth and stillbirth (prenatal mortality), calf deaths in the first two weeks after birth (neonatal mortality), and losses of older calves including those associated with branding, dehorning and castration. In northern beef herds, calf losses have been estimated to be as high as 15% (McGowan et al 2014). Calf losses can be attributed to both maternal and calf factors[25] including low body condition, reproductive and other diseases affecting the foetus or calf, mustering around calving, difficult calving (dystocia), heat stress, mismothering, calf scours, respiratory or clostridial disease, and predation by wild dogs.

Strategies to reduce calf mortality are likely to also reduce mortalities in older cattle, and vice versa, as they are inextricably linked (McGowan et al 2017). The Northern Breeding Business (NB2) program[26] focuses on reducing calf wastage in breeding herds in addition to other strategies to improve the long-term viability and sustainability of the northern beef herds.

2.3.7 Land management

Land condition is the ability of the land to respond to rainfall and produce useful forage. The main influences on land condition are rainfall, grazing by domestic, native and feral animals, and fire. A 'land type' is an area of grazing land that has characteristic patterns of soil, vegetation and landform that are easily recognised by landholders in a region. Reference to land types enables grazing land managers to describe the characteristics, capabilities and limitations of their land in producing useful forage.

2.3.7.1 Grazing land management

Grazing is managed by manipulating stocking rate, stock water distribution, feral animal control and fire. Fire on its own can change land condition by being too frequent or too infrequent over a long period, but its main effect on land condition is through changing the distribution of grazing. Overstocking and poor land management practices have the potential for irreversible consequences.

2.3.7.2 Pasture

Northern Australian beef cattle rely mainly on native grass, with few improved sown grass and legume pastures. Pasture productivity and nutritional value are the primary drivers of cattle production. With a marked seasonal rainfall pattern, pasture growth is confined mostly to the wet season, which can be erratic in both timing and quantity of rainfall.

During the dry season, cattle often lose body condition, experience slow growth and struggle to maintain weight due to low digestible energy and crude protein, pasture senescence (drying off) and overall poor pasture quality (Chilcott et al 2020).

[25] https://futurebeef.com.au/wp-content/uploads/2020/12/NB2-What-causes-calf-loss-fact-sheet-PDF-3-MB.pdf

[26] www.mla.com.au/research-and-development/livestock-production/reproductive-efficiency/nb2-hub/

The combination of amount, timing and effectiveness of rainfall is a major driver of the quantity, composition and quality of pastures. Uncertainty around the wet season is a significant management issue for which pastoralists have limited strategies for mitigation.

2.3.7.3 Supplementation

Cattle grazing native pastures in northern Australia are generally limited by protein during the dry season and phosphorus during the wet season.

Soils across northern Australia may be either marginally or acutely deficient in phosphorus and pastures growing on these soils do not contain enough phosphorus for cattle nutritional requirements.

However, there may be variation in soil types within a paddock, and cattle will source the pasture which contains adequate phosphorus before consuming pasture grown on the phosphorus-deficient soils. In North Queensland, deep sands are acutely phosphorus deficient while most other soil types are deficient to marginal. The Barkly Tableland is largely deficient but may contain isolated pockets of adequate soils. In Western Australia, the Pindan region of the Kimberley is generally considered acutely phosphorus deficient, while some areas of the Pilbara contain many land types and careful consideration of phosphorus strategies is required (MLA 2023b).

Cattle grazing phosphorus-deficient pastures require a phosphorus supplement. Feeding of an effective phosphorus supplement enables cattle to utilize 10–30% more pasture. Phosphorus supplementation yields the greatest economic benefit when fed during the wet season. If phosphorus is fed over the wet season on deficient country, young growing stock can increase their growth significantly above base growth and breeders can increase weaning rates by 10–30% and mature breeders can maintain additional weight over the wet season. Putting out regular wet season lick blocks is preferred as this allows producers to monitor cattle and ensure consumption of target amounts. Paddock access during the wet season may be difficult, in which case bulk amounts of phosphorus can be put out at the end of the dry season or bulk bags can be transported to paddocks via helicopter.

Some phosphorus supplement is also required by breeders in the dry season to minimise the mobilisation of reserves from the body in response to high demand during pregnancy and lactation.

In the dry season, the protein content and digestibility of pasture decreases, causing a reduction in cattle growth rates. Supplementing nitrogen enables the cattle to gain more nutritional benefit from the senescent tropical grasses. Urea is the main source of supplementary nitrogen and is usually supplied to cattle in the form of loose lick or lick blocks, but can also be administered in water. While administration in water provides a more consistent level of supplement across the herd, it requires close monitoring.

2.3.7.4 Fire management

Traditional Custodians have been using fire to manipulate fuel loads, maintain vegetation and enhance biodiversity in northern Australia for tens of thousands of years. Australia's northern grasslands are the largest intact tropical savanna ecosystem in the world. Indigenous fire management involves strategically burning small areas in cooler months throughout the dry season. This approach is known as patchwork mosaic burning. Without this land management, dry grasses build up and provide fuel for lightning-sparked wildfires later in the year, which burn significantly larger areas at hotter temperatures.

The pastoral industry has adopted fire management in many land types across northern Australia to improve feed quality, alter pasture composition, manage distribution of grazing land and maintain the tree–grass balance (McIvor 2010). Early fire management mitigates risk and provides nutritious green feed from regrowth.

There are 2 general sources of ignition for fires in northern Australia: lightning and people. Lightning-initiated fires are especially common during the early stages of the wet season (in association with storms), particularly in monsoonal areas.

A controlled burn is a fire that is planned for a specific part of a paddock and for a specific reason, such as pasture rejuvenation, woody weed control and prevention of wildfires. A controlled burn can become a wildfire if adequate safeguards are not taken. Wildfires cause significant destruction to pasture, causing a loss of feed and nutrition, poor ground cover and poor pasture response and commonly occur following an extended wet season with good pasture growth and high fuel loads.

The Northern Australia Fire information (NAFI)[27] website is a fire mapping tool that displays fire management data, such as hotspots (locations of recently burning fires as detected by satellites) and fire scars (maps of recently burnt country as detected by satellites) and displays them as maps tailored to northern Australian conditions. Fire mapping can be useful when planning EAD response activities to understand the feed base available to maintain herds.

2.3.7.5 Feral animal control

Feral animals have a significant impact on northern Australian pastoral enterprises. Their effect varies based on region, property infrastructure and vegetation. Section 5.4.12 outlines the major feral and other wild animal species in northern Australia.

2.3.8 Infrastructure

The northern Australia beef cattle industry is highly dependent on infrastructure for profitable business. The north has unique challenges for infrastructure investment including a small, sparse and transient population, long distances and harsh climatic conditions, underdeveloped and/or vulnerable supply chains and a higher risk business environment. There has been a recent focus on infrastructure investment in the north through the Northern Australia Infrastructure Facility (NAIF) to support biosecurity and agricultural supply chains.[28]

2.3.8.1 Roads and transport

The road network across the north (Figure 2.8) is critical infrastructure connecting pastoral properties to not only beef cattle markets but also essential community services. Livestock transport in northern Australia is characterised by long distance supply chains between production, processing and markets across Australia. Transport distances for cattle are often upwards of 2,500 km. More than 50% of Northern Territory cattle are transported in excess of 1,000 km to markets (McCosker et al 2010).

The industry in the north is almost exclusively reliant on road for both business inputs and outputs. However, year-round access in the north is not possible due to a sparse road network that is regularly inaccessible in the wet season due to flooding or wet road conditions.

[27] www.firenorth.org.au/nafi2/

[28] www.naif.gov.au/

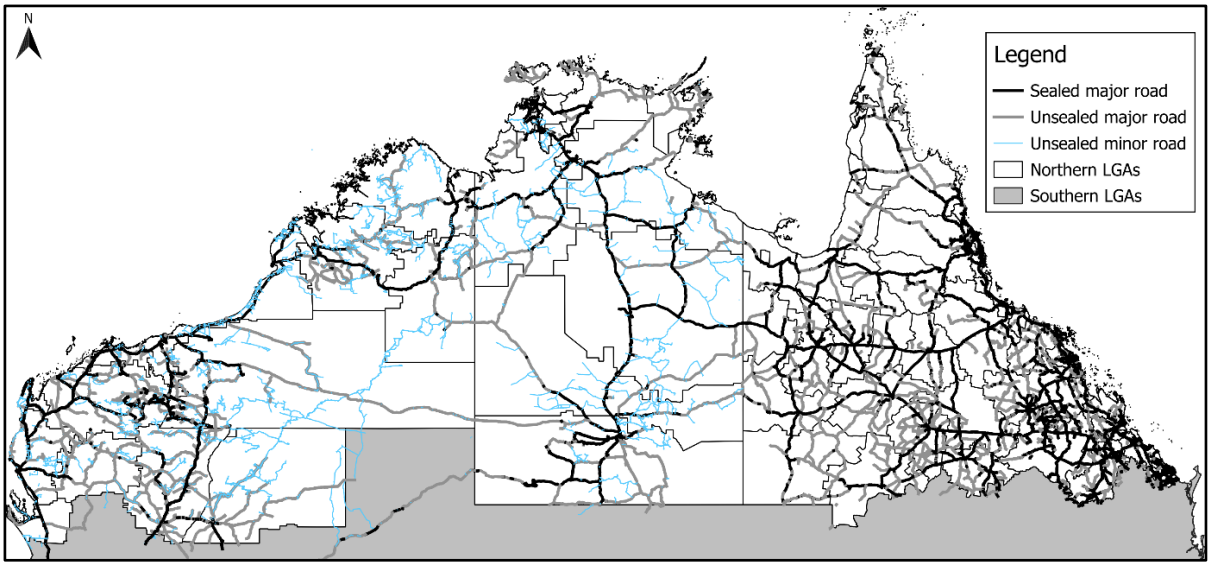

Figure 2.8 Map of the northern Australia road network

Source: NTG DAF (2024)

Cattle that do not go to live export markets through the northern ports are usually transported to properties, saleyards, feedlots and abattoirs in the eastern and southern states.

The northern beef road conditions affect livestock transport vehicle type access, average speed, transport cost per kilometre and routes to supply chain destinations. Bitumen highways connecting the states and the Northern Territory across the north are supported by a network of single-lane bitumen roads and extensive networks of unsealed dirt roads. The Great Northern Highway connects Perth and Wyndham through Broome and Halls Creek, Western Australia. The Stuart Highway connects Darwin, Northern Territory, and Adelaide, South Australia. The Victoria Highway connects Katherine, Northern Territory, and Kununurra, Western Australia. The Barkly Highway connects the Threeways junction near Tennant Creek, Northern Territory, and Cloncurry, Queensland. The Flinders Highway connects Townsville to Cloncurry, Queensland.

Road access restrictions for Single (semitrailer), B-double (2 trailers), and Type 1 and Type 2 road train vehicles frequently change with road conditions impacted by climate and roadworks. There may be restrictions in moving cattle to southern and eastern Australian abattoirs, ports, saleyards and properties as access roads to these facilities are limited to B-double access. Not only is there a higher cost per tonne for transport using smaller vehicle combinations, but there is an additional cost for breaking down larger vehicles (e.g. Type 2 road trains) into smaller configurations (e.g. B-doubles). Another restriction is the requirement for cattle tick inspection and treatments when transporting cattle from a cattle tick-infested area to a cattle tick-free area. Drivers will often avoid travelling into the cattle tick-free areas (where possible) even if/when it involves a significant detour and a higher transport cost (Higgens et al 2017). There have been recent targeted upgrades to key northern Australian beef roads necessary for transporting cattle to supply chain markets.[29]

MLA's Transport Hub,[30] developed in collaboration with the Australian Livestock and Rural Transporters Association (ALRTA) and Trucksafe® Animal Welfare, provides information about transporting beef cattle safely, legally and humanely. The Hub provides details on the effective preparation practices for transport including the fit to load checklist, time off water and spelling periods for each class of beef cattle, and loading density, as well as the consigner, transporter and receiver responsibilities. This assists producers

[29] https://investment.infrastructure.gov.au/projects/key-projects/northern-australia-roads-program-and-northern-australia-beef-roads-program

[30] www.mla.com.au/extension-training-and-tools/resource-hubs/transport-hub/

and transporters in meeting requirements of relevant state and territory legislation and the national welfare standards for land transport of livestock.

The LivestockASSIST national 24-hour hotline (1800 4 ALRTA or 1800 425 782) is available to coordinate emergency responses to incidents involving heavy vehicles carrying livestock.

2.3.8.2 Ports

Northern Australia ports with infrastructure to load cattle for export include Broome, Wyndham and Port Hedland in Western Australia, Darwin in Northern Territory and Townsville in Queensland.

2.3.8.3 Aviation

Northern Australia is heavily dependent on aviation for safe, affordable, accessible and reliable travel to connect people to essential services. Airstrips are commonplace on pastoral properties and in remote Indigenous communities. Light aircraft and helicopters are routinely used for transport of people and freight and for aerial mustering on cattle stations.

2.3.8.4 Biosecurity inspection facilities, saleyards, transit yards and export yards

There is currently one manned biosecurity inspection point at a border crossing in northern Australia located near Kununurra, Western Australia (on the border of Western Australia and the-Northern Territory). While there is biosecurity signage at a number of border crossings, inspections and treatment of livestock are routinely undertaken at government-owned or privately owned yards along the major transport routes or on pastoral properties. Temporary checkpoints may be established at any location with supporting amenities; however, infrastructure including yards with water and feed, loading ramps and restraint facilities would be required for the inspection of livestock.

2.3.8.5 Wash-down facilities

There are limited publicly accessible wash-down facilities strategically located across northern Australia due to the high cost associated with building and maintaining the facility including water access and environmental management. A comprehensive review of the feasibility of a Kimberley based wash-down facility was undertaken recommending a potentially viable investment by the private sector. Within Queensland, some local governments provide facilities suitable for machinery and vehicles for industry and public use. Most road-train companies and mining companies have facilities to clean machinery and vehicles.

2.3.8.6 Digital connectivity

Digital and mobile connectivity in northern Australia is limited, significantly impacting business and services, and has relied on geostationary orbit satellite, medium-earth orbit and ultra-high frequency (UHF) radio networks for communication on remote pastoral properties. There has been an increasing transition to low-earth orbit satellite for internet coverage around homesteads and direct-to-handset connectivity via LEO satellite is emerging for text messaging in remote locations.

2.3.8.7 Cattle station infrastructure

Infrastructure investment on large northern Australian extensive pastoral properties in fencing, yards and watering points is expensive, so producers require objective evidence and tools to target and optimise property development. Many paddocks remain large and underwatered, which can lead to limited carrying capacity, areas of declining land condition around watering points, high energy expenditure of cattle to reach water, poorer conception rates and increased calf loss.

2.3.8.8 Yards

Nearly all yards in northern Australia are constructed with steel due to the risk of destruction by termites and to withstand the large number of cattle and temperament of cattle yarded. There are usually one or more sets of main yards strategically located across the property with one of the main yards located near the homestead.

2.3.8.9 Portable yards, trap-yards and self-mustering

Portable yards may be used when the cost of building a number of fixed yards is uneconomical or when mustering in areas on a property that are not normally mustered. Portable yards are also used in conjunction with trap yards or self-mustering yards to effectively and efficiently muster, reduce stress on cattle and draft and process cattle with fewer staff and considerably less cost.

Fenced laneways may be constructed between paddocks and yards to reduce mustering costs. Holding and cooler areas are located near yards to hold cattle when they are not being processed through the yards.

2.3.8.10 Water

Well-maintained livestock watering points, which provide adequate supplies of clean drinking water, are essential in the harsh environments of northern Australia. Daily consumption of water by cattle varies considerably according to:

- breed
- class of stock
- age and condition of the animal
- quality and nature of feed
- climatic conditions
- quality of the water.

Cattle usually drink about one-third of their requirements at one time. *Bos taurus* breed cattle require up to 25% more water than *Bos indicus* breeds. Dry cows (non-lactating) may drink 40 L per day at ambient temperatures of 25 °C, which increases to 70 L per day at 32 °C, and higher during very hot conditions. Wet cows (lactating cows) may have a daily water intake that is 30% higher than that of dry cows. In northern Australia, summer temperatures significantly influence daily intake of water. High humidity with higher temperatures increases thirst. Water requirements of cattle are closely related to dry matter (DM) intake of feed. The daily water requirements of *Bos indicus* breed cattle are estimated to be 4.5 L/kg DM intake of feed at ambient temperatures of 25 °C, rising to 8 L/kg DM feed intake at 35 °C.

There are 3 major sources of water on a pastoral property:

- dams
- bores and wells
- natural rivers and waterholes.

Dams

Dams or 'Turkey nests' are the most common type of stock water supply in pastoral areas. They are favoured where groundwater is unavailable, poor quality, poor supply or at considerable depth. Up to half the water in dams is lost through evaporation in northern Australia. Fencing off dams can save cattle from bogging late in the year, keep the water cleaner from faeces and urine and reduce water losses caused by cattle dragging water out of the dam. Dams that are fenced off require a pump, tank and trough.

Turkey nest dams consist of a completely enclosed earth embankment, which is filled by pumping from an alternative water source.

Bores and wells

A major source of water in the pastoral areas of northern Australia is from underground aquifers accessed with the use of bores and wells. There are two major types of aquifers:

- artesian water where the water flows under pressure from underground to the surface with no need to be pumped
- sub-artesian water is generally shallower than artesian water and requires pumping to lift the water to the surface.

Unless the pastoral property lies over an artesian basin such as the Great Artesian Basin or the Canning Artesian Basin, the water will need to be pumped to tanks and troughs. There are a number of power units that drive water pumps, including conventional windmills, diesel motors and solar power.

The dependence on artificial waters reduces mustering costs via self-mustering, as the cattle can be more readily trapped into holding paddocks and yards using one-way spear trap gates.

2.4 Industry organisations and Indigenous participation

Cattle Australia is the national peak body representing Australian grass-fed cattle producers.

State and territory farming organization members of Cattle Australia representing the northern Australia beef cattle industry include:

- Northern Territory Cattlemen's Association
- AgForce Queensland Farmers
- Pastoralists and Graziers Associations of Western Australia
- Western Australian Farmers Federation.

The Kimberley Pilbara Cattlemen's Association (Western Australia) is also a member of Cattle Australia.

2.4.1 Cattle Australia

Cattle Australia[31] is the national peak body for the grass-fed cattle industry and provides leadership and direction in the development of policy and guidance for research, development, adoption and marketing investment. Cattle Australia is governed by a Board of elected Directors. A Regional Consultative Committee comprising elected levy-paying producers from the Meat and Livestock Australia (MLA) Regional Advisory Council regions and State Farming Organisation representatives is chaired by the Cattle Australia Chief Executive.

2.4.2 Northern Territory Cattlemen's Association

The Northern Territory Cattlemen's Association (NTCA)[32] is the peak cattle industry body in the Northern Territory. It is focused on advancing and protecting the interests of the Northern Territory pastoral industry. NTCA represents more than 90% of the Territory's pastoral industry, from small family pastoral holdings and Indigenous enterprises to large corporate entities. The NTCA Board comprises the President, NTCA National Farmers' Federation representatives and the Chair and Deputy Chair of each of the 4 NTCA branches (Top End, Katherine, Barkly and Alice Springs). The NTCA office is based in Darwin and has a second office in Alice Springs.

2.4.3 AgForce

AgForce[33] is the peak organization representing Queensland's broadacre cattle, grain, cane, sheep, wool and goat producers. The AgForce Cattle Board develops policy on behalf of the Queensland cattle industry and comprises the AgForce Cattle President, Policy Director and Directors from AgForce's North (6), Central (4), South East (2), South West (1) and Southern Inland (2) regions. The AgForce Cattle Board directors are all cattle producers. The AgForce North Queensland offices are based in Longreach and Ayr.

2.4.4 Kimberley Pilbara Cattlemen's Association

The Kimberley Pilbara Cattlemen's Association (KPCA)[34] is the peak cattle industry body in northern Western Australian. It represents a diverse range of producers and members of the beef supply chain across the Kimberley and Pilbara and into the Gascoyne region. The KPCA is a not-for-profit industry development and advocacy body, supporting and promoting a resilient, profitable and sustainable beef

[31] https://cattleaustralia.com.au/
[32] https://ntca.org.au/
[33] www.agforceqld.org.au/
[34] https://kpca.net.au/

industry in the region. The KPCA executive comprises representatives from across the Kimberley and Pilbara beef supply chain. The KPCA office is based in Broome.

2.4.5 Indigenous participation in the northern beef cattle industry

Indigenous Australians hold extensive areas of pastoral lands across northern Australia and have a deep and complex history with the pastoral industry. This experience along with knowledge and skills of traditional land management practices, means Indigenous Australians have a unique contribution to make to the long-term management of the northern Australia beef cattle industry.

First Nations people have been integral to the history and development of the northern Australia beef cattle industry. Aboriginal people have extensive knowledge of the land, and this knowledge has been vital to the operation of grazing enterprises. The northern Australia peak cattle industry organisations have strong Indigenous pastoral representation and engage with First Nations people to care for Country and develop the industry sustainably with regard to culturally driven land management.

For example, in the Northern Territory, the Indigenous Pastoral Program was developed by the Northern Land Council and Central Land Council in partnership with other stakeholders including NTCA to increase Aboriginal-managed pastoral production, commercial viability and improve rangelands management on Aboriginal land.

The industry has also supported pathways to employment for First Nations people in the industry. The Aboriginal Pastoral Academy,[35] for example, focuses on supporting employment pathways for Aboriginal people in the north-west pastoral industry of Western Australia. The Academy provides an intensive training program to help young Indigenous people gain the necessary skills and experience to join the 'job-ready' pastoral industry workforce and continue along a supported career path. The training provided is in line with the Yawuru people's traditional values and wellbeing philosophy. NTCA has also coordinated the Real Jobs program in the Northern Territory, offering training and support to young Indigenous people to get jobs in the pastoral sector.

KPMG (2023) indicated that one of the most significant barriers to attracting and retaining more Indigenous participation in contemporary agriculture is lack of cultural awareness and cultural competency within organisations, sectors, training and education forums and industry settings.

2.4.5.1 Pastoral land management

Indigenous pastoral properties in northern Australia are on land that has been the home for Aboriginal peoples for tens of thousands of years. The groups who own or manage this land retain knowledge passed on to them through countless generations — mostly via oral tradition. Much of this knowledge is handed down in the form of stories and song lines. These stories and song lines are also associated with areas of significance (often known as sacred sites) which may be within the boundaries of a property that is part of the pastoral business and operated by the local Indigenous corporation. These stories, significant sites and, in some cases, cultural material are all part of the rich fabric that is often described as 'cultural heritage'. Indigenous communities keep their cultural heritage alive by passing their knowledge, arts, rituals and performances from one generation to another; speaking and teaching languages; and protecting cultural materials, sacred and significant sites, and objects.

Land is fundamental to the wellbeing of Aboriginal peoples. The land is not just the physical attributes of soil, rocks and plants, but a whole environment that sustains the people and their culture. For these reasons, the Traditional Custodians of the land on pastoral properties should be recognised with respect to this heritage (McLelland Rural Services 2014).

[35] https://aboriginalpastoralacademy.com.au/

Northern Australia has more than 50 Indigenous pastoral properties (ILSC 2023). Land tenures include pastoral leases, Aboriginal freehold land and land managed by Aboriginal land trusts for the benefit of Aboriginal people. Indigenous landholders with commitments to place will often not sell land and thus cannot access the capital gains that substitute for operating profits in many pastoral locations (NAILSMA 2020). Landholders are challenged to finance establishment and maintenance of a small cattle herd and property infrastructure. Expertise in the physical operations of a cattle station and comprehensive ecological knowledge of Country is not always accompanied by the knowledge and experience required to manage a pastoral property or to adapt to changes in the industry and regulatory requirements. Subleasing or agistment on neighbouring properties is a common point of partnership between pastoralists and Aboriginal landowners.

The Aboriginal pastoral industry faces challenges such as limited access to finance, complex governance and decision-making processes, inadequate training, low employment opportunities, and a community focus on using generated revenue for community objectives rather than reinvesting in the business. The complexity of running a business that aims to achieve social, cultural and environmental outcomes alongside cattle production adds to the operational challenges.

Market constraints, long distances to markets, high staff turnover and reliance on contractors also pose challenges for viability. Economic returns and potential employment from expanded pastoral activity on marginal lands are likely to be very low and contribute little to employment needs, which continue to grow rapidly (Russell-Smith & Whitehead 2015).

Barnett et al (2022) indicated there is a small emerging First Nations primary production industry that is increasingly financially sustainable and delivering significant cultural, environment and social benefits to the community. The analysis indicated a high agricultural potential across the Indigenous Estate, particularly along the northern Australia coastline. These opportunities are supported by the proposal of an Indigenous Agricultural Product credentials system that would authenticate Indigenous agricultural produce and products (NFF et al 2024).

Pastoral properties in northern Australia are also unique in that a significant proportion of pastoral properties (both Indigenous and non-Indigenous pastoral lands) host whole Indigenous communities, which live on the property or nearby. Most of these community residents see the pastoral property as their traditional land. While some residents are involved in the pastoral enterprise, many live on the properties for traditional cultural and social reasons. In the Northern Territory, Aboriginal people with historical connection to pastoral leases can obtain a small excision from the lease, called a community living area.

The Australian Government's Indigenous Rangers Program (GHD 2022) assists First Nations people in managing Country according to Traditional Custodians' objectives. Indigenous Rangers use traditional knowledge and cultural practices, combined with Western science, to manage land, river and sea Country and deliver environmental, cultural, social and economic development outcomes. Caring for Country plays a key role in land and sea management, including fire management and feral weed and animal control, and has been active in preserving traditional knowledge for future generations. Northern Australia state and territory governments also support Indigenous Rangers to work on Country across different land tenures, including Native Title lands, protected areas, pastoral leases and private lands. The Western Australia Aboriginal Ranger program,[36] Queensland Indigenous Land and Sea Ranger program[37] and Northern Territory Aboriginal Ranger Grants program[38] provide support to Aboriginal Ranger groups to manage their land and sea Country.

Potential challenges during an EAD response for some of the Indigenous owned or managed properties in northern Australia include property access, particularly to areas with sites of significance and at times when

[36] www.dbca.wa.gov.au/management/aboriginal-engagement/aboriginal-ranger-program

[37] www.qld.gov.au/environment/plants-animals/conservation/community/land-sea-rangers/about-rangers

[38] https://environment.nt.gov.au/careers-programs-publications/aboriginal-ranger-grants-program

ceremonial events occur, lack of infrastructure to safely undertake operations, unmanaged cattle and other susceptible species, and deliberation on ownership.

2.5 Industry regulation, standards and programs

Government regulations and industry-based quality assurance programs allow industry to demonstrate supply chain traceability, food safety standards, animal welfare outcomes and environmental credentials to support trade to domestic and international markets.

While the northern Australia beef cattle industry does not have specific industry programs, several national industry programs are focused on meeting the trade protocols of importing countries and protecting industry, and would be integral in the management of an EAD event.

Feedlots and processors also have industry accreditation and certification systems to demonstrate quality management and industry best practice standards.

2.5.1 Integrity systems

Industry's on-property quality assurance and supply chain traceability from paddock to plate is delivered by the Integrity Systems Company, a subsidiary of Meat and Livestock Australia (MLA). Incorporating on-property assurance and livestock traceability, the red meat integrity system helps to protect the disease-free status of Australian red meat and underpins the marketing of Australian products as clean, safe and natural.

2.5.1.1 Identification and traceability — National Livestock Identification System (NLIS)

Traceability in the event of an EAD outbreak is critical to prevent the spread of disease and limit the duration of trade disruptions. The National Livestock Identification System (NLIS) is Australia's system for the identification and traceability of cattle. NLIS combines three elements to enable the lifetime traceability of animals:

- All livestock are identified by a visual or electronic ear tag/device.
- All physical locations are identified by means of a Property Identification Code (PIC).
- All livestock location data and movements are recorded in a central database.

All cattle producers must identify their stock and record their movements onto and off properties in the NLIS database. All movements to and from saleyards, transit and export yards and to abattoirs must also be recorded. NLIS is a permanent, whole-of-life system that allows animals to be identified individually or by mob and tracked from property of birth to slaughter or export, for the purposes of food safety, product integrity and market access.

The state and territory governments are responsible for the legislation that governs animal movements and NLIS. Information on cattle movements is recorded on movement documents including waybills, health certificates and National Vendor Declarations (NVDs) and entered on the NLIS database by producers, yard operators, livestock agents and processors. The Integrity Systems Company administers the NLIS database for industry and government stakeholders.

2.5.1.2 On-property assurance — Livestock Production Assurance

Livestock producers play an integral role in ensuring on-property biosecurity practices are implemented to reduce biosecurity risks. The Livestock Production Assurance (LPA) program is the on-property assurance program that underpins market access for Australian red meat. LPA NVDs provide evidence of livestock history and on-property practices when transferring livestock through the supply chain, providing assurance of food safety and ethical production. Seven requirements make up the LPA program:

- property risk assessment to assess the risk of livestock on a property being exposed to areas that are contaminated with organochlorides or other persistent chemicals

- safe and responsible animal treatments to ensure that livestock intended for human consumption do not contain unacceptable chemical residues or physical hazards
- stock feed, fodder crops, grain and pasture treatments to ensure that livestock are not exposed to feeds containing unacceptable contamination, especially animal products or unacceptable chemical residues
- preparation for dispatch of livestock to ensure that livestock to be transported are fit for the journey and not unduly stressed, and that contamination is minimised during on-farm assembly and transport to the destination
- recording of livestock transactions and movements to ensure livestock can be traced, if necessary, and that the livestock are accompanied by information on their status regarding exposure to chemical residues
- biosecurity to minimise the risks of introducing infectious diseases to livestock production properties and spreading diseases between properties
- animal welfare to ensure that livestock management is consistent with the requirements of the relevant Australian Animal Welfare Standards and Guidelines.

Producers who choose to participate in the LPA program commit to carrying out on-property practices that feed into and support the integrity of the entire system. This integrity is verified when producers sign LPA NVDs for cattle movements, which are required for all movements including property-to-property, through yards, direct to processors and feedlots, and the live export trade.

As part of the LPA program, all accredited producers must have a documented and implemented biosecurity plan. The program is managed on behalf of the red meat industry by the Integrity Systems Company and is independently audited. In 2022, audits conducted by the LPA Program showed 80% of LPA-accredited producers had a biosecurity plan in place (MLA 2023c).

Producers are required to renew their LPA accreditation every two years to ensure that their knowledge of the program is up to date. While LPA is a voluntary program, it is recognised by both domestic and international supply chains and producers supplying processors will be accredited.

2.5.1.3 National Vendor Declaration

The NVD and electronic NVD (eNVD) are legal documents that communicate the food safety and treatment status of every animal as it moves through the supply chain. eNVDs provide real-time data on livestock movements. The eNVD mobile application enables end-to-end digital tracking for livestock consignments, improving the timeliness and accuracy of livestock consignment data, regardless of connectivity. A signed LPA NVD or eNVD declares on-property practices meet the 7 requirements of the LPA program listed above.

2.5.1.4 Exporter Supply Chain Assurance System

The Exporter Supply Chain Assurance System (ESCAS) is a regulatory requirement that all Australian exporters must meet to export feeder or slaughter livestock from Australia.

The 4 principles of ESCAS are:

- animal welfare standards
- control through the supply chain
- traceability of livestock through the supply chain
- independent auditing of ESCAS facilities.

ESCAS requires exporters to have arrangements in place along the supply chain for the humane handling and slaughter of livestock in the importing country. The arrangements must be in accordance with the World Organisation for Animal Health (WOAH) animal welfare recommendations. This applies to all

importing country feedlots, depots, and abattoirs. The arrangements must cover facilities and transport, including discharge from the vessel for livestock arriving by sea, and processors.

2.5.1.5 European Union Cattle Accreditation Scheme (EUCAS)

The European Union Cattle Accreditation Scheme (EUCAS) is a regulatory requirement which all Australian EUCAS accredited properties, feedlots, saleyards and abattoirs must meet to ensure beef exported to the European Union (EU) comes from animals raised on EUCAS accredited properties. EUCAS allows Australia to meet the EU market requirements for beef by segregating cattle that have never been treated with hormonal growth promotants (HGPs) at any time. Northern Australia beef enterprises that supply EUCAS accredited properties, feedlots, saleyards and abattoirs in eastern and southern states must be EUCAS accredited. Some northern beef enterprises use HGPs to improve growth rates and feed efficiency in the beef cattle and these properties are not eligible for EUCAS.

2.6 Legislation relevant to the industry

2.6.1 Biosecurity legislation

Legislation at both the Commonwealth and state and territory levels has been enacted for controlling EADs. The *Biosecurity Act 2015* (Cth) is primarily concerned with preventing the introduction of disease into Australia. State and territory legislation relating to the management of livestock diseases contains wide-ranging provisions that can influence operational procedures during the management of an EAD response.

The Acts and subordinate legislation establish controls over movement of animals and animal products, treatment of animals, decontamination, slaughter and compensation. Powers are conferred on authorised officers appointed under legislation, including the authorisation to enter premises, impose quarantine or biosecurity obligations, restrict movement of livestock and livestock products, order livestock musters, test and treat animals, and order the destruction of animals and products that are suspected of being infected or contaminated. Relevant biosecurity legislation includes:

- Commonwealth *Biosecurity Act 2015*[39]
- Queensland *Biosecurity Act 2014*[40]
- Northern Territory *Livestock Act 2008*[41]
- Western Australia *Biosecurity and Agriculture Management Act 2007*[42]
- Western Australia *Exotic Disease of Animals Act 1993.*[43]

2.6.2 Animal welfare legislation

State and territory legislation relating to the care and protection of animals, including livestock, is an important consideration in management of EAD responses. The *Australian Animal Welfare Standards and Guidelines for Cattle* have been incorporated under the relevant state and territory legislation. The *Australian Animal Welfare Standards and Guidelines for Land Transport of Livestock* and the *Australian Animal Welfare Standards and Guidelines for Livestock at Saleyards and Depots* also apply along the supply chain[44], as adopted in state and territory legislation. Relevant animal welfare legislation in the northern states and territories includes the following, noting that cattle transported to destinations elsewhere in Australia will be subject to the applicable legislation of the receiving jurisdiction::

- Queensland *Animal Care and Protection Act 2001*[45]
- Northern Territory *Animal Protection Act 2018*[46] and Northern Territory *Livestock Act 2008*[47]
- Western Australia *Animal Welfare Act 2002.*[48]

2.6.3 Land tenure, native title and heritage legislation

The interaction of land tenure with various legislation, including native title and heritage legislation, can be complex in northern Australia. Key legislation includes:

- Commonwealth *Native Title Act 1993*
- Commonwealth *Aboriginal Land Rights (Northern Territory) Act 1976*
- Queensland *Land Act 1994*

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39 www.legislation.gov.au/C2015A00061/latest/text
40 www.legislation.qld.gov.au/view/html/inforce/current/act-2014-007
41 https://legislation.nt.gov.au/Legislation/LIVESTOCK-ACT-2008
42 www.legislation.wa.gov.au/legislation/statutes.nsf/law_a146629.html
43 www.legislation.wa.gov.au/legislation/statutes.nsf/law_a261.html
44 https://animalwelfarestandards.net.au/welfare-standards-and-guidelines/
45 www.legislation.qld.gov.au/view/html/inforce/current/act-2001-064
46 https://legislation.nt.gov.au/Legislation/Animal-Protection-Act-2018
47 https://legislation.nt.gov.au/Legislation/LIVESTOCK-ACT-2008
48 www.legislation.wa.gov.au/legislation/statutes.nsf/law_a4340.html

- Queensland *Aboriginal and Torres Strait Islander Land Holding Act 2013*
- Queensland *Aboriginal Land Act 1991*
- Queensland *Torres Strait Islander Land Act 1991*
- Northern Territory *Pastoral Land Act 2011*
- Northern Territory *Crown Lands Act 1992*
- Northern Territory *Special Purposes Lease Act 1953*
- Western Australia *Land Administration Act 1997*
- Western Australia *Aboriginal Affairs Planning Authority Act 1972*.

Under the Native Title Act, proposed actions or developments that affect native title are classed as 'future acts'. Future acts include acts done after 1 January 1994 (the date of the commencement of the Native Title Act) that affect native title. Future acts can include the making, amendment or repeal of legislation, and the grant or renewal of licences and permits (e.g. grazing licences). The future acts regime in the Native Title Act establishes procedures to be followed so that the future act can be validly done. The procedures differ depending on the type of future act. Most relevant in the resources sector is the 'right to negotiate' given to native title parties. The *Native Title Act 1993* allows states and territories to legislate alternatives to the 'right to negotiate' or to seek an exemption from the 'right to negotiate' in specific circumstances.

Each jurisdiction also maintains its own cultural heritage legislation which interacts with pastoral operations.

2.6.4 Stock reserves and stock route legislation

The northern Australian pastoral industry uses stock reserves (or stock routes) for short-term grazing, for pasture for emergency agistment and as an alternative to transporting cattle by road or rail. Legislation relating to the use of stock routes includes:

- Queensland *Stock Route Management Act 2002*
- Northern Territory *Livestock Act 2008.*

2.7 Animal welfare

Animal welfare considerations on northern Australian beef cattle properties primarily relate to regular monitoring and management of cattle body condition, observation for serious injuries or debilitating conditions, and access to adequate quality feed and water during extended dry periods and drought.

Northern Australia is characterised by climatic extremes, expansive remote properties and long distances. These characteristics, together with low management inputs, create significant challenges for the industry to maintain high standards of animal welfare.

The use of cattle adapted to the northern Australian environment may alleviate potential welfare problems. For example, *Bos indicus* cattle have greater resistance to cattle tick compared to *Bos taurus* cattle. Planning and strategies for extended dry periods and drought help prevent and manage welfare issues. Some examples include the addition of adequate watering points and water infrastructure, early mustering, segregation of cattle, altering stocking rates to meet carrying capacity, supplementary feeding and crisis feeding of underconditioned and weak stock.

The *Australian Animal Welfare Standards and Guidelines for Cattle*[49] provide recommendations for dehorning and castration of cattle up to 12 months of age (at the first muster). The use of pain relief medications has improved the wellbeing of cattle by reducing the intensity and duration of the pain response. There has been significant transition to polled breeds of cattle in northern Australia to eliminate the need for dehorning.

Industry guidelines for the management of beef cattle in low body condition[50] outline how to assess beef cattle in low body condition, their feed requirements and suitability for transport.

In an EAD response, animal welfare impacts may occur from infection with the EAD, disruption to management or from disease control measures implemented.

International market closure, in addition to state and territory border closures, movement restrictions and diminished domestic market opportunities during an EAD response may lead to animal welfare issues on pastoral properties due to increased stocking densities and inadequate feed and water supply. The speed at which feed shortages will occur will be influenced greatly by the season.

Welfare issues associated with overcrowding and feed shortages may also occur where animals in transit are aggregated at points along the supply chain when movement restrictions are declared. Facilities at aggregation points (transit yards, saleyards and export yards) are not suitable for holding cattle for extended periods.

The **AUSVETPLAN** ***Operational manual: Livestock welfare management*** provides information on management strategies to address animal welfare issues in the event of an EAD.

[49] https://animalwelfarestandards.net.au/welfare-standards-and-guidelines/cattle/

[50] www.mla.com.au/globalassets/isc/pdf-files/lpa-documents/a-national-guide-to-describing-and-managing-beef-cattle-in-low-body-condition.pdf

2.8 Other industry-specific information

2.8.1 Land tenure

Land arrangements across northern Australia are diverse. Land tenure refers to the rights and responsibilities that people have in relation to land. It includes the various ways that land can be owned, managed and transferred, such as leases, permits and customary rights. Land tenure systems vary and different legal frameworks, cultural norms and historical factors shape the ways that land is owned and managed.

Northern Australia has proportionately more determined native titles, Indigenous land and pastoral leases than southern Australia (PM&C 2015) — this land is collectively known as the Indigenous Estate. Each jurisdiction has separate arrangements and legislation for pastoral leases, Aboriginal freehold and Aboriginal land trust lands. Most land (75.4%) in northern Australia is Crown-owned, two-thirds of which is pastoral leasehold. Another 18.5% is Indigenous land. Privately owned land accounts for 6.1% (Figure 2.9).

Land tenure is specifically relevant to EAD preparedness and response. Land tenure is the way a party or person holds or occupies an area of land. It is a way of identifying who has the right to use and occupy land according to the different types of ownership including who is responsible for the management and wellbeing of livestock and the management of wild and feral animals on the land. Familiarity with jurisdictional tenure types and interacting legislation is essential for an effective EAD response.

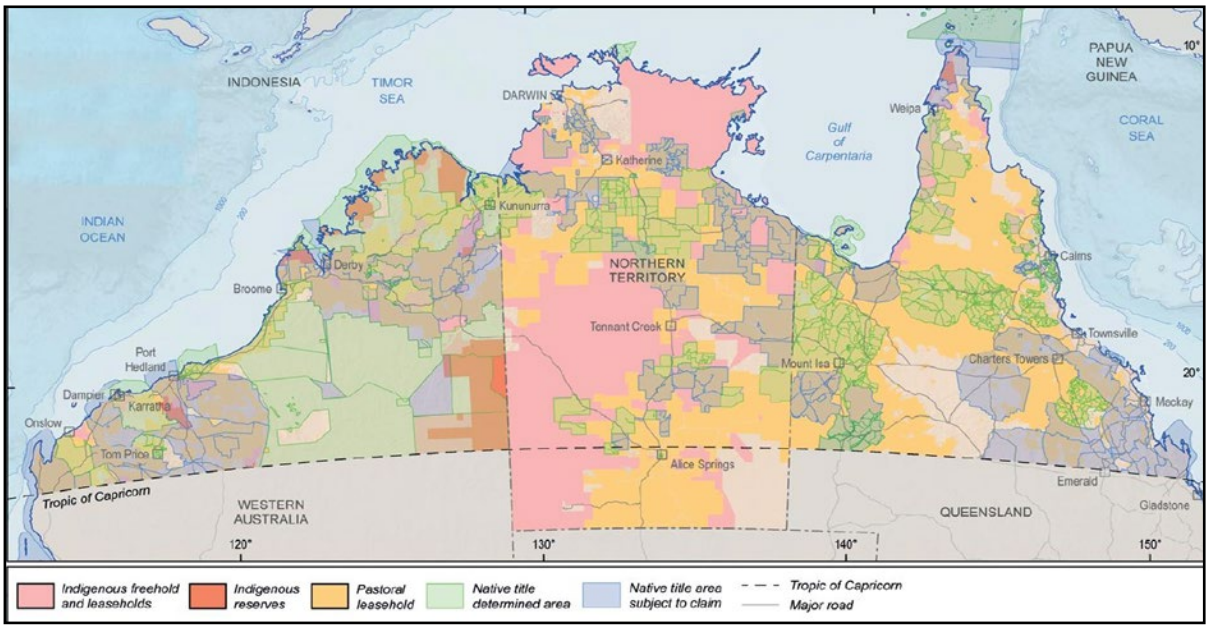

Figure 2.9 Map of northern Australia showing land tenure

Source: Geoscience Australia (2015)

2.8.1.1 Freehold land

Freehold land, also referred to as a 'grant in simple' or 'estate in fee' means the government has passed all interests in land other than resources onto the owner. This means the owner of the land has it for perpetuity, and there is no leasehold set to expire, but the Crown retains rights to reclaim oil, gas and minerals.

2.8.1.2 Pastoral leasehold

A pastoral lease is Crown land managed by the state or territory government, which is leased to a private individual or company, generally for the purposes of grazing livestock on rangelands. The terms and conditions of pastoral leasehold differ significantly across northern jurisdictions, given the distinct legislation of each jurisdiction. In northern Queensland, over 50% of the land is held under pastoral lease, compared with approximately 45% in the Northern Territory and 38% in northern Western Australia. Importantly, pastoral leases and native title rights coexist across northern Australia.

2.8.1.3 Aboriginal land

Indigenous land accounts for 28% of land in northern Australia or approximately 53 million ha (0.53 million km^2) (NAILSMA 2020). Traditional Owners have native title rights and interests across 78% of the northern Australian landscape, including on pastoral enterprises.

Land is of fundamental importance to Indigenous peoples for cultural, social and economic purposes. There are fundamental differences between land rights and native title rights, but both recognise Aboriginal and Torres Strait Islander peoples' connection to land. Land rights are rights created by state or territory governments. Land rights usually comprise a grant of freehold or perpetual lease title to Indigenous peoples. By contrast, native title arises as a result of the recognition, under Australian common law, of pre-existing Indigenous rights and interests according to traditional laws and customs.

Aboriginal land (separate from native title) accounts for approximately 50% of Aboriginal freehold land in the Northern Territory, 12% in northern Western Australia and 6% in northern Queensland. Aboriginal land is private property owned under special title, is not owned by individuals and is granted as a communal title. Land is formally held by Aboriginal land trusts, groups of Aboriginal people who hold the title for the benefit of all the Traditional Owners and people with a traditional interest in the land. Aboriginal freehold land is inalienable freehold title, meaning it cannot be sold.

Indigenous Land Use Agreements (ILUAs) are voluntary agreements between native title parties and other people or bodies about the use and management of areas of land and waters. ILUAs are governed by the *Native Title Act 1993* (Cth) and can have a wide scope.

Pastoral Land Use Agreements (PLUAs) are a specific agreement for a third party to use Aboriginal pastoral land and generally relate to subleasing pastoral land or providing agistment services. In Western Australia and Queensland, PLUAs are known as subleases and pastoral lessees require ministerial consent to enter into a PLUA.

In the Northern Territory, Section 19 of the *Aboriginal Land Rights Act 1976* allows for government, businesses, organisations and individuals to apply to an Aboriginal land council for leases over specific areas of Aboriginal land. When a Section 19 lease is applied for, the land council consults with Traditional Owners and other affected Aboriginal groups and communities to decide on each lease proposal. The lease proposal must be approved by the full council of the land council or by a delegated authority.

PLUAs provide Indigenous landowners with the means to generate income from land. One of the ways in which this income can then be used is to invest in infrastructure and skills training for Indigenous Australians.

2.8.1.4 Native title in relationship to land

Native title is the recognition by Australian law — under the *Native Title Act 1993* (Cth) — of Aboriginal and Torres Strait Islander peoples' traditional rights and interests in land and waters held under traditional law and custom. Indigenous Australians have native title rights over 78% of land in northern Australia. Over 90% of land of northern Western Australia is subject to a native title claim or determination, as is over 60% of northern Queensland and 30% of the Northern Territory.

Native title may comprise exclusive and non-exclusive native title rights. Exclusive native title is the right to control or prevent access by other land users. However, it is not the same as land ownership. Exclusive native title makes up 13% of Crown Land (National Native Title Tribunal [NNTT] 2024a) in the north. Non-exclusive native title rights include the rights to live and camp on land, hunt and fish, and light fires for personal and domestic use. These non-exclusive native title rights coexist with the rights of other land users.

Granting of pastoral leases partially extinguishes native title. Limited native title rights coexist and are recognised alongside other rights in land held under pastoral lease. While some native title rights (such as the right to control access to and use of the land) are extinguished by the granting of pastoral leases, other rights, such as rights to hunt, camp and perform a ceremony may continue. Jurisdictional legislation may also confer particular rights and interests, such as carrying out traditional activities.

Native title rights are generally communally held and cannot be sold. This protects Indigenous peoples' ongoing connection to their land. Native title does not exist on land which has been issued as freehold.

Understanding land ownership and native title rights and the Indigenous organisations that represent the interests of Aboriginal and Torres Strait Islander peoples in northern Australia can be complex. Aboriginal land trusts formally hold title to the land; Traditional Owners make decisions, as a group, regarding their land; and Aboriginal land councils manage collective land governance processes and act as the interface between Traditional Owners and external parties. Recognition and acknowledgement of native title rights are fundamental to effective biosecurity planning and management to achieve collective biosecurity emergency response outcomes. This is particularly evident for disease control strategies, including movement controls for vehicles, destruction of animals and disposal of carcasses.

Native Title Vision[51] is a geospatial tool for the visualisation and mapping of native title determinations across administrative regions and non-freehold land tenure (Figure 2.10), including the registered native title bodies corporate (RNTBC) or prescribed body corporate (PBC). Land councils and Registered Aboriginal Parties (RAPs) also function as peak bodies for Traditional Owners where no native title determination exists.

[51] http://www.nntt.gov.au/assistance/Geospatial/Pages/NTV.aspx

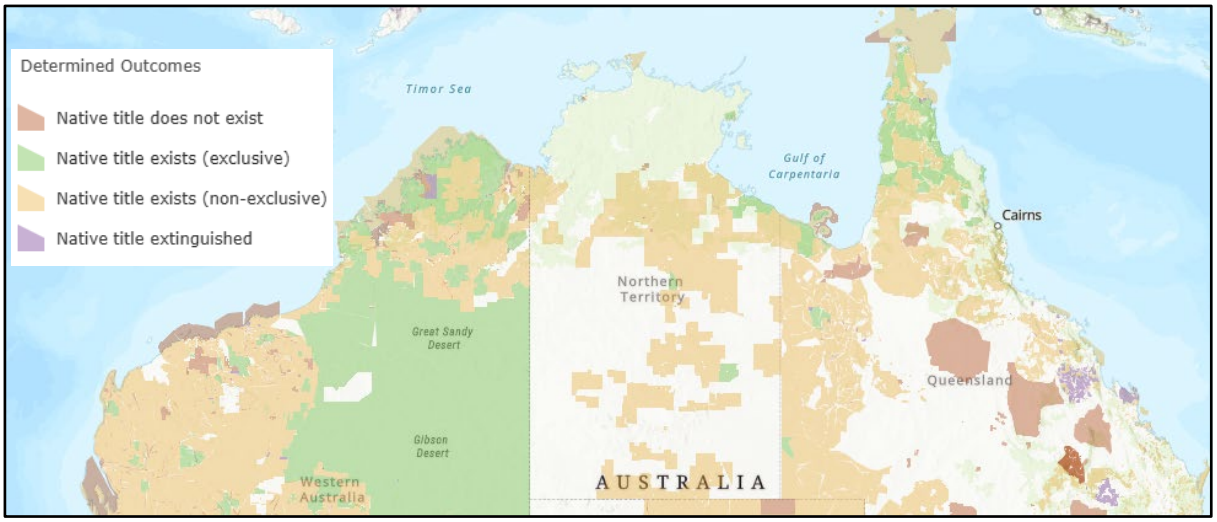

Figure 2.10 Map of native title determination outcomes across northern Australia

Source: NNTT (2024b)

Land councils representing the interests of Aboriginal people living in the northern Australian regions ensure that Aboriginal culture, traditions and law are respected and followed on Aboriginal land, and that the relevant community members make informed decisions. Land councils are established to protect the interests of Traditional Owners, assist with land claims and manage land-use consultation processes.

Land councils operate across northern Australia.

Queensland

- Cape York Land Council[52]
- Carpentaria Land Council Aboriginal Corporation[53]
- North Queensland Land Council[54]
- Torres Strait Regional Authority[55]

Northern Territory

- Central Land Council[56]
- Northern Land Council[57]
- Tiwi Land Council[58]
- Anindilyakwa Land Council[59] (Groote Eylandt region)

Western Australia

- Kimberley Land Council[60]
- Central Desert Native Title Services[61]
- Yamatji Marlpa Aboriginal Corporation[62] (Gascoyne [Yamatji] and Pilbara [Marlpa] regions)

52 www.cylc.org.au/
53 www.clcac.com.au/
54 https://nqlc.com.au/
55 www.tsra.gov.au/
56 www.clc.org.au/
57 www.nlc.org.au/
58 https://tiwilandcouncil.com/
59 https://anindilyakwa.com.au/
60 www.klc.org.au/
61 www.centraldesert.org.au/
62 www.ymac.org.au/

The Torres Strait Island Regional Council is also proactively collaborating with relevant stakeholders to develop a biosecurity plan and individual island action plans for the Torres Strait region.[63]

Parks and reserves, managed by the Australian Government or the state or territory governments, will create unique challenges for EAD response given public community access throughout the parks. Pastoral properties that border parks and reserves will need to consider disease risks and management strategies associated with wild and feral animals on these lands.

2.8.2 Stock routes

The travelling stock route network across northern Australia has a long history of supporting the pastoral industry, enabling cattle droving to other properties or markets. These routes follow corridors along river systems, artesian bores and Indigenous trade routes, providing feed, water and supplies. The network is recognised for significant Indigenous and non-Indigenous cultural heritage and provides geographical interconnectedness for the movement of wildlife.

The pastoral industry uses stock routes for short-term grazing, pasture for emergency agistment and as an alternative to transporting cattle by road or rail.

The Queensland stock route network[64] covers 72,000 km of roads, reserves and corridors on pastoral leases and unallocated state land across 48 local government areas. Movements are regulated under the *Stock Route Management Act 2002*. Permits are required for travelling stock on foot, grazing stock and using water facilities.

The Northern Territory stock route network[65] evolved into the major road network which now transports cattle by road trains and other routes have been largely resumed into the pastoral estate land. The major stock routes in the Northern Territory include the 250 km Murranji stock route, considered one of the most challenging stock routes to negotiate, the Buchanan stock route between Timber Creek and Dunmarra via Victoria River Downs and Top Springs, and the Barkly stock route across the Barkly Tableland. The rate at which travelling stock move is regulated under the *Livestock Act 2008* (NT). For all practical purposes, the Northern Territory stock routes no longer exist.

The major stock route in northern Western Australia is the Canning stock route, the longest stock route in the world, stretching more than 1,700 km through the Gibson, Great Sandy and Tanami deserts between Halls Creek in the north and Wiluna in the south. The track was created in 1910 to connect a string of 51 wells located a day's walk apart for watering stock en route to the markets. It was only used a short while for droving stock before the Port of Wyndham provided an easier option for transporting cattle south.

Knowledge of the cattle located on stock reserves or stock routes at the onset of an EAD response is an important consideration when planning effective disease control measures, especially where a livestock standstill is implemented. In Queensland, a request to the local council for current grazing permits will provide details of the location and number of cattle in these areas.

63 www.tsirc.qld.gov.au/our-work/pests-diseases

64 www.qld.gov.au/__data/assets/pdf_file/0024/527181/qld-stock-routes-map-2024.pdf

65 https://nla.gov.au/nla.obj-233091362/view

3 Emergency animal diseases and the northern beef cattle industry

The geographical location and extensive coastline make northern Australia the frontline for detecting and managing many emerging biosecurity threats that could impact Australia's economy, environment and culture. Surveillance in this region presents distinct challenges, with fewer managed commercial beef cattle herds near the coast compared to southern and eastern Australia. The landscape is characterised by diverse terrain and vast distances, which present challenges in applying disease control measures. The region's low population density, favourable environmental conditions for emergency animal diseases (EADs), and the presence of feral populations of susceptible animal species —including cattle, banteng, buffalo, pigs, camels, horses, donkeys, cats, and dogs—add further complexity. These challenges are influenced by a range of factors, including climate change, resource constraints, a challenging operating environment and changing trade and travel patterns.

The northern Australian beef cattle industry has long lived experience with the effect of disease control measures through the Brucellosis and Tuberculosis Eradication Campaign (BTEC). Australia was declared free from bovine brucellosis (*Brucella abortus*) in 1989. Targeted surveillance for *B. abortus* continued until the end of 1993. Australia was declared free from bovine tuberculosis (*Mycobacterium bovis*) in 1997, and targeted surveillance under the Tuberculosis Freedom Assurance Program continued across northern Australia until 2006. While the last case of bovine tuberculosis reported in cattle was in 2000 in northern Queensland and in buffalo in 2002 in the Northern Territory, the northern cattle industry distinctly understands the impact that EADs can have on every aspect of their livelihood and the importance of biosecurity and effective disease control measures.

Producers in the northern cattle industry have experience with property quarantine restrictions, movement controls, market constraints, biosecurity orders, surveillance testing, post-mortem sampling, destruction and disposal methods, abattoir monitoring, compensation processes and restocking.

The northern Australia beef cattle industry is also highly sensitive to trade disruptions, especially to the live export market. There have been extensive efforts for the northern Australian beef sector to diversify into other supply chains as the impact of even short periods of trade disruption can have devastating long-term impacts on the sustainability of industry. Diversification is also challenging due to the climate and land systems lending themselves to specialised breeding and breeding and growing systems.

The consequences of an EAD outbreak for the northern Australia beef cattle industry are exceptionally high with significant economic, social, animal welfare and environmental impacts. The northern beef industry provides significant employment, both direct and indirect, and is an economic strength to regional and remote areas. Loss of market access and trade and loss of cattle through disease control programs would strongly affect employment and the social networks that exist across the northern communities, and impacts would extend into live cattle importing countries. Animal welfare implications would potentially involve high mortality rates and production losses, especially where cattle are less capable of walking long distances in paddocks to feed and water. The environmental management of eradicating an EAD and the processes of destruction, disposal, decontamination and disinfection would be substantial. The immediate and long-term impact on international and domestic tourism would be unprecedented.

3.1 The risk of an emergency animal disease entering northern Australia

The Australian grass-fed cattle sector, particularly its large northern herd, faces the potential risk of a significant biosecurity incursion. Rural, regional and remote Australian communities cannot afford to lose this sector to disease incursion (CCA 2022). The biosecurity risk pathways in northern Australia that could expose susceptible livestock to EADs include international travellers with biosecurity risk material, movement of people through the Torres Strait, returning live export vessels, other vessels, and wind-borne dispersal of infected insect vectors.

Currently, importation of live cattle into Australia from overseas is not permitted. Semen and embryos may be imported from selected countries under strict import protocols. Importation of other livestock and livestock products is also strictly controlled. Import controls ensure a level of protection for the beef cattle industry. These legal imports are unlikely to be implicated in an EAD outbreak. However, illegal imports and other uncontrollable pathways of entry (e.g. vector-borne pathways) pose threats to the industry.

Windborne dispersal during cyclonic conditions has been demonstrated to transport insect vectors from neighbouring countries to northern Australia. Exotic *Culicoides* spp. midges and mosquitoes have been detected multiple times and have been implicated in the introduction of new disease incursions (Eagles et al 2012, 2013, 2014). While risk assessments undertaken by AusVet (2022a, 2022b) determined that the risk of lumpy skin disease entering Australia by non-regulated pathways, including by windborne dispersal of arthropod vectors, was negligible, the analysis identified the potential risk areas in northern Australia for long-distance windborne dispersal of arthropod vectors from neighbouring countries. The Tiwi Islands and the region extending east of Darwin up to and including the Cobourg Peninsula, Northern Territory, was identified to be at the highest risk of windborne incursion of vectors in northern Australia. Tropical cyclones are predicted to occur less frequently, but with increased intensity due to climatic change (Suppiah et al 2011, Moise et al 2015). This is an important factor to consider in assessment of the potential for windborne dispersal of insect vectors into remote regions of northern Australia.

People returning from overseas who have had contact with livestock could transfer a disease agent to northern Australian beef herds or other susceptible animals via footwear, clothing or myiases. Some risk pathways can be managed by property biosecurity plans (e.g. managing biosecurity and livestock contact on property for people recently returned from overseas where an EAD is present). Maintenance of strict biosecurity is therefore important for all beef cattle and livestock enterprises.

Travellers may also bring undeclared processed and unprocessed food into Australia. If undetected, these products could inadvertently be fed to farmed pigs or to the feral pigs that are abundant in northern Australia. Such products could contain serious viruses, such as foot-and-mouth disease (FMD) virus, which can infect pigs through feeding. If an incursion of FMD were to occur in Australia, it would have severe consequences for Australia's beef cattle industry.

There are numerous risk-mitigation strategies in place to reduce the likelihood of an outbreak, including—but not limited to—the requirement that food and food waste containing meat, meat products, milk or milk products not of Australian origin, or anything that has been in contact with these items, must not be fed to pigs. Feeding these materials to pigs is illegal in all states and territories of Australia.

Northern Australia has several designated international airports, including major international airports located in Darwin, Northern Territory, and Cairns, Queensland, restricted international airports in Broome, Western Australia and Townsville, Queensland, and alternate international airports in Alice Springs and Tindal, Northern Territory, and Rockhampton and Townsville, Queensland.

The risk of introduction and establishment of EADs is mitigated by import controls; however, the increasing movement of personal mail, cargo and people result in a changing risk profile to northern Australia and neighbouring countries.

3.2 Risk of disease spread from the enterprise

The potential for transmission of EADs within and between pastoral properties in northern Australia may be less than intensive beef cattle enterprises in southern Australia. Factors contributing to this include the large and extensive nature of pastoral properties in northern Australia with lower stocking densities and widely dispersed herds. East et al (2015) found that remote northern areas are more likely to experience smaller outbreaks that are less likely to spread or be reported to state and territory biosecurity authorities than outbreaks in the more developed southern areas of Australia. The potential extent of spread of an EAD in the north is unknown and an uncontrolled vector-borne disease such as lumpy skin disease or a population of infected feral animals with FMD could result in a prolonged and widespread outbreak in the north.

There is also opportunity for disease to spread within and from northern Australian beef properties to multiple enterprises over a wide geographical area associated with long-distance transport along the eastern and southern Australian supply chain. Regular, frequent contact between properties by road trains and trucks transporting livestock, feed and machinery, contract musters, livestock agents, veterinarians and other service providers are also risks for the spread of an EAD. These daily movements, which are part of the northern beef industry core business, may lead to the unknown spreading of an EAD before it is diagnosed.

Within a cattle property, an EAD may spread between cattle where they congregate at watering points or feed supplement and through infected feral animals moving across the landscape. Live animals, people, vehicles, vectors, wind, fomites and manure present modes of disease transmission. The relative importance of these depends on the nature of the disease involved, the source of infection, the number of animals affected, the number of susceptible feral animal species on the property and the degree of contamination of yards, vehicles, people and equipment. Given the many different pathways for disease transmission, it is vital that the degree of risk for each animal, person or item is assessed and control activities are prioritised to limit disease spread.

The main means of spread is usually through the direct contact between infected and susceptible stock on the property and the movement of stock incubating the disease but not yet showing any clinical signs of illness. Other means of spread include indirect contact between infective and susceptible animals via:

- road trains and other trucks carrying infected livestock
- people who have had contact with infected stock
- contaminated equipment
- feral or other wild susceptible animals
- other vehicles, people, manure and, for some diseases, insect vectors
- windborne spread, under some circumstances.

The challenge when confronted with a suspected disease outbreak will be to prioritise investigation and control activities, especially given initial information and resources are likely to be limited. The three basic tools of disease control are:

- quarantine (movement controls) and surveillance
- destruction and disposal of affected or at-risk animals
- disinfection of contaminated areas and equipment.

Although these tools can be applied very successfully with little knowledge of the particular disease of concern, more effective and targeted strategies can be used if there is knowledge of where the disease came from, how it spreads and where it may have spread to.

3.2.1 Factors to consider in assessing risk of disease spread

Key challenges of the northern beef industry include remote and sometimes inaccessible landscapes, sparse populations with a greater proportion of people identifying as Indigenous and living in remote communities on pastoral properties impacted by disease control activity, extensive pastoral production systems, abundant feral animals, and ongoing risk associated with the proximity to northern neighbouring countries, particularly with regards to vector borne diseases.

3.2.1.1 Live animals

Live animals pose the most significant risk of disease spread and livestock movements are usually the most important means of spread. Wild, including feral, animals can spread disease within and between properties and may pose a significant risk of transmission and disease spread between livestock. Wild animals can be subclinical carriers of some diseases and can also act as a reservoir for disease even after it has been eliminated from domestic livestock populations.

3.2.1.2 People

Service providers and visitors who commonly visit pastoral properties can be categorised as high risk, moderate risk and low risk. This is based on their degree of exposure to the disease through livestock interaction, the infective properties of the disease agent, and the likelihood of the disease being passed on given the temporal relationship of past and future animal interactions. Footwear is usually not sanitised before people enter or leave a property and food waste, including prohibited pig feed, may be inadequately disposed of while travelling, which can increase the risk of spreading disease.

The risk categories for people include:

- High risk — people in close contact with susceptible animals such as livestock handlers including contract mustering camps, livestock agents, exporters, truck drivers, veterinarians and government officers working with livestock (stock inspectors and researchers); hunters; workers returning from overseas or international visitors who handle livestock; people visiting several properties in a short time frame. Tourists camping on or close to properties and people who land illegally along the coastline and dispose of food that includes contaminated meat products are also potential sources of exposure.
- Moderate risk — people in occasional contact with livestock, yards or equipment such as helicopter pilots, other producers, family and friends, including Traditional Custodians who may be undertaking cultural activities close to cattle camps and watering points.
- Low risk — people with no contact with livestock such as people living in community living areas, people involved in businesses operating on the property that are not livestock businesses (e.g. cropping, horticulture, minerals), officers with a statutory right to enter premise for regulatory functions (e.g. pastoral inspectors), service providers not in contact with livestock (e.g. tradespeople, government workers including health and education sectors), tourists and the general public.

3.2.1.3 Vehicles

Vehicles can spread disease and therefore can be categorised as high risk, moderate risk and low risk based on the degree of exposure of the vehicle to the disease agent and the likelihood of the disease being passed on. This is dependent on the environmental survival of the pathogen, its mode of transmission and the degree of contact with susceptible animals. Vehicles are generally not sanitised before entry to or leaving a property, but often remain at the homestead while station vehicles are used to transport visitors around the property.

The risk categories for vehicles include:

- High risk — vehicles with close contact with susceptible livestock, such as vehicles that transported livestock from an infected or dangerous contact premises.

- Moderate risk — vehicles with contact with susceptible livestock, such as vehicles that transported livestock (but not from an infected premises or dangerous contact premises), station vehicles (e.g. utilities that carry stockfeed or are driven into paddocks or stockyards) and vehicles driven through the paddocks, including contractors' vehicles.
- Low risk — vehicles with no contact with susceptible livestock, such as vehicles that enter property or transit through property on public roads but are not used on station.

3.2.1.4 Carcass disposal

Detailed carcass disposal procedures are described in the **AUSVETPLAN *Operational manual: Disposal***.

Mortalities that occur during everyday management on pastoral properties may be managed differently depending on location, the local environment and producer preference. Most properties have one or more excavated dumps or dead animal pits close to the homestead or cattle yards, which may or may not be fenced.

Carcasses from paddocks are usually dragged to areas that are fenced off from the rest of the herd to minimise access and scavenging by other animals. Where larger numbers of cattle have died in paddocks, carcasses may be stockpiled in a central area for composting. Carcasses are less likely to be deep buried or burned in northern Australia due to the logistics of machinery access or large fuel load required to burn carcasses.

In an EAD response, planning for suitable on-property locations for disposal of mass mortalities and destroyed animals needs to be considered. The control program for an EAD in northern Australia may involve culling of feral animals and unmusterable domestic livestock. Destroy and let lie[66] may be a viable carcass disposal method for extensive properties and non-pastoral lands depending on the disease agent persistence and environmental conditions. Destroy and let lie involves aerial shooting of susceptible animals in the field that are left in situ to decompose. However, scavenging by predators such as feral pigs, dingoes and birds can spread potentially infectious material. There may be environmental, cultural and heritage factors to consider in cooperation with relevant state or territory authorities and Traditional Custodians.

3.2.1.5 Waste

Effluent from yards and truck-washing facilities may contain infectious material, but the material is likely to be greatly diluted. Therefore, the risk of disease transmission is low unless susceptible species come into direct contact with the effluent or aerosols are produced during its production or disposal. Waste disposal will be managed within appropriate state or territory legislation.

3.2.1.6 Other factors

In assessing the risk of disease spread, other factors to consider include:

- the areas from which stock have been assembled and to which they will disperse
- the prevailing weather conditions
- the potential contact time between infected and other stock (i.e. the time that infected and other stock are held in the same yards or yards in close proximity)
- the degree of direct and indirect contact between infectious and susceptible animals in common boundary fences and laneways
- the time required to undertake destruction, disposal and decontamination.

[66] www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/animal-plant/emergency/wildlifeexoticdiseaseprogram/08-09/Destroy_and_Let-Lie-Project-Report-July2011.pdf

3.3 Significant issues for the industry in the event of an EAD incident

The most significant issue for the northern Australia beef cattle industry in the event of an EAD outbreak is the immediate closure of the live export market and domestic supply chain disruptions associated with movement restrictions. The northern Queensland beef cattle industry may have potential for ongoing access to processing facilities, subject to movement restrictions, however the available processing facilities in Northern Territory and the Kimberley region of Western Australia have limited capacity for processing. This places immense pressure on industry to sustain large herds while planning for depopulation and disposal where required.

Securing a suitably skilled workforce to initiate and maintain a response to an EAD detection in northern Australia will be challenging. Happold (2023) identified workforce mobilisation in terms of capability and capacity as a major vulnerability for northern Australia, even for a relatively small-scale EAD response. Access to contractors for destruction and disposal of cattle and resources to support operations including suitably qualified aerial platform shooters, helicopters and ammunition may be limited.

The key focus for the northern Australia beef cattle industry throughout the emergency response will be return to trade. An EAD response and required proof of freedom phase take a long time and pastoralists will need to remain on property with limited to no source of income during this period. There is no immediate opportunity to rapidly diversify the property for non-pastoral income because most pastoral lease conditions restrict the use of the majority of the pastoral property to grazing cattle.

The northern Australia beef cattle industry has the knowledge and experience working in a unique operating environment to provide support in various functions for an EAD response. Pastoral property owners and managers anticipate that operational response activities will be undertaken on property and be performed by station employees and contractors with state or territory biosecurity authority oversight. Effective EAD response operations will not be possible without industry support for mustering, surveillance, vaccination (if required) and large-scale depopulation and disposal on-property (if required) in the absence of strategically located processing facilities. Using industry for response activities will increase the efficiency of response measures, reduce costs associated with accommodation, equipment and catering for response personnel, and reduce the work health and safety risks associated with acclimatising response personnel to work in unfamiliar, hot and potentially hazardous environments.

Another significant challenge for many of the pastoral properties in northern Australia will be the ability to effectively manage the disease transmission risk associated with the movement of people and vehicles on the property. Due to the exceptionally large size of extensive beef cattle properties in northern Australia and pastoral lease arrangements, non-pastoral enterprises and businesses frequently co-exist with beef cattle production. These may include agricultural cropping, horticulture, forestry, fishing, aquaculture, tourism, mineral and petroleum exploration and extraction, energy production, helicopter mustering, contracting, steel fabrication businesses and Indigenous training centres. In addition to the land access these businesses require on pastoral properties, the public and service providers also travel on pastoral properties to access supplies from station stores, travel on gazetted public roads through properties and to access Aboriginal community living areas.

Persons living and working on pastoral properties and regular visitors (with or without native title rights) should form part of the property's biosecurity plan. To enable business continuity for non-pastoral enterprises, businesses and other persons with a statutory right to access land during an EAD event, risk assessments for property access should be undertaken as part of the EAD response planning process by beef cattle enterprises. Communication with these enterprises and people is an integral component of EAD preparedness, which extends beyond the property biosecurity plan.

The transit of tourists throughout northern Australia will be significant in an EAD response as numerous national and state and territory parks and reserves border some of Australia's largest pastoral holdings. Engagement with the tourism sector during EAD response planning will enable implementation of

strategies to minimise potential risks of disease spread and support tourism business continuity where possible.

While state and territory declared area restrictions and property quarantine measures will determine the conditions for the movement of people, vehicles and other things onto and off properties during an EAD response, the ability to effectively implement these disease control measures on some pastoral properties in the north is complicated and may be unfeasible in many situations.

Indigenous people have a significant presence in northern Australia and a strong connection to land. Non-exclusive native title rights on pastoral lands may pose challenges during an EAD response and will need to be managed with respect and sensitivity.

During an EAD response, Traditional Owners will continue to access and use the pastoral lands, including to hunt to feed the community. There are many tracks from community living areas onto the surrounding pastoral lands. Maintenance of fencing erected around community living areas to prevent livestock entering the community and management of entry points into paddocks remains an ongoing challenge for pastoralists. Managing the movement of people, vehicles and other things to enable native title rights activities through record management and decontamination processes will be impossible on the scale required under legislation.

While the people working in the livestock industry are some of the most resilient people in Australia and constantly adapt to changing circumstances and continuously rebuild physically, financially, and emotionally, particularly following natural disasters, the impact of an EAD outbreak on mental health and wellbeing should not be underestimated. Norco (2023) found in the absence of an EAD response, the top three factors impacting producer mental health were weather or natural disasters, financial stress, and inflation and cost pressures. More than 50% of producers indicated that the most emotionally taxing experience was financial burden, followed by the impact on animals and loss of stock (39%), and the physical rebuild and recovery process (3%). Happold (2023) found that more than 80% of northern Australian stakeholders surveyed strongly agreed or agreed that they were more concerned about EADs than other risks to their business or way of life.

The toll on mental health and wellbeing is compounded by producers not wanting to seek or receive help or being too embarrassed to do so, and challenges in accessing suitable support services in a regional community. During an EAD event, the very limited face-to-face mental health services will be overstretched. In most remote locations in the north, there are no such services. Engagement with the health sector during EAD response planning is a critical element to ensure industry is supported. Jones-Bitton and Hagen (2020) developed an emergency response model for mental health during an agricultural crisis. The model is focused on prevention, intervention and recovery and provides guidance for industry on managing wellbeing in an EAD event.

3.3.1 Commercial implications

The commercial impact of an EAD event on northern Australian beef cattle enterprises will be immediate and catastrophic with the abrupt loss of international market access and a long and difficult pathway to regain those markets.

While the northern Australian beef enterprises have more flexibility than intensive industries in managing livestock on property when markets close or decline, the length of time that cattle can be held over will vary significantly based on the time of year, seasonal conditions and feed base reserves.

Previous trade disruptions to the live cattle export market for even a short period demonstrated a large and immediate impact on beef cattle producers in northern Australia. Producers held onto the cattle bred for the live export market to increase weights for alternative domestic supply chains where possible. For producers experiencing a season where pasture availability was minimal and supplementary feed limited, humane destruction of cattle was necessary to manage welfare risks. Where markets were available and it

was economically feasible to move cattle to southern and eastern abattoirs, there were record high slaughter numbers by Australian beef processing plants. This surge of northern Australian cattle into these markets resulted in a significant decline in cattle values, which created a flow-on effect for southern beef producers.

If live cattle exports cease, trading partners may import more processed beef, but other countries are likely to be more competitive suppliers of low-value processed beef than Australia. There is a real risk the net result of such a decision would simply be a loss of overall markets for Australian beef (ACIL Allen 2022).

With prior trade disruptions the lack of income generated throughout the year impacted the ability to invest in station resources for general maintenance on properties and reduced inputs into the cattle (supplement, vaccines, pregnancy testing), thereby reducing productivity. In some cases, the reduction in cashflow for mortgages resulted in property sales. Similar impacts would occur during an EAD response but on a much larger and longer-term scale.

Commercial implications of an EAD outbreak affecting the northern beef industry include:

- loss of income for people and companies that own cattle along the supply chain, including producers, exporters, processing plants and manufacturers
- loss of income for companies that provide services to the northern Australia beef cattle industry including:
    - contract mustering companies
    - livestock transport companies
    - helicopter mustering companies
    - feed and supplement suppliers
    - suppliers of miscellaneous services (e.g. livestock agents, exporters, transit, export and saleyard operators, veterinarians, consultants, nutritionists, reproductive service providers)
    - rural and regional businesses dependent on the northern Australia cattle industry
    - tourism, hospitality, transport, sport and education companies.

Although most EADs are not a risk to public health, loss of consumer confidence in the Australian cattle industry and beef products, both domestically and internationally, would lead to long-term reductions in:

- demand (or change in supplier)
- export markets
- the overall number of animals in areas affected by the EAD (and loss of important genetics)
- long-term sustainability of producers, processors, allied industries and rural communities in northern Australia.

3.3.2 Nature of incurred losses

Market losses are likely to be immediate and significant, followed by problems associated with cashflow and loss of income.

An EAD outbreak would create:

- financing problems (and associated interest charges) for recurring costs associated with business operations in the absence of part or all of the business's cash flow
- immediate loss, devaluation or decrease of domestic and international trade in live animals, beef and beef products
- potential environmental issues resulting from decontamination and disinfection processes and disposal of carcasses and other beef products
- additional costs for any remedial treatment and monitoring required

- potential losses due to depreciation in market value
- potential herd and genetic losses as a result of disease and disease control measures
- job losses as businesses respond to their reduced ability to maintain normal business operations
- potential business closures
- potential closures of related industry business and businesses servicing rural and remote communities
- potential animal welfare issues not only associated with disease risk management but also due financial limitations impacting the inability to supply supplements to livestock and maintain workforce.

Compensation may be available to beef producers if their cattle are destroyed.

Further detail on valuation and compensation is outlined in the **AUSVETPLAN** ***Operational manual: Valuation and compensation***.

3.3.3 Possible longer-term implications

Long-term implications will vary with the type of EAD, its location and spread, and the export market response. If loss of access to Australian live cattle export and beef export markets results in reputational damage and sourcing of products from competitor countries, reduction in demand for Australian live cattle and beef and beef products and a loss of export income in the long term may have devastating impacts.

A reduction or cessation of live cattle trading has the potential to impact land values and profitability. ACIL Allen (2022) modelled the impact of a 50% reduction to cessation in live cattle export trading and estimated the cattle income per hectare of land declined by between 11.0 and 34.4%. Reduced investment in the high capital pastoral properties in northern Australia may also occur due to a loss of confidence in market security and on-going disease risk. The distance from alternate markets will also mean increase the transit distance for cattle into a southern or eastern market, making the north even less viable as an investment region.

The response of international trading partners to an EAD outbreak in the Australian cattle industry is unknown. Some trading partners may impose their own import bans, despite lack of certification requirements, making the timeframe for the return to normal trade uncertain. The cattle industry is focused on building strong relationships by engaging with trading partners to pre-emptively mitigate trade risks with several key markets and enable trade to continue with minimal disruption during specific EAD outbreaks.

3.4 Diseases of concern for the industry

Appendix 1 summarises the features of each of the diseases included in the Emergency Animal Disease Response Agreement (EADRA)[67] and AUSVETPLAN that affect cattle. For more information, refer to the relevant AUSVETPLAN disease-specific response strategy.

At the time of writing, the most notable EADs of concern for the northern Australia beef cattle industry are lumpy skin disease (LSD) and foot-and-mouth disease (FMD)[68] due to their presence in countries close to northern Australia. The National LSD Action Plan outlines priorities to strengthen Australia's preparedness for a LSD outbreak.[69] The unknown risks associated with the extensive populations of susceptible feral animals in northern Australia remain a significant concern for industry, particularly with the inability to control a vector-borne disease like LSD in feral animals.

3.5 Work health and safety

The guiding principle of workplace health and safety (WHS) legislation is that all people are given the highest level of health and safety protection from hazards arising from work activities, so far as is reasonably practicable. Everyone has a responsibility and a duty of care towards each other in a workplace. Northern cattle industry guidelines[70] identify the key WHS hazards in the northern Australian pastoral environment and provide practical guidance on measures to eliminate or manage the risks. Key WHS hazards more likely to occur in northern Australia include:

- extreme heat and heat exhaustion
- fatigue, including that from long-distance driving
- lone, remote and isolated work
- working in an environment with wild and feral animals (crocodiles, feral buffalo, feral pigs)
- zoonoses, vector-borne disease and melioidosis.

Zoonoses pose a potential risk to people handling infected animals or tissues. People responsible for handling infected or suspect animals must maintain due care and maximum personal hygiene at all times to limit the risk of becoming infected. Most EADs only affect animals, but a few can infect humans, with varying consequences. Diseases presenting the most risk include rabies, screw worm fly, vesicular stomatitis, Rift Valley fever and anthrax.

Farmsafe Australia[71] provides an extensive library of guidance on safe work practices to minimise harm.

[67] https://animalhealthaustralia.com.au/eadra

[68] www.aph.gov.au/Parliamentary_Business/Committees/Senate/Rural_and_Regional_Affairs_and_Transport/FMDBiosecurity/Submissions

[69] www.agriculture.gov.au/sites/default/files/documents/lsd-national-action-plan.pdf

[70] https://ntca.org.au/wp-content/uploads/2023/12/WHS-Handbook.pdf

[71] https://farmsafe.org.au/content/product/Safety%20Library/#list

4 Emergency animal disease management

Information on national arrangements for management of EADs can be found in the **AUSVETPLAN** ***Management manual: Control centres management*** **(Part 1 and Part 2)**.

5 Industry preparedness

5.1 National-level industry preparedness and response planning

On behalf of the northern and southern Australia grass-fed beef cattle industry, Cattle Australia participates in various national emergency animal disease (EAD) preparedness and response planning activities. These include maintenance of the Emergency Animal Disease Respond Agreement (EADRA) and the Australian Veterinary Emergency Plan (AUSVETPLAN), training for personnel to undertake roles as beef cattle industry representatives on the Consultative Committee on Emergency Animal Diseases (CCEAD) or National Management Group (NMG), or to fill the Liaison – Livestock Industry (LLI) function in state coordination centres (SCCs) or local control centres (LCCs). State farming organisations also participate in various levels of response preparedness training.

The beef cattle industry's national EAD response planning will be complementary to EAD response planning for the beef feedlot, saleyard and transport, and processing sectors, and other livestock industries susceptible to the disease and market impacts of the EAD. Although there may be some overlap between these, each industry's response plans will have standalone status.

5.2 Northern Australia-level industry preparedness and response planning

Northern Australia is highly vulnerable to natural hazards and experiences fires, floods, drought and cyclones annually. Despite the experience in responding to large-scale emergencies, the Australian Disaster Resilience Index suggests that northern Australia generally has an exceptionally low capacity for disaster resilience. However, the northern beef cattle industry has been the most disaster resilient enterprise for the past century, continuously adapting and evolving to the challenging and changing conditions.

Disaster resilience is the capacity for communities to prepare for, absorb and recover from natural hazard events and to learn, adapt and transform in the face of future events. Disaster resilience is formed from coping and adaptive capacity. Coping capacity is how communities or organisations can use available resources and abilities to face adverse consequences. Adaptive capacity is the arrangements and processes that enable adjustment through learning, adaptation and transformation. Business resilience planning provides a mechanism for businesses to build resilience through planning today to manage tomorrow's business risks.

The focus of business resilience planning for the northern Australia beef cattle industry has been on developing sustainable practices to manage future drought and other climate risks and consider opportunities for market diversification (Futurebeef 2024). Business resilience planning can also include risk management planning to prepare a beef business to survive an EAD outbreak. Section 5.4 provides further detail on EAD response and survival plans.

5.2.1 Crisis coordination across the northern Australia beef cattle industry

The Northern Australian Co-ordination Network (NACN) for EADs[72] was established in 2022 to strengthen disease surveillance and preparedness coordination capabilities across the north through collaboration between the northern Australian state and territory governments and peak cattle industry bodies. Industry biosecurity officers have been embedded within the cattle industry bodies to provide assistance to northern beef producers, including through:

- on-property biosecurity consultations
- EAD awareness training
- biosecurity management plan development

[72] www.facebook.com/people/Northern-Biosecurity-Northern-Australian-Coordination-Network/61555272852508/

- disease reporting advice and assistance
- industry biosecurity response readiness training
- business resilience planning.

The Queensland Government EAD Preparedness Engagement Hub[73] and the Northern Territory Cattlemen's Association Knowledge Hub[74] provide EAD information and training resources specifically for northern Australian beef producers. Other industry and government organisations also provide EAD information via their various websites.

5.2.2 Enhanced surveillance for EADs across northern Australia

The northern Australia beef cattle industry collaborates with government and non-government organisations and private businesses to enhance awareness, training and surveillance for EADs in the north.

The northern Australia beef cattle industry works directly with the Northern Australia Biosecurity Surveillance Network (NABSnet)[75] through reporting significant disease events to private veterinarians for thorough disease investigations with a focus on excluding EADs. NABSnet is comprised of over 50 veterinarians across northern Australia and was designed to ensure there is effective veterinary response and investigation of significant disease events in northern Australia.

The northern cattle industry has worked closely with some of the northern state and territory governments and private veterinary practitioners to provide training to producers in post-mortem techniques to support disease investigations. When northern veterinarians are unable to travel to remote locations, producers have the skills and sampling equipment to undertake a post-mortem for samples to rule out suspect EADs. While the preference is for veterinarians to undertake disease investigations, the ability of industry to contribute to the timely exclusion of EADs provides confidence in early detection and on-going disease freedom.

The Northern Australia Quarantine Strategy (NAQS) conducts surveillance across pastoral properties and other land tenure in northern Australia. Surveillance extends along the northern Australian coastline from Broome, Western Australia, to Cairns in Queensland, with sentinel cattle herds located in 5 locations across northern Australia. The NAQS surveillance program targets EADs that have potential to enter Australia from Timor Leste, Indonesia, Papua New Guinea or other locations via northern Australia by non-conventional pathways (e.g. windborne or unregulated human-assisted pathways) and are considered serious threats to Australia's agricultural productivity, export markets or the environment.

The northern Australia beef cattle industry actively participates in several national surveillance programs together with state and territory biosecurity agencies, coordinated by Animal Health Australia. These include the National Arbovirus Monitoring Program (NAMP) with frequent serological monitoring of cattle in sentinel herds, seasonal serological surveys of strategically located commercial cattle herds, and trapping insect vectors focused on detection of exotic bluetongue virus and other vector-borne diseases. Producers also actively contribute to the Screw-Worm Fly Surveillance and Preparedness Program (SWFSPP) through targeted surveillance of cattle wounds for myiasis and the freedom from bovine spongiform encephalopathy (BSE) through targeted investigation of neurological cases in cattle.

Indigenous Rangers across northern Australia (Figure 5.1) also play a critical role in helping to protect the northern Australia beef cattle industry through the Indigenous Ranger Biosecurity Program (IRBP).[76] Sixty-seven Indigenous Ranger groups across northern Australia undertake monitoring and surveillance activities, via fee-for-service arrangements, for exotic animal pests and diseases and weeds in remote Indigenous communities and on Country. The groups also share biosecurity awareness messages with their

[73] https://dpi.engagementhub.com.au/animal-disease-preparedness
[74] https://ntca.org.au/projects/biosecurity/
[75] https://nabsnet.com.au/
[76] www.agriculture.gov.au/biosecurity-trade/policy/australia/indigenous-ranger-biosecurity-program

communities. Through annual animal visit and animal check-up activities, Indigenous Rangers monitor for changes in the health of domestic and feral cattle and buffalo in their area.

NAQS provides annual in-person training to around 90 Indigenous Rangers on the clinical signs of foot-and-mouth disease (FMD), lumpy skin disease (LSD) and other EADs, including how to report suspect cases. Training is also provided through key capability-building initiatives such as the Northern Australia Indigenous Biosecurity Ranger Forum[77] facilitated by the IRBP. Collaboration between NAQS and Indigenous Rangers helps increase surveillance coverage in northern Australia, and hence the likelihood of identifying EADs and pests that may enter northern Australia (PWC 2022).

Figure 5.1 Map of the Indigenous Ranger groups undertaking IRBP activity across northern Australia

Source: NAQS (2024)

Despite these collective proactive approaches to surveillance in the north, close observation of managed animals is infrequent on many properties and close observation of wild, including feral, animals is almost non-existent. The investment to undertake meaningful disease surveillance and investigation activities is exceptionally high and the effectiveness of current surveillance efforts to inform further investment undetermined (Happold 2023).

[77] www.agriculture.gov.au/biosecurity-trade/policy/australia/indigenous-ranger-biosecurity-program/nai-biosecurity-ranger-forum

5.3 Enterprise-level industry preparedness and response planning

EAD response planning is a critical part of the northern Australian beef industry's preparedness for an outbreak, or suspicion of an outbreak, of an EAD in Australia. Effective response planning supports livestock owners, managers, and other associated businesses and personnel in the northern beef industry to:

- reduce the risk of introducing disease to their enterprise
- reduce the risk of spreading disease within an already infected or contaminated property, or from such a property to other properties
- work collaboratively across industry with government biosecurity authorities and other stakeholders to manage an EAD outbreak with the highest degree of mutual understanding and efficiency
- minimise the time out of domestic and export markets.

In addition to disease control principles, factors that need to be considered in developing appropriate response plans include:

- implementation of pre-incursion strategies to minimise the impact
- opportunities for business continuity
- animal welfare management
- heritage, cultural and environmental impacts
- communication with community stakeholders to support collaborative control efforts.

Enhancing routine on-property biosecurity, as part of contingency planning, provides a solid basis for protecting beef cattle properties and the industry in the event of an EAD outbreak.

5.4 Biosecurity measures and the industry

EAD preparedness involves developing plans in advance to protect the beef cattle enterprise from the risk of disease and to minimise the impacts on business. In addition to a property biosecurity plan[78,79], beef cattle enterprises in northern Australia should also develop an EAD response plan and EAD survival plan[80] to prepare their beef business to survive an EAD outbreak and improve resilience of the business. An EAD survival plan describes the key risks an EAD outbreak poses to the business and the actions which should be taken to minimise the impact of an EAD on the business.

The process of developing an EAD response plan needs to consider existing property biosecurity and disease control actions and applicable processes. Key considerations include the impact of an EAD response on property operations, (e.g. structural and environmental features), daily operations and cattle management.

Developing the EAD response plan is a 2-stage process. The first stage is to examine the property's existing biosecurity protocols to identify areas where measures that protect livestock operations from the introduction and spread of pests and diseases can be enhanced when an EAD is detected in Australia. This includes examining the security of the boundary fencing, routes of entry and exit, control of people and vehicles, decontamination procedures and cattle health monitoring and management.

78 www.farmbiosecurity.com.au/industry/beef-cattle/

79 www.integritysystems.com.au/globalassets/isc/pdf-files/lpa-documents/lpa-records-templates/lpa-06-lpa-on-farm-biosecurity-plan-template-form.pdf

80 www.farmbiosecurity.com.au/wp-content/uploads/2023/10/Preparing-Your-Business-Document_Fillable.pdf

The second step is to examine the property's potential situation where an EAD outbreak has been detected in Australia and:

- the property remains disease free
- the property remains disease free, but is located in a declared area
- the property is confirmed as a dangerous contact premises (DCP) or infected premises (IP), destruction and disposal of cattle is required, and decontamination and disinfection procedures will be implemented.

In each case, additional EAD preparedness will ease the difficult decisions that will need to be made. Considerations that may be relevant, depending on the property's circumstances and the nature of the EAD, are outlined below.

The type of biosecurity measures applied during an EAD response will depend on the specific disease, whether the disease has been detected in the state or territory and the disease status and risks associated with the beef cattle enterprise. One of the most significant factors for northern Australia will be the time of year the disease is detected. If detected in the wet season, access to cattle to apply disease control measures and access to resources, including equipment and labour, will be severely limited.

Information specific to each outbreak will be available from state and territory government biosecurity authorities during an EAD outbreak and guidance is available in the AUSVETPLAN disease-specific documents.

5.4.1 General biosecurity

Many EADs can spread before signs of disease are obvious. This is especially the case in northern Australia where monitoring of livestock on properties can range from weekly to much longer intervals and over the wet season, when feed and water is abundant and access to paddocks is limited.

Feral animals, common on pastoral lands, can move through properties and onto neighbouring properties without being noticed, potentially spreading disease. On non-pastoral lands, monitoring of wild and feral animals is likely to be far less frequent or non-existent. This makes the implementation of strong biosecurity practices on pastoral properties important regardless of whether an EAD has been reported in Australia. Biosecurity management can be especially challenging for pastoral properties with non-pastoral neighbours, including national or state or territory parks and Indigenous lands.

Effective and practical biosecurity measures should be practiced where possible on pastoral properties to help manage endemic diseases and will assist in preparing for and responding to an EAD outbreak.

Biosecurity measures applicable to the beef cattle industry in general include:

- increased surveillance for signs of the EAD (e.g. by producers, station staff, stock agents, veterinarians, truck drivers, helicopter pilots) and prompt reporting if an EAD is suspected
- enhanced record keeping for:
    - movements of animals, visitors, vehicles and products onto and off the property
    - livestock currently on the property (e.g. numbers, class or age, paddocks)
- measures to prevent the infection of cattle and spread of disease:
    - checking boundary fences, gates and biosecurity signage
    - restricting the movement of people (including tourists), vehicles and equipment onto and off the property where possible
    - fencing dump sites and introducing animal carcass disposal procedures
    - introducing or enhancing personal decontamination and disinfection procedures

- introducing or enhancing the decontamination and disinfection of vehicles onto and off the property
- increasing monitoring and management of feral animals
- working with neighbouring non-pastoral properties to implement strategies to minimise the risk.

Beef cattle enterprises should document their biosecurity management procedures in a biosecurity plan. This includes activities that minimise the likelihood of disease entering the property, and spreading within or outside the property.

Employees should be trained to understand the mechanisms of disease introduction and spread, including via cattle and other animals (including feral animals), people, vehicles, machinery and equipment.

Use of a single property entry by all vehicles, machinery and equipment is desirable to minimise the entry and spread of disease, but often impractical on large pastoral properties.

Visitors entering the property should be assessed for their biosecurity risk before being provided access to the property. This assessment includes their potential to have been exposed to a livestock disease and to introduce it into the herd. While biosecurity legislation is in place to support biosecurity measures, consideration should also be given to how potential risks can be mitigated for tourists, local recreational fishing, hunting and camping on the property without consent, and native title holders, particularly those accessing waterways.

Other non-pastoral enterprises operating on the pastoral property will need to review and revise their biosecurity practices to manage the increased level of risk for business continuity. Some enterprises may be required to stop or reduce operations.

5.4.2 Record keeping

Record keeping is critical to assist with tracing potentially infected animals and contaminated material. It may also aid the assessment of the disease status of the premises and any applications for movement permits. Sound record keeping includes keeping the records readily accessible, current, comprehensive and complete.

Sound record keeping is important at all points in livestock transactions along the supply chain, including internal property livestock movements and between properties under the same ownership/management. Accurate records are also required for trucks transporting livestock, at saleyards, transit yards and export yards, and at processing facilities. Records for returning stranger cattle will also be very important as a potential source of disease and for tracing purposes in an EAD event.

In addition to National Livestock Identification System (NLIS) and National Vendor Declaration (NVD) records, cattle movements in northern Australia may be accompanied by waybills or health certificates, live export declarations and road train or trucking delivery records. Records of livestock movements onto and off the property include details of the origin, transit points, destinations, relevant dates, permissions and any other items moved.

Maintaining appropriate livestock identification records, and a current and accurate inventory of livestock, infrastructure and equipment, will expedite the process of valuing animals and items to be destroyed, which is required for the preparation of claims for compensation.

Visitor records are an essential component of biosecurity plans. Some properties manually record visitors in a visitor book. Other operations maintain electronic records accessed through a farm biosecurity check-in application.

When preparing for an EAD response, records to consider for quick access (in addition to the property biosecurity plan) include:

- NLIS reports (transfers onto and off the property)
- vendor declarations (including for live export)
- waybills, health certificates and cattle health statements
- trucking delivery dockets (livestock, feed, vehicles, machinery)
- biosecurity visitor entry records
- herd management records (approximate number and class or age of cattle in each paddock on the property, if known, and pregnancy status)
- property map showing visitor entry points, boundary fences and entry points, internal fences, paddocks, roads and tracks including gazetted roads, water sources, yards, stock feed supplies, stock dead pits, homestead and associated buildings
- inventory of vehicles and equipment (may be used to support response activity)
- personal protective equipment (PPE) and decontamination equipment (available to support response activity)
- list of staff and regular visitors including contractors and locations of community living areas
- neighbouring properties, including National Parks, Defence and Aboriginal land, and known contact details.

During an EAD response, good records of disease control measures and other activities on the property should be kept in a station diary or property management record.

5.4.3 Tracing

The **AUSVETPLAN** ***Guidance document: Tracing and surveillance*** outlines information on tracing activities that may be undertaken during an EAD response.

Tracing the movements of exposed and potentially exposed animals and identifying all infected and potentially infected herds will be a high priority in the response to an EAD. This activity will continue until the extent of the outbreak is determined.

Northern Australia has several systems to support tracing activities. Branding and ear marking are used as a form of legal identification in Queensland, Northern Territory and Western Australia. This is particularly valuable where NLIS devices have been displaced. NVDs are used for movements between the property of origin and the destination. Beef cattle enterprises in the northern jurisdictions also routinely use health certificates and waybills for movements between properties. These documents can provide useful additional information on transport routes and spelling facilities used along the journey. There may be circumstances where the transport route for cattle between parts of a property under the same property identification code (PIC) may potentially expose cattle on another PIC where a waybill or NVD is not required for the movement. Property records of internal movement will help to inform tracing in these circumstances.

5.4.4 Surveillance

The **AUSVETPLAN** ***Guidance document: Tracing and surveillance*** outlines information on surveillance activities that may be undertaken during an EAD response.

During an EAD response, surveillance is undertaken to establish the source, presence, extent or absence of a disease. Surveillance is initially focused on defining the source and extent of disease distribution as quickly as possible and then focuses on establishing the infection status of all properties within a specific area. The objective is to detect new cases quickly and monitor the progress of disease control measures. At a later stage, the objective of surveillance is to demonstrate the eradication of disease from specific areas

to support proof of freedom from the EAD. Surveillance in northern Australia involves significant challenges, including:

- scale of the area to undertake surveillance and the large number of animals
- limited access to paddocks to effectively muster cattle due to climate at specific times of the year (e.g. wet season)
- limited access to some land systems and terrain (e.g. escarpments) to muster livestock or destructively aerial survey feral susceptible animals
- delays associated with time taken to muster cattle
- inadequate infrastructure and handling facilities to support surveillance sampling
- logistical challenges and timely transport of samples to laboratory
- potential administrative and logistical constraints and delays in accessing some land tenures to undertake surveillance
- a shortage of appropriately skilled personnel, which prolongs the time taken for surveillance activities and response decisions and actions
- difficulties in designing and implementing surveillance in feral populations
- limited or intermittent communication with response personnel in remote locations.

5.4.4.1 Stakeholder surveillance

Rapid recognition and reporting of suspect cases will greatly assist disease control by facilitating veterinary investigation and implementation of disease control measures to limit the potential for disease spread.

The frequency of inspection of cattle on pastoral properties varies significantly, depending on the seasonal weather, property size, cattle location, paddock accessibility and terrain and management practices.

Where there is sufficient surface water and feed, cattle may not be inspected for several months. Where cattle are dependent on artificial water sources and supplement, cattle in the vicinity of watering points may be checked weekly when monitoring water and distributing supplement. The adoption of remote water-monitoring technology has significantly reduced the requirement for the physical inspection of watering points; however, regular fencing inspections and distribution of supplement provide opportunities to check stock.

Generally, close observation of every animal only occurs when cattle are mustered, processed or transported. Daily monitoring of individual animals is impractical across the scale of northern enterprises.

The frequency of inspection of cattle should be increased during an EAD outbreak, particularly if the EAD has been confirmed in the state, territory or region.

Aerial monitoring may be available using helicopters, aeroplanes, gyrocopters and drones. Remote monitoring may also be available on properties that have established cameras at watering points for water medication or yards for remote walk-over weighing. Regular aerial or remote monitoring would probably detect sick animals for further investigation, providing confidence that clinical signs of disease would be detected.

The effectiveness of surveillance on a property will be enhanced if awareness materials are displayed on site and training in EAD awareness is routinely provided. The stock camp and other employees and contractors involved in property operations should have adequate training and awareness to observe and report sick cattle to management for further action. During an EAD response, enhanced training would ensure the EAD response plans for the property were implemented.

5.4.4.2 Response surveillance

Pastoral properties located within declared areas will be affected by the activities of surveillance teams seeking to define the extent of the disease, detect new outbreaks and establish disease-free zones. Within a restricted area (RA), surveillance will be by inspection of livestock on properties. Surveillance within a control area (CA) may involve serological surveys and investigation of reports of suspected disease.

Circumstances, such as potential spread by wind, vectors or wild animals, may necessitate increased surveillance. The intervals between property inspections and surveys will depend on the incubation period of the disease and the risk of exposure. The causative organism for some diseases, such as LSD, Rift Valley fever and screw worm fly, can survive in the environment, resulting in prolonged eradication and an extended period of surveillance.

While the surveillance teams will be coordinated through the LCC, managers should consider how to facilitate the entry of response personnel onto the property and their movement to different areas of the property. Using the pastoral property vehicles will minimise decontamination and disinfection processes and times for response teams, and reduce potential contamination risks from other properties.

Disease surveillance in feral animals is likely to be very difficult. The populations are generally poorly defined, which makes surveillance design challenging. Access to, and handling of, wild and feral animals is extremely difficult, and surveillance is likely to be undertaken through destructive sampling which increases costs and work health and safety (WHS) risks for response personnel. Effective surveillance of feral animals is likely to delay EAD response activity.

5.4.5 Vaccine and treatments

Where a vaccine or treatment is approved for use during an EAD response, all cattle on properties will need to be mustered to pass through a race where vaccine or treatment can be administered. Although vaccination teams can be formed by the state or territory biosecurity authorities, managers should consider how they can best use their employees to increase the efficiency of this process.

The use of vaccine for FMD is a part of the **AUSVETPLAN *Response strategy*: *Foot-and-mouth disease***. How and when the vaccine would be used would be determined by the CCEAD. This depends on a combination of complex factors, including the nature and extent of the outbreak, the assessed risk to cattle on the property, the availability of vaccines, the potential to slaughter vaccinated animals and other cost–benefit factors.

In the event of an incursion of FMD, LSD, exotic bluetongue or Rift Valley fever, vaccination may be a feasible disease control strategy for cattle. FMD vaccine can be sourced immediately from Australia's FMD vaccine bank, although intensive livestock industries would likely be prioritised to receive FMD vaccine depending on the location of the outbreak. Australia also has arrangements for access to LSD vaccine. Vaccines for the other diseases are unlikely to be available immediately following detection of an outbreak, and any vaccination carried out would need to be in accordance with the agreed response plan.

Treatment to limit the potential for disease spread may be used for some EADs if approved by the CCEAD. For example, treatment of cattle with Ivermectin would limit any *Culicoides* spp. midges (a vector for bluetongue virus) feeding on the cattle and aid the control of bluetongue.

5.4.6 Feed

The extensive grazing system of northern Australia rangelands allows beef cattle to graze on native vegetation including grasslands, shrublands and woodlands. This reduces the reliance on buying and importing feed to the property. This in turn reduces the risk of an EAD being introduced to properties through contaminated feed or feed delivery vehicles. However, hay and other supplements are delivered to beef cattle properties and there may be additional feed requirements during an EAD outbreak if there are

restrictions on movements and increased numbers of cattle remain on the property or in yards if they were in transit at the time of EAD detection.

Some northern pastoral properties manage hay and other stock feed production enterprises on the same property with beef cattle to supply the wider industry. These feed supplies will be critical in an EAD response, which may involve limited access to interstate suppliers. There may also be demand for additional feed for livestock unloaded from vehicles into temporary holding facilities at the onset of an EAD response or during a livestock standstill. Vehicles entering and leaving properties to load and deliver feed must be kept separate from susceptible animals and cattle yards and must undergo decontamination on entry to and exit from the property.

5.4.7 Equipment

Equipment used for routine husbandry procedures and mustering usually remains on the property; however, the equipment may be used for different classes of cattle mustered from different paddocks and in different yards. Some equipment is routinely decontaminated and disinfected (e.g. castration, dehorning and spaying equipment), but most other equipment may not be disinfected (e.g. vaccination guns, NLIS readers, cattle crush, radios). This creates possible pathways for disease spread between groups of cattle on property.

Contract musterers and other service providers who may work closely with cattle, such as veterinarians, livestock agents, biosecurity officers, researchers and agricultural sales representatives, should have biosecurity procedures for decontamination and disinfection of equipment between properties.

The long distance of the entry points to some pastoral properties (e.g. 70 km from boundary to homestead) makes it difficult to prevent the entry of vehicles of some essential services.

5.4.8 Work procedures, staff hygiene and biosecurity

Biosecurity procedures for employees, contractors and regular visitors to properties should be part of the biosecurity plan. During an EAD response, entry of people to a property should be restricted to essential personnel. Foot baths and wash-down facilities will be required for some diseases. Station staff and their families living on the property or nearby will need to undertake special cleaning and disinfection precautions.

5.4.8.1 Properties with community living areas and public roads

Property biosecurity plans should outline what biosecurity measures apply to movement of people and vehicles where public access is permissible due to publicly gazetted roads, Aboriginal community living areas, and station stores and roadhouses located on pastoral properties on which there are cattle. In some cases, the property owner or manager may decide to move the cattle away from potential sources of disease risk rather than implement additional biosecurity measures such as decontaminating vehicles.

These biosecurity measures may also change depending on the declared area restrictions and disease status of the property under the direction of the state or territory biosecurity authority.

5.4.8.2 Biosecurity procedures for non-pastoral enterprises operating on the property

Property biosecurity plans should include non-pastoral enterprises that operate on pastoral properties, such as agricultural cropping, horticulture, forestry, fishing, aquaculture, tourism, mineral and petroleum exploration and extraction, and energy production. These enterprises should have biosecurity procedures in place to minimise the risk of disease entry to the property. These arrangements may be required by the state or territory biosecurity authority to enable property access and business continuity for non-pastoral enterprises during an EAD.

These biosecurity measures may also change depending on the declared area restrictions and disease status of the property under the state or territory biosecurity authority.

5.4.9 Movements

Understanding livestock movements and contact between susceptible animal species and people, equipment, vehicles and other items is an important factor in effective disease control. Aspects of the northern Australia beef cattle industry can provide advantages and challenges in terms of implementing movement controls during an EAD response.

Advantages include:

- movements between properties occur relatively infrequently
- the road network has fewer suitably maintained roads for livestock transport, requiring less resources to monitor and control movements
- there are few livestock transport companies, and they monitor vehicles movements in real time
- closure of live export markets and state and territory borders would limit livestock movements along the supply chain.

Challenges include:

- movements with large numbers of livestock
- timely communication of movement controls with key stakeholders
- some properties have their own livestock transport vehicles
- there are remote road networks between pastoral lands where movements are difficult to monitor
- limited capacity to enforce movement controls 24/7, particularly in remote areas
- managing feed and water supply for livestock at holding facilities
- lack of fences to adequately confine livestock
- potential disease risk from large feral animal populations
- inability to effectively control disease risk from vectors for vector-borne EADs
- difficulties in undertaking risk assessment to mitigate biosecurity risks associated with people moving onto and off the pastoral property for non-industry related purposes (e.g. community living areas, tourists, recreational fishing, hunting and camping, other non-pastoral enterprises).

5.4.9.1 Impact of a national livestock standstill

A national livestock standstill will be called if an incursion of FMD is strongly suspected or confirmed in Australia. It will not be possible to move any animals that are susceptible to FMD off a property, or receive any of these animals onto a property, unless the animals were already in transit when the standstill was called, or a movement permit had been issued by the state or territory biosecurity authority.

The purpose of the national livestock standstill is to limit the spread of the disease and allow authorities time to conduct surveillance activities and trace the movement of affected livestock.

Restrictions placed on the movement of cattle by a national livestock standstill will affect the operations of all pastoral properties and associated businesses. When a national livestock standstill is implemented, movement of all animals susceptible to FMD will stop for at least 72 hours. While a national livestock standstill is currently relevant only to FMD, governments and livestock industries may agree to a national livestock standstill for other significant EADs.

The national livestock standstill will be implemented through legal orders issued under the state or territory biosecurity legislation. Government authorities will advise livestock transporters on how to manage animals that are on the road when the standstill is issued.

Options may include completing their journey, returning to the property of origin, or off-loading cattle at a designated site. The preference for dealing with livestock in transit at the time of a standstill would usually be to complete their journey. This recognises the logistical challenges of trying to offload cattle mid-journey and sourcing feed and water for an undetermined timeframe. Returning cattle back to the property of origin may be very difficult, especially for loads with stock from multiple properties. An official movement permit may be required for movements to continue. All incoming cattle should be treated as potentially infected and segregated from other cattle on arrival.

During the national livestock standstill, all contacts with animals on infected premises (IPs), dangerous contact premises (DCPs), and suspect premises (SPs) or trace premises (TPs) will be followed up by the state or territory biosecurity authorities. The extent of trace-back of cattle movements will depend on the period between infection and the onset of clinical signs. Trace-forward of movements off IPs will apply up to the time quarantine is imposed. Tracing will also apply to all animal products, vehicles (livestock transport vehicles, feed trucks, visitors' vehicles), feed and supplement supplies, and people (including contractors, veterinarians, livestock agents and visitors). This emphasises the importance of accurate and up-to-date record keeping. An extension to movement restrictions beyond the initial standstill will apply in some situations. If the beef property is located within a CA or RA, movement controls will continue to apply.

Beef cattle properties should ensure their records can rapidly identify the source of recently introduced livestock susceptible to FMD. Cattle movement records should detail the PIC of the last property, the PIC of any spelling or transit stops and the current location of stock on the property. This will allow segregation from other stock, if necessary, facilitate increased monitoring of stock for clinical signs consistent with FMD and ensure that accurate information can be provided to state and territory biosecurity authorities if they have a tracing enquiry.

With suitable contingency planning, managers can take actions to reduce the risk of disease spread to their cattle herd. For example, cattle could be moved to internal paddocks away from the property boundary to create a buffer zone and reduce the risk of infection to the herd from neighbouring properties.

There is an Animal Health Australia fact sheet available that provides information on a national livestock standstill.[81]

5.4.9.2 Impact of movement controls

The **AUSVETPLAN *Guidance document: Movement controls*** provides information on how the risk of disease transmission by the movement of animals, people, vehicles and equipment in and out of declared areas and from properties with different disease classifications may be managed. The state or territory biosecurity authority will outline the movement controls required during an EAD response. The movement controls may change throughout the EAD response.

Controls on the movement of animals, people, vehicles, equipment and products that may be infected or contaminated with an EAD are an essential component of a response to prevent spread. In an EAD outbreak, all enterprises are responsible for avoiding the risk of disease spread through their routine activities.

However, movement controls will limit operations, especially when controls are maintained for an extended period. Operations that may be especially affected include:

- movements of susceptible livestock (and potentially other animals – e.g. horses and dogs) onto and off properties
- movements of vehicles (including trucks and other machinery) onto, off and between properties, including those supplying supplementary feed

81 https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2022/07/National-Livestock-Standstill-Factsheet-1.pdf

- movements of service providers (including contractors, veterinarians, livestock agents and sales representatives).

Permits may be required for the movement of animals, people, vehicles and products during an EAD response.

Managers should plan for a worst-case scenario where cattle cannot move onto or off the property for an extended period. It is important to consider how the cattle will be maintained in a healthy state until a decision is made about their potential destination, slaughter or destruction and disposal. Under welfare guidelines, the person in charge of the cattle has responsibility for their care and welfare during an EAD response. There may be significant budgetary pressures, as the costs of feeding cattle are not eligible under national cost-sharing arrangements. The LLI can provide advice on assistance measures which may be available to support industry.

When planning transport during an EAD response, specific supply chain transport routes may be impacted by movement restrictions in declared areas. The Transport Network Strategic Investment Tool (TraNSIT) computer model creates detailed maps of Australia's supply chains, freight movements and costings to improve supply chain efficiency (Higgens et al 2015), which may support EAD response decision-making. TraNSIT selects the most cost-effective route that accounts for travel distance and time, vehicle configuration, road conditions, driver fatigue regulations and vehicle decoupling costs. While originally developed to reduce the cost of transporting cattle from pastoral properties in northern Australia to domestic and international markets, TraNSIT has been refined to inform investment in infrastructure and support decision making during natural disasters, including when transport routes are impacted by weather events (Higgens et al 2017). This tool can also assist decision-making during an EAD response where declared areas restrict movements.

5.4.9.3 Impact on livestock transport

Vehicles that have been used to transport live susceptible animals (this may include cattle and other species depending on the EAD), and equipment used with live susceptible animals, or their products must be thoroughly decontaminated after use and between loads at an appropriate wash-down facility.

5.4.10 Decontamination

The **AUSVETPLAN** ***Operational manual: Decontamination*** provides guidance on the decontamination of vehicles, machinery, equipment, people and other things for specific EAD agents.

Decontamination is the combination of physical and chemical processes that kills or removes EAD agents or reduces them to non-infective levels.

Decontamination frequently applies to vehicle and equipment movements into, within and out of RAs and CAs if the vehicles and equipment have had direct contact with susceptible animals or their products. Movement of these vehicles and equipment should be as shown in the relevant movement control matrix available from the state or territory biosecurity authorities. On IPs and DCPs, decontamination is carried out under the management of the infected premises operations (IPOP) team.

Monitoring and management of vehicles may be challenging due to the size of the pastoral properties in northern Australia and the nature of the road network. There are publicly gazetted roads through pastoral properties and numerous river systems with tracks along the boundaries and within paddocks. Consideration for decontamination of vehicles associated with mining, tourism and other industries and Indigenous community access will be critical to minimise disease risks.

The introduction of biosecurity management plans[82,83] across the north considers the biosecurity risks associated with accessing pastoral lands. Entry of vehicles onto a property during a livestock standstill or a property that is located within a declared area should be restricted to essential vehicles. A systematic decontamination procedure may need to be introduced for vehicles that must enter a property. Before vehicles are allowed entry onto a property, their previous locations should be checked to ensure that they have not entered any other at-risk properties. If the disease can be spread by contaminated materials, vehicle movement within the property needs to be minimised and routes rigidly controlled to avoid potential spread.

Livestock vehicles must be maintained in a clean condition and carry stock from only one property at any one time. Vehicles must be thoroughly cleaned and disinfected between loads and a vehicle logbook recording details of stock pickups and deliveries must be maintained. Property access and parking at the homestead are to be controlled to minimise any contact with areas containing livestock. Non-livestock transport vehicles must be parked separately from livestock transports, to minimise the risk of contamination.

5.4.11 Disposal

The **AUSVETPLAN** ***Operational manual: Disposal*** provides information and guidance on disposal methods for waste, including animal carcasses and animal waste, for disease control purposes.

Carcasses and other waste awaiting disposal during an EAD response pose a high risk of disease spread and pre-incursion planning for carcass disposal on-property should be undertaken.

Mortalities that occur during everyday management on pastoral properties may be managed differently depending on location, the local environment and the producer preference. Most properties have one or more excavated dumps or dead animal pits close to the homestead or cattle yards which may or may not be fenced.

Carcasses from paddocks are usually dragged to areas which are fenced off from the rest of the herd to minimise access by other cattle. Where larger numbers of cattle have died in paddocks, carcasses may be stockpiled in a central area for composting. Carcasses are rarely deep buried or burned in northern Australia due to the logistics of machinery access and the large fuel load required to burn carcasses, depending on the location of destruction.

Northern Australian pastoral properties are experienced in dealing with the disposal of small numbers of cattle carcasses and may also have experience managing the disposal of larger numbers. However, there may be logistical, physical, heritage, environmental and cultural limitations to disposal of large numbers of cattle carcasses on pastoral properties. In an EAD response, planning for suitable locations on-property for disposal of mass mortalities and destroyed animals needs to be a considered part of the property EAD plan. Consultation with industry biosecurity officers and the state or territory biosecurity authorities is recommended to ensure that all factors are considered in planning.

5.4.12 Wild and feral animal control

The **AUSVETPLAN** ***Operational manual: Wild animal response strategy*** provides information, guidelines, management strategies and control procedures for wild animals during an EAD response.

Feral animals are vast in number and distribution across the northern Australian landscape. Some species are regionally specific. The role of feral animals in the transmission of an EAD in Australia is difficult to predict due to Australia's freedom from these diseases and uniqueness of our environmental ecosystems. The risk of entry, establishment and spread of EADs in these populations remains unknown (Happold 2023);

[82] www.daf.qld.gov.au/business-priorities/biosecurity/policy-legislation-regulation/biosecurity-planning

[83] https://nt.gov.au/industry/agriculture/livestock-and-animals/biosecurity-management-plan

however, the presence of an EAD in feral animals would significantly impact response operations, especially disease surveillance, eradication and proof of freedom.

The geographic distribution and isolation of feral animal populations means that an EAD could reside in these populations for some time before it was detected. Feral animal populations also pose a high risk to Australia's disease-free status and could potentially prevent Australia from achieving freedom from disease status and a return to normal trade arrangements after an EAD incursion (Rural and Regional Affairs and Transport References Committee 2022).

In the event of an EAD outbreak, surveillance in feral and other wild animal populations may be required. Susceptible feral and other wild animals will be identified and an assessment of their potential role in EAD spread will be undertaken. Interactions between feral or other wild animals and livestock species pose a high risk of spread of an EAD. Control activities to depopulate or strategically reduce the susceptible animal population in a localised area may need to be undertaken.

It is important to note that wild animals may have significant cultural, biodiversity, social and community value, especially for First Nations people. Feral animals may also be an important nutrition source for communities. In northern Australia, wild animals are also important for eco-tourism businesses.

Some Indigenous Ranger groups across the north are contracted to reduce feral animal numbers through controlled culls, making feral animals an important potential income stream. It is important to consider that outside of Indigenous Ranger groups there is a general lack of feral animal management capacity on non-pastoral Indigenous lands. This is of particular importance where land boundaries adjoin pastoral properties. This is also evident for national, state and territory parks, conservation lands and other land tenure types. Lack of adequate boundary fencing is also a factor in the intermingling of feral and managed animals.

Wild and feral animal control on pastoral properties is the responsibility of the property owner or manager. During an EAD response, state and territory biosecurity authorities may require biosecurity measures to be applied to feral animals for effective disease control on a range of land tenures including freehold and leasehold beef cattle properties.

Engagement with national, state and territory recreational shooting organisations during EAD response planning provides a potential capability to support disease control efforts through the reduction in feral animal populations in the vicinity of declared disease control aeras.

Animal welfare is an important consideration when controlling wild animals. Codes of practice (CoPs) and standard operating procedures (SOPs) have been developed at a national level as well as within most states and territories for each of the key pest animal species. These provide information on best practice management, control strategies, species biology and impact, and the humaneness of control methods.

5.4.12.1 Wild cattle, banteng and buffalo

Unmanaged cattle and buffalo are present throughout much of northern Australia. On Indigenous lands, cattle and buffalo may be considered as a harvestable resource, even if not managed more formally. Limited information is available to estimate the distribution and abundance of feral bovids across northern Australia.

Feral cattle (*Bos indicus* and *Bos taurus* spp.) are located in rugged and remote areas across northern Australia that are too difficult to muster. They remain a constant challenge for pastoral properties bordering other types of land tenure, such as those used for defence, conservation management, national, state and territory parks, and non-pastoral Indigenous lands.

Banteng cattle (Bos javanicus) are generally confined to the Cobourg Peninsula region of the Northern Territory, but are also found in northern Arnhem Land. Banteng are considered an endangered species on the International Union for Conservation of Nature (IUCN) Red List.

The **AUSVETPLAN** ***Guidance document: Risk-based assessment of disease control options for rare and valuable animals*** provides information for defining rare and valuable animals and assessing the risks of disease exposure and transmission for EADs.

Feral swamp buffalo (*Bubalus bubalis*) are generally confined to the Top End of the Northern Territory; however, they can also be found in the Gulf of Carpentaria, Queensland, and the Kimberley region, Western Australia (Jesser et al 2016). The main area for feral buffalo is an area comprising the 100,000 km^2 of Arnhem Land Aboriginal land trust land and surrounding areas of Aboriginal land. Arnhem Land is an almost entirely unfenced area of woodland, sandstone escarpments and floodplain country, where there is surface water. There was an estimated 350,000 head of buffalo prior to extensive culling in the 1980s as part of the Brucellosis and Tuberculosis Eradication Campaign (BTEC). The buffalo population in Arnhem Land has been gradually increasing, with an estimated 180,000 head in 2020 (MacDonald et al 2021). Significant climatic events can also displace buffalo beyond the main populated areas.

There is also a small population of managed riverine buffalo in the Top End of the Northern Territory.

5.4.12.2 Feral pigs

Feral pigs (*Sus scrofa*) are abundant in the wetlands, floodplains and associated watercourses in north-eastern Australia. Populations are more abundant in Cape York Peninsula, Queensland and the Top End of the Northern Territory. Feral pigs are more restricted in the Kimberley region of north-western Western Australia, where there is limited access to water and shelter. The national population of feral pigs is estimated to be approximately 24 million; however, the population across northern Australia is unknown.

Feral pigs are abundant on pastoral properties in northern Australia and there is little to prevent contact between feral pigs and cattle. Feral pigs are often captured, domesticated and kept by rural landholders, and Indigenous communities in northern Australia have feral pigs throughout the community. On Indigenous lands, feral pigs may be valued as a source of protein and an opportunity to encourage young people to hunt and maintain the kinship system. To others, feral pigs are a threat to traditional food sources, totemic native species and the cultural environment (DEE 2017).

Genetic analysis has shown that major geographic features, including topographic roughness, watercourses and dry season habitat suitability, influence feral pig population connectivity. These strongly differentiated populations with defined boundaries suggest that the potential for disease spread and subsequent containment of an EAD is more likely in isolated populations (Campbell et al 2021).

The national threat abatement plan for feral pigs outlines the control methods available for feral pig management (DEE 2017). The national feral pig action plan outlines the strategy for community-led land managers to more effectively and cost-efficiently undertake adaptive feral pig management on a sustained, landscape-scale, cross-tenure basis (National Feral Pig Action Plan Steering Group 2023) to reduce the population and impact.

Widespread destruction of feral pigs is not typically considered an efficient strategy for eradication of disease during an EAD response. However targeted culling and exclusion is potentially a feasible option to assist in the prevention of the establishment and spread of an EAD that can be spread by pigs prior to, or following, an incursion into Australia (AHC 2020).

5.4.12.3 Feral camels

Feral camels (*Camelus dromedarius*) are located over much of arid Australia (Figure 5.2) with large populations centred in the Simpson and Great Sandy deserts. The feral camel population was significantly

reduced from an estimated 600,000 to 300,000 in 2013 under the national feral camel action plan. However, with suitable seasonal conditions, the population can increase by 10% annually (VPC 2010).

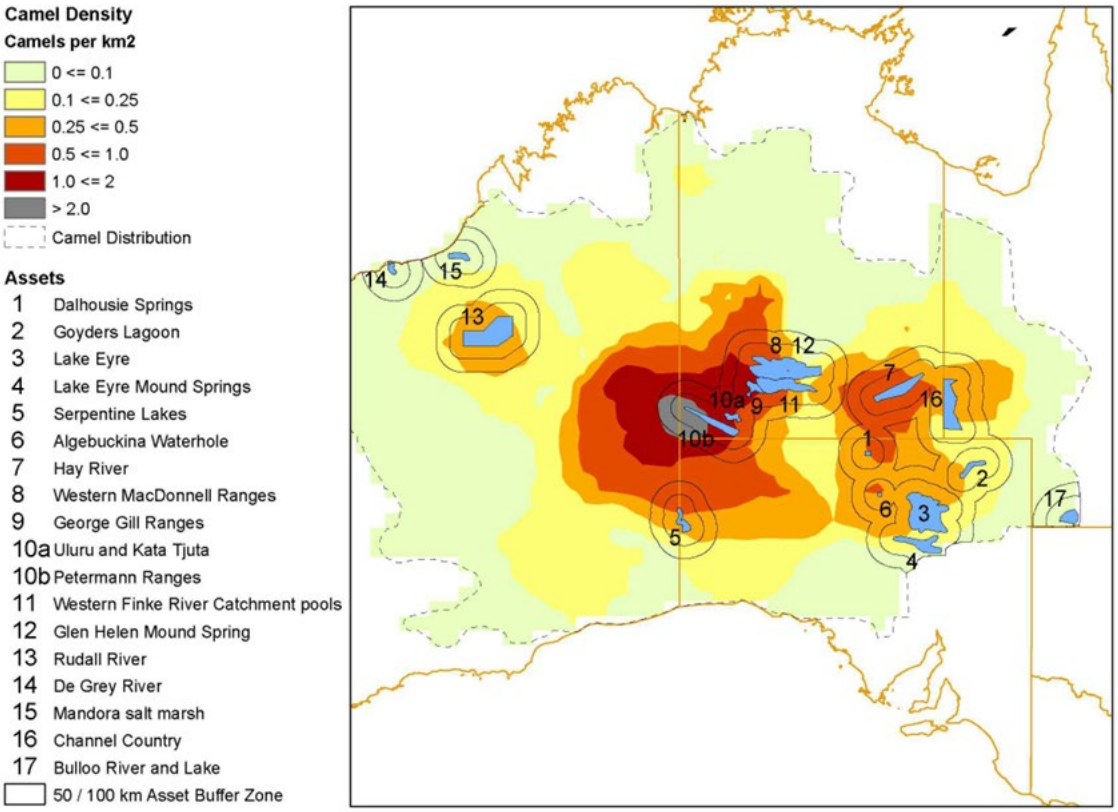

Figure 5.2 Map of Australian feral camel distribution and density

Source: Edwards et al (2013)

5.4.12.4 Feral horses and donkeys

Australia has the world's largest population of feral horses *(Equus caballus*). Most of the population is widely distributed in arid and semi-arid parts of the Northern Territory, Queensland and the northern rangelands of Western Australia. Large numbers are present west of Alice Springs, in the Victoria River District, and the Gulf region all the way up to Cape York Peninsula, Queensland, as well as on offshore islands such as Goulburn, Badu and Moa Islands. The population of feral horses was estimated to be approximately 400,000 across northern Australia. Feral donkeys *(Equus asinus)* are also widely distributed over pastoral regions in the Northern Territory and northern Western Australia, and in isolated pockets in Queensland. The estimated population of feral donkeys exceeds 5 million (DSEWPC 2011).

5.4.12.5 Wild dogs (including dingoes, feral domestic dogs and hybrids)

Wild dogs are considered major pests across northern Australia, and livestock owners undertake wild dog management practices to reduce livestock losses. The dingo (*Canis familiaris*) is protected on all land tenure in the Northern Territory and protected areas of Queensland. Dingos can be controlled under permit in Northern Territory and in all areas of Queensland, except the protected areas. The dingo is a declared pest in Western Australia and therefore can be controlled on all land tenure. The National Wild Dog Action Plan (AWI 2020) outlines the strategic coordinated approach to effective management of wild dogs across Australia.

5.4.12.6 Kangaroos and wallabies

Kangaroos and wallabies are found in a wide range of habitats, including rocky slopes, arid grasslands and monsoon forests. They are protected wildlife; however, commercial harvesting may be approved for some macropod species. The susceptibility of Australian macropods to most EADs is unknown.

5.5 Valuation and compensation

Detailed valuation and compensation procedures are described in the **AUSVETPLAN** ***Operational manual: Valuation and compensation***.

5.6 Media and public relations

The Biosecurity Incident Public Information Manual[84] provides guidance on how public information should be operationalised and resourced to ensure nationally consistent communications during biosecurity incidents, including EAD outbreaks. The National Biosecurity Communication and Engagement Network (NBCEN) is tasked with producing and disseminating nationally consistent public information in a biosecurity response. The national Crisis Communications Playbook outlines the key communications and processes for the first 72 hours of an EAD response. Cattle Australia, as the peak industry council for the Australian grass-fed beef cattle sector, will ensure clear, concise and accurate information is provided to industry and the public in the pre-incursion and post incursion phases of an EAD incident.

Northern Australian cattle industry organisations may also have specific media policies that provide guidance for the organisation's personnel, industry members and producers on the management of media enquiries.

Pastoral properties should work with industry organisations and support industry spokespeople by directing media enquiries to the LLI representatives to safeguard the reputation of the enterprise and the industry.

5.7 Recovery

The resilience and recovery phase includes measures such as trade negotiation to reopen export markets and herd rebuilding following stamping out of affected areas. Depending on the extent of the incursion, rebuilding devastated communities will also be required, similar to drought, fire, flood and cyclone recovery efforts.

5.7.1.1 Relief measures

EADs cause severe disruption and hardship to the livestock industry and related businesses in many ways, all of which will attract intense public scrutiny. Support from other producers, community organisations, government agencies and other organisations becomes very important.

Industry, business and community-wide relief measures will be required during and following an EAD response. The nature and scale of these measures will be dependent on the EAD scenario. The northern cattle industry organisations will work together with the national peak industry bodies, state and territory governments and services providers to coordinate support including for:

- mental health

[84] https://animalhealthaustralia.com.au/bipim/

- rural financial counselling services
- other community support services.

5.7.1.2 Return to trade

Business continuity and early return to trade are key aspects of recovery for northern Australian enterprises. With this focus, pastoralists will need to remain on property, undertaking maintenance and managing other livestock while awaiting restocking to replace any livestock destroyed for disease control purposes. Finding opportunity for supplemental income through auxiliary employment while remaining on the property is exceptionally challenging due to the remoteness of properties from regional centres.

There is also limited opportunity for immediate development and diversification on pastoral properties if destocked of livestock due to legislative restrictions for pastoral lease purposes. To initiate non-pastoral activity may involve lengthy administrative approval processes. Chilcott et al (2020) recognized regulatory constraints as a key challenge for diversification on northern Australia pastoral leases.

5.7.1.3 Proof of freedom

The greatest barrier to achieving proof of freedom from an EAD in northern Australia is the abundance of feral animals and their widespread distribution in remote areas of difficult-to-access terrain. There are very complex challenges associated with the risk of an EAD establishing and spreading in the feral animal population. Most notably, it may not be feasible to eradicate the disease from the feral population and undertaking widespread surveillance in the feral population would present significant challenges.

The occurrence of an EAD in feral animals has the potential to prevent Australia achieving freedom from disease status and a return to normal trade arrangements after an incursion (Rural and Regional Affairs and Transport References Committee 2022). Any attempt to demonstrate freedom is made substantially more difficult if there is an ongoing risk of reintroduction. This is particularly relevant if key diseases become endemic in neighbouring countries and risk pathways cannot be adequately managed.

Traditionally international market access has been restored once trading partners are satisfied that the disease of concern has been eradicated.

5.8 Industry preparedness for an infected premises

5.8.1 Overview

There are many uncertainties associated with managing a property that has infected animals or has had contact with an EAD such as FMD. However, there is also a large body of information about the policies that apply and the actions that the disease control authorities will take.

The primary objectives of the disease control strategy for an EAD are to:

- prevent contact between infected and susceptible animals
- contain the infection to the infected premises
- prevent the production of large volumes of infectious agent by infected animals
- minimise the amount of infectious agent in the environment
- control vectors which transmit the disease.

These objectives can best be achieved through quarantine and movement controls, tracing and surveillance, destruction, disposal and decontamination. Vaccination may be used under certain circumstances — where it is considered that it will assist eradication or control where the disease is widespread. Where it is not possible to establish and maintain disease freedom for the entire country, establishing and maintaining disease-free subpopulations through zoning may be considered. This may help to reduce the time for to reestablish international markets, to accept exports from disease-free areas.

Depending on the disease, a property classified as an IP will generally have all cattle on the property destroyed. A property classified as a DCP may also have all or some cattle on the property destroyed, depending on property biosecurity measures and herd management practices.

Consideration will need to be given to quarantining and securing of premises, including holding yards, and vehicle wash-down areas. The most difficult stage will be implementing quarantine movement controls upon first suspicion of disease. Reliable and rapid risk assessment that focuses on priority areas is essential. The least possible disruption to normal movement patterns will help to maintain public cooperation, while minimising risk.

Actions such as vaccination or internal quarantine to isolate diseased cattle from healthy cattle may offer a reprieve from slaughter or destruction. All cattle may eventually be subjected to procedures (including destruction) necessary to assist eradication of the disease. Because of the exceptionally large size of pastoral properties, a risk assessment that demonstrates that part of a herd is not infected and biosecurity measures that demonstrate independent herd management may allow alternative disease control measures to be applied.

Eradication procedures will be under the management of the IPOP team. The property owner or manager will be a key adviser to the infected premises site supervisor. The station employees will be impacted by the disease control personnel on the property and the activities they undertake; they may also play an active role in disease control processes.

The manager should direct the head stockperson to oversee the handling and moving of all livestock in accordance with the plans developed by the IPOP. An equipment and vehicles controller should also be nominated.

Planning activities can be divided into two areas:

- actions that build upon, or are related to, tighter biosecurity and control measures, described above
- actions that are related to the processes of valuation, destruction, disposal and decontamination.

In all cases, the first step will be to place an IP or DCP under a formal quarantine notice, as defined in the relevant state or territory biosecurity legislation. The terms of such quarantine will vary depending on the circumstances, but generally will formally restrict all cattle movements and require the owner or manager to take specific steps to manage the disease.

The actions described are intended to provide a summary of the IPOP activities. Managers need to be aware of these so that they can provide practical and effective advice and assistance where required to the site supervisor. The description of the processes of valuation, destruction, disposal and decontamination in this manual is provided to raise awareness of what will occur. Detailed information is provided in the relevant AUSVETPLAN operational manuals.

5.8.2 Biosecurity

5.8.2.1 Managing employees

Managers need to plan for the potentially devastating effects an EAD may have on employees. This includes actions to reassure employees, retain skilled personnel, maintain biosecurity measures for the purposes of the EAD response, and plan for a return to normal operations. Management should ensure a close working relationship with the IPOP to ensure that most employees are retained for the duration of all response operations. Using local knowledge of the property and its operations, facilities and equipment will maximise the efficiency and effectiveness of response activities. Managers should plan to fully brief and reassure employees and ensure ongoing support where required.

5.8.2.2 Livestock movements

All livestock movements will be managed by the IPOP team.

5.8.2.3 People movements

The IPOP will restrict entry and exit to the property. Security of an IP is not a feasible option for most pastoral properties in northern Australia because they have multiple access points. For some properties, it may be possible to lock other entry points to the property and use signage to restrict access.

5.8.2.4 Vehicle movements

Designated areas for parking should be located away from the yards and cattle. Vehicles and machinery that must enter will be logged, and their cleaning and decontamination will be under the control of the IPOP. Feed may need to be imported to feed cattle held in yards until they are valued and destroyed. Delivery vehicles must not have contact with personnel or equipment where possible and must be cleaned and decontaminated before leaving the property.

5.8.2.5 Valuation

Property records with cattle details (e.g. age or class, numbers, breed, paddock location) will support the valuation process. Consider how records can be managed so that the required information can be made available without revealing confidential information. Plan the order in which cattle may be mustered and yarded to be valued (if required) so that the process can proceed in an efficient manner. Consider alternative options for valuation, such as aerial observation of unmusterable cattle or video records. Evidence of cattle ownership will be required for compensation claims. Registered brands and earmarks, including for the neighbouring properties and purchased cross-branded stock, will support NLIS devices and database records.

5.8.2.6 Destruction

Consider alternatives to destroying animals in yards and transporting carcasses to a disposal site, for example, consider moving live animals to a site where they can be contained in temporary yards adjacent to the area where disposal will occur. Do not destroy any animal without the permission of the site supervisor.

5.8.2.7 Disposal

Work with the IPOP to select the most appropriate disposal method for the property. If available, an area of land on the property may be used to either bury or compost large numbers of animals. The IPOP will identify any approvals required from environmental or sacred site authorities to use the area for disposal.

5.8.2.8 Decontamination

Work with the IPOP to select the most appropriate location for decontamination on the property. This may be the wash-down facility used routinely for vehicle wash-down or another location suited to the management of wastewater.

5.8.2.9 Sentinel animals

Depending on the disease, sentinel animals may be placed back on the property after a defined period has elapsed since completion of decontamination. If this occurs, arrangements for the feeding, monitoring and management of these animals will be required.

5.9 Operation of an enterprise classified as an infected or dangerous contact premises

Management of a property that has been declared an IP or DCP will require the manager to collaborate with the site supervisor and obtain approval for actions affecting the response. Although the site supervisor is responsible for all disease control actions on the premises, the manager and employees will need to help apply appropriate disease control measures and continue to care for the cattle.

Planning ahead by managers will improve understanding of what would occur and raise awareness among staff. Employees who are skilled in handling cattle, accustomed to working in the extreme environmental conditions, and competent operators of equipment and machinery are a major asset. Employees can provide support for mustering and yarding, transport of response personnel, surveillance sampling, vaccination, valuation, destruction, disposal and decontamination.

5.9.1 Movements

5.9.1.1 People movements

The only visitors to the property should be those associated with the disease control program. It is desirable that employees travel off the property as little as possible to reduce the potential spread of disease. Disinfection to safely remove any contamination from personnel and their clothing may be necessary to prevent the spread of disease; this would be under the control of the IPOP. Records of the destinations of all persons requiring decontamination would be maintained.

People working with livestock through the disease control program are considered high risk and will be required to undergo thorough decontamination and disinfection.

People considered low risk may only require vehicle decontamination and disinfection.

5.9.1.2 Vehicle movements

While cattle remain on the property, vehicles (including cattle trucks, feed trucks, personal vehicles and some machinery) will need to enter and leave the premises. If the disease can be spread by fomites, vehicle movements must be minimised and tightly controlled. This may involve restricting the entry of passenger vehicles. Vehicle movements within the property should be strictly managed to minimise the potential for disease spread. A stringent procedure for disinfecting vehicles leaving the property may be required, supervised by the IPOP.

High-risk vehicles that have been in contact with the disease agent will be required to undergo thorough decontamination and disinfection.

Low-risk vehicles should also undergo vehicle decontamination and disinfection when leaving the property.

5.9.2 Tracing

The **AUSVETPLAN** ***Guidance document: Tracing and surveillance*** provides information on tracing activities in an EAD response.

Tracing is the gathering of information on the movements of animals, commodities and other things during a defined period, that are capable of spreading the disease agent to and from affected premises. The aim is to identify the source and extent of spread of the outbreak.

The LCC will manage tracing. Tracing will focus on identifying the source(s) of infection and possible spread of infection via movement of stock, vehicles and people. Considerations include the following:

- infected livestock (and susceptible livestock that have had prolonged, close or direct contact or prolonged indirect contact with affected livestock) are the highest priority
- the time of detection of infected livestock, in relation to when other stock have assembled and/or disseminated, will influence priorities and the magnitude of the task
- detected cases may not represent the only sources of infection. Other livestock on the property may have been exposed prior to detection and could be incubating the disease or shedding the disease agent
- a starting point in the tracing procedure is to identify the transport company and vehicle that carried the livestock and then all subsequent properties and livestock exposed to the livestock transporter
- tracing from the infected premises could identify the source of infection, which will then generate another round of tracing.

The manager can assist the LCC by providing property records that identify:

- stock introduced onto the property within the relevant tracing window
- stock that have left the property within the relevant tracing window
- stranger cattle returned from neighbouring properties within the relevant tracing window
- trucks that have been to other properties following the delivery of stock (a list of these properties will be required) within the relevant tracing window
- people who visited the property within the relevant tracing window
- locations where station personnel have travelled within the relevant tracing window
- locations of other animals, such as dogs or horses, in the area that may be involved in disease transmission — these animals should be confined.

It is important that documents and systems (e.g. the NLIS database) are kept up to date to ensure that accurate tracing can occur.

5.9.3 Destruction of animals

The **AUSVETPLAN** ***Operational manual: Destruction of animals*** provides information on the techniques of humane destruction of cattle.

In an outbreak of a rapidly spreading disease such as FMD, it will be necessary to destroy a large number of cattle quickly to reduce the potential for further spread of the virus. Speed is essential in most outbreaks because live animals will continue to produce and possibly spread the disease agent. During an emergency, additional resources must be obtained to enable rapid upscaling of activities such as destruction and disposal.

It is essential that animals are destroyed humanely. The aim is to achieve animal destruction in a single treatment by a rapid loss of consciousness leading to death, with no return to consciousness and with an acceptable (minimal) level of stress to the animal before its death.

Under most circumstances on pastoral properties in northern Australia, cattle will be mustered into yards and headshot using firearms at the closest possible range. Where 100% musters cannot be achieved, unmustered animals will be shot in paddocks. Captive-bolt devices are the most suitable method of destruction when animals can be adequately restrained in a crush equipped with a side-opening gate. For large herds, such as those on northern Australian pastoral properties, this approach may be impractical. If the use of captive-bolt devices is not possible, operators should shoot from the top rail in a small yard.

Civil Aviation Safety Authority (CASA) approval is required to discharge firearms from helicopters. Such shooting should be carried out only by experienced personnel specifically trained, and with current proficiency, in this type of operation. A high degree of pilot and shooter proficiency is required.

5.9.4 Disposal

The **AUSVETPLAN** ***Operational manual: Disposal*** provides information on disposal procedures.

5.9.4.1 Burial

Mass burial is likely to be used for the disposal of large numbers of cattle in northern Australia where large areas of suitable land are available. Unlined burial is usually used when soil types or local geology can control the risk of leachate leakage, whereas lined burial is used when there are risks of leakage of leachate into subsoil or the water table. Mounding (above-ground burial) involves placing carcasses on a natural surface of earth and covering them with earth obtained from another source.

5.9.4.2 Burning

Burning as a disposal method is unlikely to be used in northern Australia; however, burning may be considered where a high water table or unstable or rocky soil types preclude burial.

5.9.4.3 Destroy and let lie

The control program for an EAD in extensive pastoral areas of northern Australia may involve culling of feral animals and unmusterable domestic livestock. 'Destroy and let lie'[85] may be a viable alternative carcass disposal method for extensive properties, depending on the disease agent persistence and environmental conditions. Animals are aerial shot in the field and are left in situ in the environment to decompose. This is more likely to be used for cattle unable to be mustered into a set of cattle yards or trap-yards for destruction and disposal on-property and for wild and feral cattle and other susceptible species on non-pastoral lands.

5.9.5 Decontamination

The **AUSVETPLAN** ***Operational manual: Decontamination*** provides guidance on the decontamination of vehicles, machinery, equipment, people and other things for specific EAD agents.

5.9.5.1 Vehicles

The size of the pastoral properties in northern Australia and road access for other purposes means that the monitoring and management of vehicles may be challenging. There are publicly gazetted roads through pastoral properties and numerous river systems with tracks along the boundaries and within paddocks.

Consideration for mining, tourism and other operations and Indigenous community access is critical. Biosecurity management plans across the north have been developed in a way that considers the biosecurity risks associated with accessing pastoral lands.[86,87]

5.9.6 Media and public information

Industry personal involved in the EAD incident need to be mindful of how information should be provided to the media, either directly or indirectly. Property managers or owners may consider implementing a media and social media policy on the property to ensure media enquiries are managed appropriately. The state or territory cattle industry organisation recommends that media enquiries are referred to the LCC.

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85 www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/animal-plant/emergency/wildlifeexoticdiseaseprogram/08-09/Destroy_and_Let-Lie-Project-Report-July2011.pdf

86 www.daf.qld.gov.au/business-priorities/biosecurity/policy-legislation-regulation/biosecurity-planning#Biosecurity%20Management%20Plans%20and%20Registered%20Biosecurity%20Entities

87 https://nt.gov.au/industry/agriculture/livestock-and-animals/biosecurity-management-plan

General inquiries about the disease or the control activities being undertaken must be directed to Public Information in the LCC. Maintaining an appropriate channel of communication with the media is an important function of the LCC. This is made very difficult if other information is coming from elsewhere that may appear to conflict with advice given by the LCC.

Appendix 1 – EADRA-listed cattle diseases

Disease	Main species affected	Agent	Main transmission pathway	Human health risk	EADRA category
Anthrax	Cattle and other mammals	Bacterium	Dead animal	Yes	3
Aujeszky's disease*	Pigs, but also seen in cattle, sheep and goats	Virus	Close contact with live animal or ingestion	No	4
Bluetongue — exotic serotypes*	Cattle, buffalo, sheep, goats, camels, deer	Virus	Vector	No	3
Bovine brucellosis (*Brucella abortus*)	Cattle and horses	Bacterium	Live animal, fomites	Yes	2
Bovine spongiform encephalopathy (BSE)	Cattle	Prion	Product	Yes	2
Bovine tuberculosis (*Mycobacterium bovis*)	Cattle, buffalo, deer, camelids	Bacterium	Live animal	Yes	4
Contagious bovine pleuropneumonia	Cattle	Mycoplasma	Live animals	No	3
East coast fever	Cattle	Parasite	Live animal, vector	No	4
Encephalitides (tick-borne)	Cattle, sheep, horses, pigs, deer	Virus	Live animal, vector	Rare	3
Foot-and-mouth disease* (FMD)	Cattle and all cloven-hooved animals	Virus	Live animal, product, fomites, aerosol, semen	Rare	2
Haemorrhagic septicaemia	Cattle, buffalo and bison	Bacterium	Live animal, fomites	No	4
Heartwater	Cattle, buffalo, sheep and goats	Rickettsia	Live animal, vector	No	4
Jembrana disease	Cattle	Virus	Vector, mechanical, live animal	No	4
Lumpy skin disease (LSD)	Cattle and buffalo	Virus	Mechanical	No	3

Disease	Main species affected	Agent	Main transmission pathway	Human health risk	EADRA category
Peste des petits ruminants	Cattle, sheep, goats, pigs	Virus	Live animal, aerosol, semen	No	2
Rabies*	Cattle and all mammals	Virus	Live animal	Yes	1
Rift Valley fever	Cattle, sheep, goats and dogs	Virus	Live animal, vector	Yes	2
Rinderpest	Cattle, sheep and pigs	Virus	Live animal	No	2
Screw worm fly*	Cattle and all mammals	Parasite	Live animal as vector	Yes	2
Surra* (*Trypanosoma evansi*)	Cattle, horses, camelids, deer, dogs and cats	Parasite	Mechanical	No	4
Vesicular stomatitis	Cattle, sheep, goats, pigs and horses	Virus	Live animal, vector	Yes	2

* Northern Australian Quarantine Strategy (NAQS) Target List Diseases (AUSVET 2019)

Source: Adapted from East I, Martin P & Sergeant ESG (2017). *Risk profile for priority animal diseases across northern Australia: risk mapping final report*, Northern Australia Biosecurity Surveillance (NABS) Animal Project NABS A1.1.

Glossary

Terms and definitions

Standard AUSVETPLAN terms

For definitions of standard AUSVETPLAN terms, see the **AUSVETPLAN *Glossary***.

Manual-specific terms

Term	Definition
Anthelminthic	Chemicals used to prevent and treat parasitic worm infections.
Backgrounding	Growing system for feeder cattle from the time calves are weaned until they enter a finishing system.
Body condition	Subjective assessment of the body tissue (fat and muscle) reserves of an animal. A score on a 5-point scale (1 = poor), 2 = backward, 3 = moderate, 4 = forward or good, 5 = fat) may be used to assess body condition.
Bos indicus	Sub-species of cattle originating in tropical southern Asia. Brahmans are derived predominately from *Bos indicus* cattle.
Bos taurus	Sub-species of cattle originating in Europe, and includes British and continental breeds.
Boxed beef	Cuts of beef put into boxes, for shipping from processor to wholesalers or retailers.
Bull	An entire or uncastrated adult male bovine.
Calf	An unweaned bovine under 11 months of age.
Calf scours	Scours in young calves caused by an interaction between the environment, the health of the calf and the presence of disease-causing agents (pathogens). Common pathogens that cause calf scours include bacteria, viruses and protozoa.
Carrying capacity	The number of animals that may be maintained on an area of land (based primarily on the available feed supply). Carrying capacity can be estimated over long and short timeframes.
Cattle tick line	Boundary that divides the areas where cattle ticks are expected (endemic) from those where cattle ticks are not expected to be present and are prohibited.
Composite	A stabilised or synthetic crossbreed established from the mating of the progeny of two or more existing breeds.
Cow	A female adult bovine that has produced at least one calf.
Country	For Aboriginal and Torres Strait Islander peoples, represents the lands, waterways, seas and skies to which Indigenous people are connected. The term contains complex ideas and meaning about lore, place, custom, language, economy, spiritual belief, cultural practice, wellbeing, kin and identity.
Crossbreed / crossbred	Progeny from crossing two or more breeds, lines or strains.

Term	Definition
Dry cow	Non-lactating cow (i.e. cow not suckling a calf).
Dry season	The period between May and September of the same year in northern Australia when there is typically no rain.
Empty (cow)	Non-pregnant cow at pregnancy diagnosis.
Feed base	The suite of perennial grasses, annual grasses, forbs, native legumes, edible shrubs and edible trees in a grazing area that provide potential forage for livestock.
Feeder cattle	Cattle purchased by a lotfeeder to be placed in a feedlot. Cattle specifications (entry weight, muscle and fat score, breed, age etc) are dependent on the market the animal is destined for.
Heifer	A female adult bovine animal that has not produced a calf.
Manufacturing beef	System that produces lean beef of lower eating quality, used for manufacturing purposes. Also known as commodity beef or grinding beef. Typically uses resilient, lower-fatness breeds or genotypes, such as tropically adapted cattle, within extensive production systems, and cull cattle.
Myiasis	Parasitic infestation of the body of a live animal by fly larvae (maggots).
Mickey bull	A young, unmarked cleanskin bull which has not been castrated or branded.
Prescribed bodies corporate (PBCs)	A prescribed body corporate (PBCs) is a group of people chosen by native title applicants to manage their rights and interests before a decision is made by the court. After a native title decision is made, the PBC becomes a registered native title body corporate (RNTBC). While officially known as RNTBCs, these groups are still called PBCs. These groups have a job under the *Native Title Act 1993* (Cth) to hold, protect and manage native title in their specific area. PBCs look after Country and culture according to the wishes of the PBC members and the native title group they represent.
South-east Asia	The countries of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste and Vietnam.
Spaying	A management practice that involves the surgical removal of the ovaries from cows or heifers with the aim of preventing pregnancy.
Steer	A castrated adult male bovine.
Stocking rate	The number of animals grazing an area of land at a particular time point (as related to feed demand). In northern Australia, the usual measure is hectares per adult equivalent (ha/AE) or adult equivalents per square kilometre (AE/km^2); however, stocking rate may also be expressed in terms of cattle per unit area, such as breeders (cattle) per ha or km^2.
Supplement	Addition to the diet to balance primary deficiencies, speeding up digestion, thereby increasing the rate of pasture or hay consumption, thus energy intake. Supplement can be fed in the form of solid lick blocks, loose mix or through water medication.
Top End (of the Northern Territory)	A region which encompasses the northernmost areas of the Northern Territory including West Daly, Kakadu National Park, West Arnhem, the Tiwi Islands, Nitmiluk National Park (Katherine) and various rural areas.
Unmusterable	Refers to domestic livestock that cannot be mustered — the process of gathering livestock, usually by horseback, vehicle, or aircraft — using conventional techniques, typically due to rugged, remote or inaccessible terrain.

Term	Definition
Weaner	A calf that has been weaned from dependency on its mother.
Wet cow	Lactating cow or cow suckling a calf.
Wet season	The period between November and April of the crossover years in northern Australia when monsoonal rainfall, and grass and pasture growth, are at their peak.
Yearling	A heifer or bull greater than 12 months of age.

Abbreviations

Standard AUSVETPLAN abbreviations

For standard AUSVETPLAN abbreviations, see the **AUSVETPLAN *Glossary***.

Manual-specific abbreviations

Abbreviation	Full title
BTEC	Brucellosis and Tuberculosis Eradication campaign
ESCAS	Exporter Supply Chain Assurance System
EUCAS	European Union Cattle Accreditation Scheme
FMD	foot-and-mouth disease
HGP	hormonal growth promotant
ILUA	Indigenous Land Use Agreement
IPOP	infected premises operations
KPCA	Kimberley Pilbara Cattlemen's Association
LLI	Liason – Livestock Industry
LPA	Livestock Production Assurance
LSD	lumpy skin disease
MLA	Meat and Livestock Australia
NACN	Northern Australia Co-ordination Network
NAILSMA	North Australian Indigenous Land and Sea Management Alliance Limited
NLIS	National Livestock Identification System
NTCA	Northern Territory Cattlemen's Association
NVD	National Vendor Declaration
PIC	property identification code
PLUA	Pastoral Land Use Agreement

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