



Australian Government

**Department of Agriculture,
Fisheries and Forestry**

Australia's freedom from lumpy skin disease

Biosecurity Animal Division

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Summary

This dossier provides detailed information on Australia's animal health status, biosecurity and surveillance systems and domestic and wild bovine populations. It demonstrates that:

- Lumpy skin disease (LSD) has never occurred in Australia
- Australia is free from LSD infection in accordance with the provisions of the World Organisation for Animal Health (WOAH) Terrestrial Animal Health Code.
- LSD is nationally notifiable in Australia
- Australia's animal health surveillance system and underpinning activities support early detection and provide evidence for freedom from LSD infection
- Trading partners can have confidence in Australia's status as free from LSD infection
- Australia has a demonstrated history of timely disease notification
- Australia's surveillance system achieves a high surveillance sensitivity
- The absence of reports of LSD strongly supports Australia's free status, as does data generated from targeted surveillance activities
- Many exclusion tests are undertaken for LSD each year
- Australia has a key focus on preventing entry of LSD into Australia
- Established surveillance, preparedness and response arrangements mean that Australia would promptly detect and respond effectively to an outbreak of LSD if it were to occur
- Australia is committed to meeting all reporting obligations as a member of the WOAH and to immediately notify trading partners of any emergency animal disease (EAD).

In summary, Australia is free of LSD infection. Australia's excellent animal health surveillance system and effective EAD response arrangements mean a change in animal health status would be detected, reported and dealt with rapidly.

Australian bovines and bovine products represent a negligible risk of LSD to trading partners.

Introduction

The purpose of this dossier is to provide information on Australia's animal health status, biosecurity and surveillance systems and domestic and wild bovine populations to demonstrate that Australia:

- is free of LSD infection
- can detect an LSD outbreak promptly
- would respond effectively in the event of an LSD outbreak, including with timely notification to trading partners.

The Australian bovine (beef cattle, dairy cattle and buffalo) population is free of many of the World Organisation for Animal Health-listed diseases that affect bovines. This can be attributed to a robust biosecurity system, geographical isolation providing a natural biosecurity barrier and successful implementation of disease eradication programs. LSD has never occurred in Australia and Australia is free from LSD infection in accordance with the provisions of the WOAHA Terrestrial Animal Health Code. Infection with LSD virus is a nationally notifiable animal disease with legislated requirements for immediate reporting of suspicion or confirmation of clinical signs of disease to government veterinary authorities.

This dossier provides an overview of Australia's animal health system to demonstrate the robust biosecurity and surveillance systems, competent veterinary and laboratory services, adequate resourcing and established preparedness and response arrangements for emergency animal diseases (EADs). Summaries of Australian bovine industries and Australia's status for diseases that affect bovines are provided. Evidence is presented to demonstrate Australia's freedom from LSD infection, based on surveillance activities. Methods to prevent LSD virus from entering Australia are discussed, along with preparedness and response arrangements. Australia's wild bovine population is considered, including EAD surveillance, preparedness and response arrangements in wild buffalo and cattle.

1 Australia's animal health system

Australia's animal health system protects both domestic livestock production and valuable export markets. Australia's export market for livestock and livestock products is worth approximately \$20 billion annually (ABARES 2022). The animal health system maintains high standards of animal health and ensures trading partners can be confident in Australia's animal health status.

Essential prerequisites for prevention of, preparedness for, early detection of and effective response to an EAD outbreak include trained and competent veterinary and laboratory services, pre-defined governance and funding arrangements and supporting strategies for EAD response implementation.

The [Animal health in Australia system report](#) provides an in-depth description of Australia's animal health system. An overview is presented in this section.

1.1 Competent veterinary and laboratory services

1.1.1 Australian animal health governance and legislation

Australia has a federal system of government comprising a national government, 6 state governments and 2 territory governments. The division of powers between the national, state and territory governments is outlined in the Australian Constitution. National biosecurity and international trade are primarily the responsibility of the Australian Government, while animal health matters, such as disease surveillance, are a state and territory responsibility. Structures are in place for the sharing of EAD preparedness and response responsibilities between the Australian, state and territory governments and livestock industry groups.

The Department of Agriculture, Fisheries and Forestry (the department) administers the [Biosecurity Act 2015](#), which governs how biosecurity threats to plant, animal and human health in Australia and its external territories are managed.

The department also administers the [Export Control Act 2020](#), which sets out the overarching legal framework for the regulation of exported goods, including food and agricultural products, from Australia. Australia's export legislation ensures that exported goods:

- meet importing country requirements
- comply with government and relevant industry standards
- are traceable through the export supply chain where required
- have integrity and have accurately applied trade descriptions and official marks.

There are 4 main divisions in the department that support animal health: Biosecurity Animal Division; Exports and Veterinary Services Division; Traceability, Plant and Live Animal Exports Division; and the Australian Chief Veterinary Office. The [department's organisational chart](#) can be found on the department's website.

Technical staff working in these areas of the department hold a tertiary degree in a relevant scientific field (Inspector-General of Biosecurity 2022), such as veterinary science, ensuring that staff members have a strong fundamental scientific knowledge base and critical thinking skills. Upon

commencement, all staff receive relevant training specific to their role (Inspector-General of Biosecurity 2022).

Responsibilities at the Australian Government level, implemented by the department, include:

- biosecurity
- international disease reporting
- export certification
- trade negotiation
- national coordination of EAD response activities
- animal health policy.

State and territory governments deliver their services through government-appointed or government-accredited animal health professionals such as district veterinarians, regional veterinary officers and local biosecurity officers. Each state and territory also has a chief veterinary officer. Key responsibilities of states and territories include:

- coordinating animal health services within their borders
- conducting EAD response activities within their borders
- developing and implementing legislation relevant to surveillance, control, investigation and reporting of diseases.

1.1.2 Role of private veterinarians in the official veterinary services

Private veterinarians play a vital role in providing livestock owners with animal health, welfare and production advice, and in investigating and treating disease. They also play an integral role in programs for detecting and responding to significant disease incidents in Australia's livestock industries. For example, private veterinarians may be contracted by the government to investigate suspect notifiable diseases and are a key part of the general surveillance system.

During an EAD response, private veterinarians may be engaged by state and territory governments to provide support. In 2017, nationally consistent conditions and remuneration policy were agreed to by the Animal Health Committee (see Section 1.4.3) to promote prompt and consistent responses.

Australia maintains the [Accreditation Program for Australian Veterinarians](#), which is a program designed to integrate private veterinarians into the national animal health system. It enables veterinarians to apply their skills and knowledge to government and industry animal disease control programs and export inspection and certification. There are approximately 200 veterinarians distributed across Australia with active [accreditation](#) under this program (AHA 2022a).

1.1.3 WOAH Performance of Veterinary Services evaluation

Australia's veterinary services were assessed in 2015 by WOAH. The [Performance of Veterinary Services evaluation](#) assessed Australia's animal health and biosecurity system. The report demonstrated the veterinary system's ability to support Australia's strong animal health status, which underpins access to international markets.

Australia scored the highest level (level 5) for most key technical veterinary services capabilities, including (Schneider et al. 2016):

- The veterinary services implement prevention, control or eradication programs for all relevant diseases with scientific evaluation of their efficacy and efficiency consistent with relevant WOA international standards
- The veterinary services can demonstrate the scientific basis for any disease-free zones and can gain recognition by trading partners that they meet the criteria established by WOA (and by the World Trade Organization Sanitary and Phytosanitary Measures Agreement, where applicable)
- The veterinary services have access to and use a network of national or international reference laboratories to obtain a correct diagnosis
- The veterinary services work with neighbouring countries and trading partners to establish, apply and audit quarantine and border security procedures that systematically address all risks identified
- The veterinary services regularly report to producers and other interested parties and the international community on the findings of passive surveillance programs
- The veterinary services conduct active surveillance for relevant diseases and apply it to all susceptible populations. The surveillance programs are evaluated and meet the country's WOA obligations
- The veterinary services have national contingency plans for all diseases of concern, including coordinated actions with relevant competent authorities, all producers and other interested parties through a chain of command. These are regularly updated, tested and audited.

1.1.4 Laboratory systems

Australia has a network of world-class animal health laboratories operated by the Australian, state and territory governments, veterinary schools and the private sector. They provide surveillance, diagnostic and research services for endemic and exotic diseases, including zoonoses.

The Commonwealth Scientific and Industrial Research Organisation operates Australia's national animal health laboratory, the [Australian Centre for Disease Preparedness](#) (ACDP; formerly known as the Australian Animal Health Laboratory). The ACDP is 1 of only 6 major high-containment animal health laboratories in the world and is a national and WOA reference laboratory for several EADs (AHA 2021a).

In addition to the ACDP, there are animal health laboratories providing government services in all 6 states and in the Northern Territory. Government laboratories play a key role in testing for EADs to support disease surveillance and response, biosecurity policy and domestic and international trade in animals and animal products.

The [Laboratories for Emergency Animal Disease Diagnosis and Response \(LEADDR\) network](#) consists of members from the department, the ACDP and state and territory government laboratories. The network aims to standardise or harmonise testing services for targeted EADs of terrestrial and aquatic animals in all member laboratories. This ensures a nationally coordinated approach and

maximises the availability of national resources to meet demands for large-scale testing in an EAD outbreak. The LEADDR network reports to the [Subcommittee on Animal Health Laboratory Standards](#) under the [Animal Health Committee](#) (see Section 1.4.3).

In the event of an EAD outbreak, once the [Consultative Committee on Emergency Animal Diseases](#) (see Section 1.4.3) is formed, the LEADDR Coordinating Committee (comprising the senior representatives of each LEADDR member organisation) operates as the Laboratory Subcommittee, and may co-opt technical specialists appropriate for the disease in question (AHA 2013). The role of this subcommittee is to provide technical advice and technical support to the Consultative Committee on Emergency Animal Disease. The [Australian Veterinary Emergency Plan](#) (AUSVETPLAN; see Section 1.4.1) *Management manual: Laboratory preparedness (version 4.0)* assists laboratories to prepare an EAD contingency plan for an animal disease emergency (AHA 2013).

1.1.5 Infrastructure and resources

Staff and offices

The department has approximately 5,000 staff working in offices, airports, mail centres, shipping ports, laboratories and abattoirs throughout Australia. The national office is in Canberra. As shown in Table 1, there are more than 16,000 veterinarians and other personnel directly involved in animal health services across Australia, inclusive of terrestrial and aquatic animals.

Table 1 Number of veterinarians and other animal health personnel in Australia in 2018

Personnel type	Number of people
Registered veterinarians	
Government	785
Laboratories, universities etc.	988
Private practitioners	10,574
Other veterinarians	1,632
Total	13,979
Auxiliary personnel	
Stock inspectors, meat inspectors etc.	2,464

Source: Animal Health Australia (AHA 2019)

Emergency animal disease funding

The department is allocated budgetary resources each financial year to support EAD preparedness and emergency response activities. Annual budget details are presented in the department's [Portfolio Budget Statements](#). Additionally, the department receives revenue from a range of cost-recovery activities.

For details on the department's funding arrangements and cost sharing in the event of an EAD outbreak, refer to the [2022–23 Portfolio Budget Statements](#) and the [Emergency Animal Disease Response Agreement](#) (EADRA; see Section 1.4.1).

1.2 Animal health surveillance system

1.2.1 Overview

Disease surveillance is a critical element of an effective and efficient animal health system and a core competency of veterinary services. Australia's animal disease surveillance system has been established to support (DAWR 2018):

- early detection of emergency and emerging animal diseases
- access to international markets
- management of endemic pests and diseases.

These functions underpin both national and international trade in animals and animal products. They provide necessary information for disease control policies, programs and reporting requirements. Coordinated approaches at a national level ensure that Australia can continue to meet international and domestic requirements for animal health.

1.2.2 Surveillance activities

Australia's animal health surveillance system and underpinning activities support early detection, provide an understanding of disease distribution and prevalence, and provide evidence for disease freedom. This is supported by a network of government field veterinary officers, private veterinarians, government and private veterinary diagnostic laboratories, researchers and livestock producers. Australia's disease surveillance includes general and targeted activities, including targeted national surveillance programs.

Government animal health personnel conduct general and targeted surveillance and provide disease diagnosis services. Field staff are supported by [National Association of Test Authorities](#) (NATA) accredited government veterinary laboratories or government-contracted veterinary diagnostic laboratories. There is a national framework for subsidising disease investigations, which covers field work, laboratory expenses and training for private veterinarians. This is supported under the [National Significant Disease Investigation Program](#), which is in place to investigate and report potentially significant disease events in livestock and wildlife (AHA 2021b).

LSD has never been reported in Australia and Australia is free from LSD infection. LSD is a nationally notifiable animal disease in Australia, and any suspected cases must be reported to government veterinary authorities for investigation.

Section 3 provides further information on Australia's status for nationally notifiable animal diseases, and Section 4 collates surveillance information related to LSD.

1.2.3 Data and reporting

Data on disease investigations is held in national, state and territory field and laboratory databases to maintain disease profiles of districts and individual properties. A subset of this information is collated through the [National Animal Health Information System](#) for analysis, reporting and response (AHA 2021c). The National Animal Health Information System data is used in fulfilling Australia's WOH reporting obligations, for substantiating claims on animal health status and for trade negotiations. Data is routinely reported in the [Animal health in Australia annual report](#) and [Animal Health Surveillance Quarterly](#), the newsletter of the National Animal Health Information System.

1.3 Identification and traceability

The [National Livestock Identification System](#) (NLIS) is Australia's system for livestock identification and traceability. The 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, for the purposes of food safety, product integrity and market access. The NLIS enhances Australia's ability to track livestock during disease and food safety incidents.

The NLIS combines 3 elements to enable the lifetime traceability of animals (ISC 2021):

- All livestock are identified by a visual or electronic ear tag or device
- All physical locations are identified by means of a property identification code
- All livestock location data and movements are recorded in a central database.

All animals are identified with an accredited NLIS tag or device from their property of birth. Cattle are identified at the individual level, whereas sheep, goats (generally) and pigs are identified at the mob/group level. As rangeland goats are harvested from the wild, tagging exemptions are in place for these and dairy goats in some states and territories (ISC 2021). At harvesting, feral buffalo are required to be fitted with NLIS tags for traceability before being transported, like other commercial livestock. Australia is working towards a national mandatory [individual electronic identification system for sheep and goats](#) by 1 January 2025. It is an offence in all states and territories to not tag or to remove tags from livestock.

Any premises that graze or keep livestock (including other species such as alpacas, camels and horses) and livestock businesses, such as saleyards or abattoirs, are required to have a property identification code. This is an 8-character code allocated by the primary industries department or an equivalent authority in each state or territory to identify a livestock-producing property.

As animals are bought, sold and moved along the supply chain, each movement is recorded centrally on the NLIS database. Information on animal movements is recorded on movement documents – National Vendor Declarations, or [PigPass](#) (the national tracking system that provides information on the movements of all pigs in Australia) National Vendor Declarations for pigs – and submitted to the NLIS database by producers, saleyard operators, livestock agents and processors.

Using this information, the NLIS can provide a life history of an animal's movements. Participation in the NLIS is mandatory for all cattle, sheep, goats and pigs. State and territory governments are responsible for the legislation that governs animal movements and implementation of the NLIS. States and territories monitor compliance with NLIS requirements throughout the livestock supply chain. The [Integrity Systems Company](#) administers the NLIS database for industry and government stakeholders.

1.4 Emergency animal disease preparedness and response

1.4.1 Emergency animal disease preparedness and response arrangements

Australia has well-established EAD preparedness and response arrangements with demonstrated effectiveness and efficiency. For example, Australia has eradicated outbreaks of avian influenza in poultry and equine influenza, and managed arbovirus outbreaks such as Japanese encephalitis virus

and West Nile virus (Kunjin strain). Response arrangements are regularly tested, updated and improved.

The core components of Australia's preparedness and response arrangements include:

- AUSVETPLAN
- the EADRA
- formalised and experienced consultative committees
- veterinary services.

Australian Veterinary Emergency Plan

[AUSVETPLAN](#) outlines general and disease-specific procedures on how to respond in the event of an EAD outbreak in Australia. These documents, managed by Animal Health Australia, describe the implementation of control measures such as livestock movement controls, zoning, culling and disposal methods and vaccination. They are endorsed and supported by both government and industry, with well-established collaboration to implement them in the event of an EAD outbreak.

AUSVETPLAN comprises disease-specific response strategies, operational manuals, enterprise manuals and management manuals. Additional supporting information is available in guidance and resource documents.

[AUSVETPLAN documents](#) can be found on Animal Health Australia's website.

Emergency Animal Disease Response Agreement

The [EADRA](#) is a legally binding agreement between the Australian, state and territory governments, livestock industry groups and Animal Health Australia. This agreement brings together government and industry to increase Australia's capacity to prepare for, and respond to, an EAD outbreak. Under the EADRA, states and territories are required to maintain sufficient staff trained in EAD response and routinely provide training for their staff to support this. The EADRA facilitates a rapid and effective response by:

- minimising uncertainty over management and funding arrangements
- enabling affected parties to be involved in decision-making
- establishing operating principles and guidelines
- defining key roles and responsibilities for relevant stakeholders
- sharing eligible response costs of an EAD outbreak.

Consultative committees

There are several key consultative committees that support EAD responses. They ensure government and industry work collaboratively and help to coordinate animal health services.

See Section 1.4.3 for more details.

Veterinary services

See Section 1.1 for details.

1.4.2 Emergency animal disease response human resources

In the event of an EAD outbreak, government officers, livestock producers, private veterinarians and emergency workers may be called on to help eradicate or control the disease. Australia has a [National Biosecurity Response Team](#) of almost 70 trained and experienced personnel that can be deployed to assist another state or territory during a biosecurity incident. The team is cross-sectoral and could be deployed to an animal, plant, aquatic or environmental biosecurity incident response.

If Australia requires additional resources during an EAD response, the [International Animal Health Emergency Reserve](#) arrangement provides access to additional human resources from Canada, Ireland, New Zealand, the United Kingdom and the United States.

1.4.3 Coordination and harmonisation of animal health services

National consultative committees are in place to ensure all components of the animal health system work together to serve Australia's interests, including in the event of an EAD response. These include:

- [National Biosecurity Committee](#) – responsible for managing a national, strategic approach to biosecurity threats. A core objective of this committee is to promote cooperation, coordination, consistency and synergies across and between Australian governments. It supports implementation of the [Intergovernmental Agreement on Biosecurity](#), signed by all states and territories
- [Animal Health Committee](#) – sits under the National Biosecurity Committee; develops scientific, strategic and nationally consistent policy on animal health issues and provides advice on animal health to the National Biosecurity Committee. The Animal Health Committee leads the development and implementation of government policy, programs, operational strategies and standards in national animal health, animal biosecurity and veterinary public health
- [Consultative Committee on Emergency Animal Diseases](#) – convened in the event of an EAD outbreak. Its role is to effectively and efficiently coordinate the national technical response to, and to advise meetings of the National Management Group on, the EAD response in accordance with the EADRA
- [National Management Group](#) – makes decisions on the technical feasibility and cost–benefit analysis of eradicating the EAD in accordance with the national response plan and agreed cost-shared budget
- [Animal Health Australia](#) is a not-for-profit public company that facilitates partnerships between governments, livestock industries and other stakeholders. It supports engagement and collaboration through information sharing, networking, training and running programs.

2 Australian bovine industries

2.1 Size and distribution of Australian bovine industries

Australia has 3 distinct bovine industries – beef cattle, dairy cattle and buffalo. In recent years, Australia experienced severe and long-lasting drought conditions, resulting in a marked decrease in the national cattle herd. However, improved environmental conditions during 2020–21 led to increased pasture production and lower feed prices, and many producers expanded their cattle herds accordingly. Nationally, the total cattle herd numbered 23.5 million in 2020, comprising 90% beef cattle and 10% dairy cattle (MLA 2021).

In 2021, the Australian beef herd was approximately 22 million head, comprising 4.9 million calves, 11.8 million cows and heifers, and 5.4 million other beef cattle (ABS 2022a). Beef cattle are predominantly located in Queensland (45% of national beef herd), New South Wales (16% of national beef herd) and Victoria (15% of national beef herd) (MLA 2021).

The Australian beef industry can broadly be divided into the northern and southern production regions. The northern region is characterised by extensive farming systems spanning very large areas with relatively low stocking densities (Australian Competition and Consumer Commission 2016). These enterprises typically use *Bos indicus* breeds, due to their heat tolerance, tick resistance and hardiness. Pasture is generally of lower quality and is reliant on monsoonal rainfall. The northern cattle industry is significantly more export-oriented than the southern industry. In contrast, intensive farming systems are typical in the southern production region. Enterprises are generally smaller, have higher stocking rates, use improved pastures due to more consistent rainfall and often span several agricultural activities, such as grain or sheep production (Australian Competition and Consumer Commission 2016). *Bos taurus* breeds are preferred, due to their superior meat quality.

In 2021, the Australian dairy herd was approximately 2.4 million head, comprising 1.4 million cows in milk and dry, 423,500 dairy calves, 383,300 heifers between 1 and 2 years old, and 105,000 heifers older than 2 years (ABS 2022a). Dairy operations are predominantly pasture-based and are located across the temperate and some subtropical regions of Australia, with most production occurring in south-eastern Australia (Dairy Australia 2021).

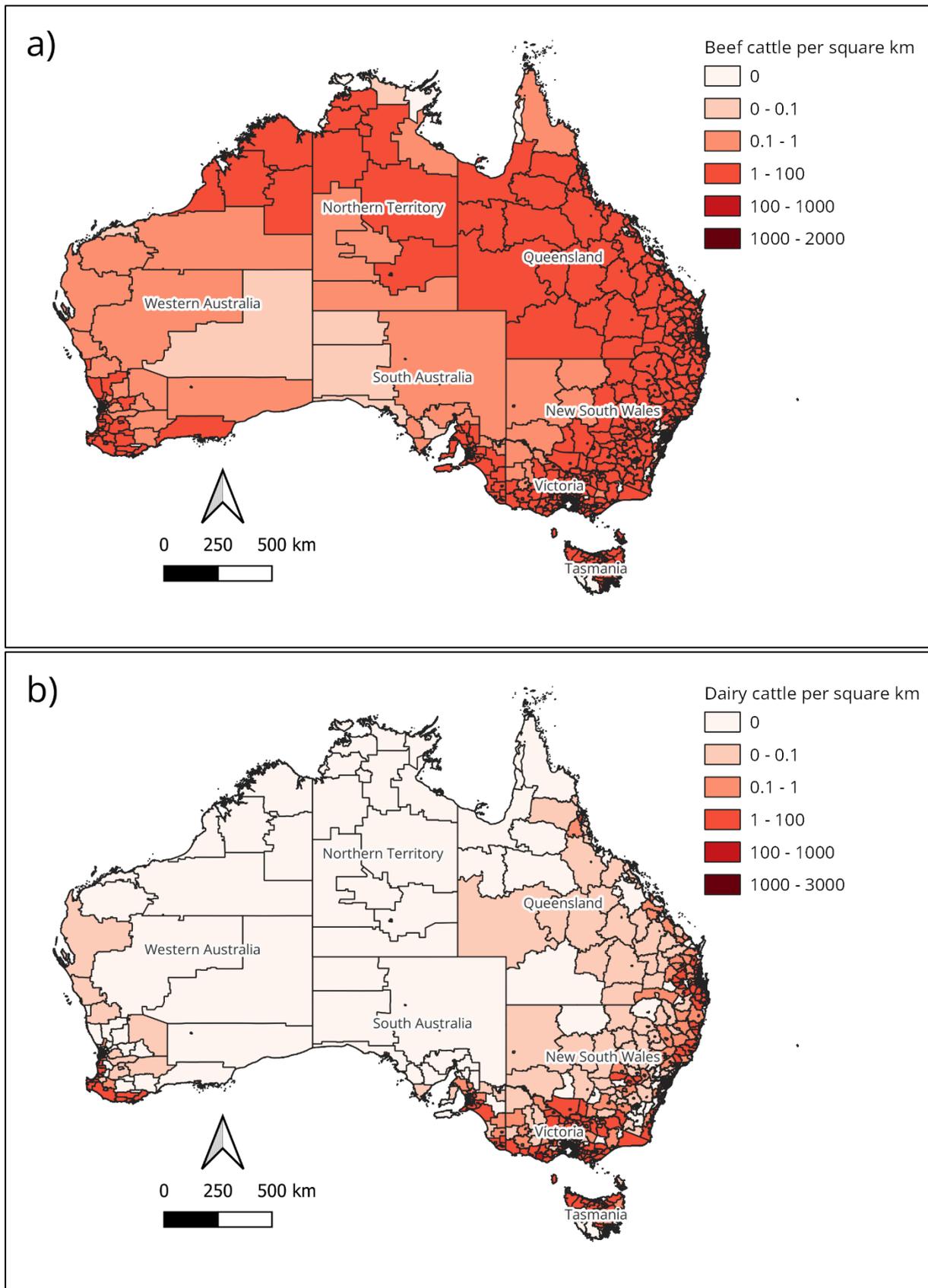
Figure 1 shows the distribution of commercial beef and dairy cattle across Australia.

The Australian buffalo industry is much smaller than either cattle industry and it is further subdivided into the free-range buffalo industry of the Northern Territory and the dairy buffalo industry. The buffalo industry is based on the Asian water buffalo (*Bubalus bubalis*; also known as the water buffalo or domestic water buffalo) of which there are 2 distinct subtypes: swamp and river buffalo. The Northern Territory industry comprises approximately 180,000 head (in 2020) of swamp buffalo in uncontrolled herds (i.e. wild buffalo), plus a further 10,000 head managed on extensive commercial stations (MacDonald et al. 2021; Saalfeld 2014). The dairy buffalo industry operates in most states and comprises 12 dairies with approximately 3,000 head of riverine buffalo run on an intensive or semi-intensive scale (MacDonald et al. 2021). Surplus animals are harvested for meat.

The Australian Bureau of Statistics is Australia's national statistical agency. It produces yearly estimates of the size of Australia's agricultural industries using survey methodologies of farmers.

Every 5 years a census of Australian farms is completed, which obtains more accurate data on commercial beef and dairy cattle numbers. Data and figures on commercial cattle numbers included here are derived from this census data. Buffalo numbers are not specifically reported by the Australian Bureau of Statistics but are captured by [AgriFutures Australia](#). This is an Australian statutory corporation established by the Australian Government in 1990 to fund research and development for Australia's rural industries that collect levies, including the buffalo industry.

Figure 1 Commercial beef cattle (a) and dairy cattle (b) density across Australia (2020–21)



Source: Australian Bureau of Statistics (ABS 2022a).

2.2 Production and consumption of beef

[Meat & Livestock Australia](#), the industry body for Australian red meat and livestock producers in Australia, produces a series of [market reporting publications](#) on prices, trends and forecasts both at the domestic and international level.

Australia is a key exporter of red meat globally, despite having a relatively small proportion of the world cattle herd. In 2019–20, Australia had approximately 1.6% of the global cattle herd and accounted for approximately 3% of global beef production, yielding 2.1 million tonnes carcass weight of beef and veal (MLA 2021). Australia is the second largest beef exporter after Brazil (MLA 2021). In 2021, 1 million tonnes shipped weight of beef was exported, principally to Japan (26% market share), the United States (20%) and China (19%), equating to a value of \$9.6 billion (MLA 2021). In 2020, Australia exported more than 1.04 million live cattle, principally to Indonesia (44.3%) and Vietnam (28.4%) (DAFF 2022a). Live exports of cattle decreased in 2021 to 771,931. While the per capita consumption of red meat has steadily declined in Australia over the last 2 decades, Australia continues to be a large consumer of beef (seventh globally). Domestically, Australian consumption of beef was approximately 23.4 kg per capita in 2020, compared with a global average of 6.4 kg (MLA 2021). There were 7.1 million adult cattle slaughtered in 2020, of which cows and heifers accounted for 52% (MLA 2021). The national average carcass weight was 293 kg/head, increasing from just over 260 kg/head in 2000 (MLA 2021). The National Beef Retail Price Indicator averaged 2,145 c/kg retail weight in 2019–20 (MLA 2021).

Australia currently only imports fresh and/or frozen beef from New Zealand and Japan. There are no imports of live bovines other than rare imports of zoo Bovidae from approved countries. Imports of zoo Bovidae include requirements that the animals have been resident in a country recognised by Australia as free from LSD for at least 180 days prior to export and that the animal has not been vaccinated against capripoxviruses (including LSD) in the 3 years prior to export. Australia imports bovine genetic material (semen and embryos) only from countries approved by and recognised by Australia as free from LSD.

The red meat and livestock industry turnover (including beef, sheep and goats) was estimated at \$69.9 billion in 2019–20, accounting for approximately 2% of Australia's total key industry turnover (MLA 2021). This was a 5% increase in turnover from 2018–19, driven by growth in the feedlot sector, increased demand from export markets and domestic supply constraints. 'Beef cattle farming' contributed 30% of the total red meat and livestock industry turnover, while 'processing' represented 33%, 'retail' represented 12% and 'feedlots' and 'wholesale' each represented 7%, with the remainder contributed by 'sheep farming' (MLA 2021). The Australian red meat and livestock industry employed approximately 445,000 people during 2019–20, with a further 249,000 people employed in allied industries (MLA 2021). Table 2 summarises the last decade of beef and veal production, trade and consumption data from Australia.

Table 2 Production, trade and consumption statistics for beef and veal in Australia

Fiscal year of production	Number of slaughtered cattle ('000 head)	Average slaughter weight (kg)	Production of beef and veal (kt)	Imports of beef and veal (kt)	Exports of beef and veal (kt)	Australian consumption of beef (kt)	Australian beef consumption per person (kg)
2010–11	8,099	263	2,133	4.1	981	692	31.0
2011–12	7,875	269	2,115	4.5	995	657	28.9
2012–13	8,456	265	2,245	3.2	1,052	708	30.6
2013–14	9,474	260	2,464	3.0	1,214	697	29.7
2014–15	10,105	263	2,662	2.2	1,376	653	27.4
2015–16	8,800	266	2,344	2.9	1,196	596	24.6
2016–17	7,421	279	2,069	3.6	991	626	25.4
2017–18	7,915	283	2,238	2.3	1,122	597	23.9
2018–19	8,704	270	2,352	2.2	1,222	579	22.9
2019–20	8,699	273	2,372	2.8	1,290	510	19.9
2020–21	6,621	292	1,933	6.1	981	526	20.5
2021–22	6,148	305	1,878	6.8	940	533	20.5

Source: Australian Bureau of Agricultural and Resource Economics (ABARES 2023); Australian Bureau of Statistics (ABS 2023)

2.3 Production and consumption of dairy

[Dairy Australia](#), the industry body for dairy producers in Australia, produces a series of [market reporting publications](#) on prices, trends and forecasts both at the domestic and international level.

Dairy was Australia's third largest rural industry (after beef and wheat) in 2020–21, generating \$4.7 billion and directly employing approximately 37,400 people (Dairy Australia 2021). Growth in the dairy industry has stalled since the early 2000s due to industry deregulation and severe and prolonged drought. As a result, the number of dairy farms has fallen since this time, decreasing by a further 9% in 2020–21 (Dairy Australia 2021). Correspondingly, the average size of dairy farms increased; the average herd size in 2021–21 was 300 cows. Total annual Australian milk production in 2020–21 was 8,858 million litres, of which 32% was exported, mostly to China, Japan, Singapore, Malaysia and Indonesia (Dairy Australia 2021). These exports comprised approximately 280 million litres of liquid milk (predominantly as ultra heat treatment milk), 155,000 tonnes of cheese, 25,000 tonnes of butter, 178,000 tonnes of milk powders, and 35,000 tonnes of whey products (Dairy Australia 2021). Milk exports in 2020–21 totalled \$3.3 billion, averaging US\$39 per 100 kg of milk (Dairy Australia 2021). This makes Australia the world's fourth largest dairy exporter, with a 4% market share despite producing less than 2% of the world's estimated milk (Dairy Australia 2021).

Australia imports dairy products mostly from New Zealand, with the European Union and the United States largely accounting for the remainder of imported dairy products (Dairy Australia 2021). Dairy imports for 2020–21 totalled 277,143 tonnes (Dairy Australia 2021).

Domestically, 39% of milk is used in cheese production, 29% is processed as drinking milk, 22% is used for skim milk powder or butter and the remainder is used for other purposes (Dairy Australia

2021). During 2020–21, Australia produced over 380,000 tonnes of cheese, 206,000 tonnes of milk powders and 72,000 tonnes of butter (ABS 2022a). Australian annual per capita consumption of milk in 2020–21 was 94.4 litres, one of the highest rates in the world, and annual per capita consumption of cheese was 13.4 kg (ABS 2022a). Table 3 summarises the last decade of dairy production, trade and consumption data from Australia.

Table 3 Production, trade and consumption statistics for dairy in Australia

Fiscal year of production	Average yield	Total production				Exports			Australian consumption per person
		Milk (L/cow)	Milk (ML)	Cheese (kt)	Butter (kt)	Milk (ML)	Cheese (kt)	Butter (kt)	Milk (ML)
2010–11	5,777	9,180	339	122	77	163	54	2,316	104
2011–12	5,604	9,589	347	120	91	161	48	2,387	105
2012–13	5,431	9,334	338	118	106	174	52	2,445	106
2013–14	5,684	9,421	311	116	118	151	49	2,466	105
2014–15	5,758	9,806	344	119	157	159	43	2,489	105
2015–16	6,191	9,681	344	119	183	172	32	2,520	104
2016–17	5,918	9,016	349	100	189	167	21	2,506	102
2017–18	6,000	9,325	378	93	217	171	16	2,491	101
2018–19	6,160	8,793	385	73	236	166	21	2,476	98.6
2019–20	6,311	8,797	392	73	244	158	11	2,468	97.0
2020–21	6,380	8,858	390	82	275	154	24	2,421	94.4
2021–22	6,748	8,554	432	73	405	157	19	2,394	93.0

Source: Australian Bureau of Agricultural and Resource Economics (ABARES 2021); Australian Bureau of Statistics (ABS 2023); Dairy Australia (Dairy Australia 2022)

2.4 Production and consumption of buffalo

Swamp buffalo from the free-range Northern Territory industry are exported (live) to South-East Asia or processed locally for meat through a domestic abattoir (MacDonald et al. 2021). Live export numbers have gradually increased over the previous 5 years, from 9,710 in 2017 to 10,827 in 2021 (DAFF 2022a). Exported animals are typically slaughter-weight, although Indonesia takes younger males up to 350 kg to be finished in feedlots; small shipments of breeders are also sold regularly (MacDonald et al. 2021). Buffalo from Australia are exported to Vietnam, Indonesia, Malaysia, Brunei Darussalam and Japan (DAFF 2022a). Export prices in 2020 reached approximately \$2 per kg liveweight (MacDonald et al. 2021). Animals that do not meet live export specifications are processed domestically. The largest Australian processor, which has operated since 2019, is located south of Darwin and processed approximately 7,000 head of buffalo in 2020 (MacDonald et al. 2021). The buffalo meat industry, both domestic and live export, was valued at \$16 million in 2020.

There are 12 buffalo dairies located across Australia: 3 each in New South Wales, Victoria and South Australia, 2 in Queensland and 1 in Tasmania (MacDonald et al. 2021). Australian buffalo dairies are either vertically integrated, marketing their own products directly, or sell their milk to cheese factories for between \$3 and \$4 per litre (MacDonald et al. 2021). Breeder animals are also exported

to various countries. Surplus animals may be processed domestically for meat; however, many abattoirs in the southern states do not slaughter buffalo.

2.5 Australia's zoological collections

Australia has several recognised zoological organisations that house large collections of wild and domestic animals. Zoological collections in Australia hold species that may be susceptible to LSD, such as impala and giraffe.

To enable implementation of appropriate biosecurity and quarantine, the [National Zoo Biosecurity Manual](#) was produced as a cooperative initiative between the [Zoo and Aquarium Association](#), [Wildlife Health Australia](#), the department and the Australian zoo industry. It contains basic and high-level guidelines that outline the approach to achieve best practice zoo biosecurity outcomes for all zoos in Australia. A biosecurity self-audit checklist for ongoing assessment and improvement is available, in electronic format, as a supplement to the manual.

The [AUSVETPLAN Enterprise manual: Zoos \(version 3.0\)](#) is aimed at both government officers and zoo industry personnel who may be involved in EAD preparedness (AHA 2014).

3 Australia's status for diseases that affect bovines

Australia has a long history of being free of many harmful animal diseases found elsewhere in the world. This freedom has been maintained due to a robust biosecurity system, geographical isolation providing a natural biosecurity barrier and successful implementation of disease eradication programs (including bovine tuberculosis by 1997).

Australia reports to WOAHP every 6 months (and in a timely manner in the event of an important outbreak), demonstrating the national status for diseases that are listed by WOAHP. Australia has domestic disease reporting requirements that include not only WOAHP-listed diseases, but also endemic diseases of national significance. The [Animal health in Australia annual report](#) contains a complete list of Australia's status for [nationally notifiable diseases](#) of terrestrial animals. This report also covers animal health and related matters that have occurred during the year, including relevant new policies and projects, disease incidents and status and research activities.

Table 4 outlines the status of WOAHP-listed diseases that affect bovines and their status in Australia in 2021.

Supporting evidence of Australia's freedom from LSD infection is provided in Section 4.3.

Table 4 Australia's status for WOAHP-listed diseases that affect bovines 2022

Disease	Status	Date of last occurrence
Anthrax	Present	Limited distribution
Bluetongue virus	Present	Restricted to specific zones of Australia; sentinel herd and vector-monitoring programs are in place
Bovine anaplasmosis	Present	Transmission mainly in areas of northern Australia
Bovine babesiosis	Present	Transmission mainly in areas of northern Australia
Bovine genital campylobacteriosis	Present	–
Bovine spongiform encephalopathy	Free – negligible risk	Never occurred; Australia has official WOAHP 'negligible risk' status
Bovine viral diarrhoea	Present	Bovine viral diarrhoea virus 1 is present; bovine viral diarrhoea virus 2 has never occurred
<i>Brucella abortus</i>	Free	Australia declared freedom from all terrestrial animal species in 1989
Enzootic bovine leucosis	Free (dairy cattle herd) Very low prevalence (beef cattle)	Australian dairy herd achieved freedom on 31 December 2012
Epizootic haemorrhagic disease virus	Virus present	Disease has not been reported
Foot-and-mouth disease virus	Free	1872; Australia is officially recognised by WOAHP as free without vaccination

Australia's freedom from lumpy skin disease

Disease	Status	Date of last occurrence
Haemorrhagic septicaemia	Free	Never occurred; strains of <i>Pasteurella multocida</i> are present, but not the 6b or 6e strains that cause haemorrhagic septicaemia
Heartwater	Free	Never occurred
Infectious bovine rhinotracheitis / infectious pustular vulvovaginitis	Present	Bovine herpesvirus 1.2b is present; bovine herpesvirus 1.1 and bovine herpesvirus 1.2a have never occurred
Lumpy skin disease virus	Free	Never occurred
<i>Mycobacterium tuberculosis</i> complex	Free	Australia declared freedom from bovine tuberculosis in 1997; the last case in any species was reported in 2002
<i>Mycoplasma mycoides subsp. mycoides</i> SC (contagious bovine pleuropneumonia)	Free	1967; Australia declared freedom in 1973 and is officially recognised by WOAAH as free
Paratuberculosis	Present	National control and management programs are in place
Q fever	Present	–
Rift Valley fever virus	Free	Never occurred
Rinderpest virus	Free	1923; with the global eradication of rinderpest in 2011, all countries are free
Screwworm fly (<i>Cochliomyia hominivorax</i> and <i>Chrysomya bezziana</i>)	Free	Never occurred
Theileriosis	Free	<i>Theileria orientalis</i> is present in Australia but WOAAH-listed species <i>T. parva</i> and <i>T. annulata</i> are not
Trichomonosis	Present	–
<i>Trypanosoma brucei</i> , <i>Trypanosoma congolense</i> , <i>Trypanosoma simiae</i> and <i>Trypanosoma vivax</i>	Free	Never occurred

Source: Animal Health Australia (AHA 2023).

4 Lumpy skin disease surveillance

Australia meets the requirements of the WOAHP Terrestrial Animal Health Code for historical country freedom from LSD infection (Articles 1.4.6 and 11.9.3), as infection with LSD virus has never been reported and vaccination for LSD is prohibited.

Australia has well established surveillance systems to support early detection of LSD, including formal and ongoing systems for detecting and investigating cases, undertaking laboratory testing and reporting, managing and analysing diagnostic and surveillance data as outlined in the WOAHP Terrestrial Animal Code Article 11.9.15.

This ensures that, in the unlikely event of an LSD outbreak, Australia is well-placed to respond promptly and meets its reporting obligations as a member of the WOAHP and to immediately notify trading partners. Surveillance activities also provide evidence for disease freedom. Australia's animal disease surveillance includes widespread and effective general surveillance, along with targeted surveillance programs. Surveillance activities are delivered under the authority of the Australian, state and territory governments.

4.1 General and targeted surveillance activities

General surveillance approaches are the main way that Australia would detect an outbreak of LSD. This is because general surveillance is more efficient than targeted surveillance programs (Sergeant & Perkins 2015). During 2022 and 2023, general surveillance for LSD was further enhanced through widespread industry education and engagement due to the spread of LSD virus into Indonesia. Targeted surveillance activities are also undertaken, such as surveillance through the [Northern Australia Quarantine Strategy](#) (NAQS).

Australia has in place a strong general surveillance strategy that includes a formal and ongoing system for detecting and investigating cases, a procedure for the rapid collection and transport of samples from suspected cases to a laboratory for diagnosis, and a system for recording, managing and analysing diagnostic and surveillance data.

4.1.1 Veterinary diagnostic system delivered by veterinary services

Australia has a large and competent veterinary sector that provides effective general surveillance for outbreaks of important EADs such as LSD. An overview of Australia's veterinary and laboratory services is provided in Section 1.1.

The number of veterinarians in Australia has been increasing for several decades (Heath 2008). There are now approximately 14,000 registered veterinarians in Australia (AHA 2019). This large veterinary force can detect unusual outbreaks and syndromes of disease in Australia's animal and livestock industries as they occur.

In practice, most detections of suspicious cases occur through private veterinarians who report their tentative diagnoses or concerns to government veterinary services, who then definitively diagnose an EAD outbreak and respond accordingly. However, there are also networks of government veterinarians in each state and territory who are specifically tasked with maintaining the biosecurity, food safety and welfare of livestock in their state. For example, the New South Wales Local Land

Services is a regionally focused government agency. It employs veterinarians and Local Land Services (LLS) officers across every region of New South Wales to provide support and advice on agriculture, biosecurity, natural resource management and emergency management (LLS 2022). Policy, legislation, regulation and research are delivered by the New South Wales Department of Primary Industries.

4.1.2 Inspections

National, state and territory frameworks of animal welfare are informed by a series of [Australian Animal Welfare Standards and Guidelines](#). These underpin access to domestic and overseas markets and reinforce Australia's commitment to advancing meaningful and effective animal welfare outcomes. Standards are the legal requirements for livestock welfare and provide the basis for developing and implementing consistent legislation and enforcement across Australia; guidelines are the recommended practices to achieve desirable livestock welfare outcomes. In the context of LSD surveillance, this means that animals are regularly inspected, which provides the opportunity to detect clinical signs of and report potential cases of LSD.

The [Australian Animal Welfare Standards and Guidelines for Cattle](#) require that a person in charge must ensure the inspection of cattle at intervals, and at a level appropriate to the production system and the risk to the welfare of cattle (AHA 2016). Any unexplained disease and deaths should be investigated, and appropriate veterinary advice should be sought as required. A person in charge must ensure the daily inspection of all cattle within a feedlot; the same applies for lactating dairy cows (AHA 2016). Inspections of beef cattle in intensive pasture-based systems are farm-dependent. Due to large paddock and property areas, challenging terrain, seasonal flooding and lack of fencing, extensive production systems in northern Australia are generally mustered once or twice per year (Henderson et al. 2013).

The [Australian Animal Welfare Standards and Guidelines for Exhibited Animals](#) cover all animals kept at facilities for exhibition purposes, including zoological collections. These standards state that the operator of the facility must ensure effective health programs are implemented including appropriate and regular monitoring to assess the health of animals. To be considered 'appropriate and regular', monitoring needs to occur at least daily, except where doing so will result in a significant risk of harming the animals (e.g. hibernating animals) (AHA 2020).

All commercial livestock that are transported must be inspected prior to transportation. The [Australian Animal Welfare Standards and Guidelines — Land Transport of Livestock](#) apply to the major commercial livestock industries in Australia (cattle, sheep, goats, horses, pigs, alpacas, poultry, emu, ostriches, buffalo, deer and camels) and require that, prior to transport and at each loading, all livestock are assessed as fit for the intended journey (AHA 2012). This includes being free of visible signs of disease, as may occur with a case of LSD.

Requirements for ante- and post-mortem inspection of all livestock intended for human consumption at the time of slaughter are detailed in the Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption: AS 4696:2023 (the meat standard) (FRSC 2007). An ante-mortem inspection is conducted within 24 hours pre-slaughter by a meat safety inspector; any animal suspected of being affected by a notifiable disease must be reported without delay to the relevant state or territory authority (FRSC 2007). A post-mortem inspection of each carcass and/or carcass parts is also conducted by a meat safety inspector and

systems are in place to ensure identification of the origin of all carcasses and carcase parts until the port-mortem disposition is applied (FRSC 2007).

The agency responsible for regulating the meat standard varies depending on the destination of the meat product. The inspection of meat destined for domestic consumption in Australia is regulated by the relevant state or territory government. The department is responsible for ensuring that ante- and post-mortem inspection of animals in export abattoirs is in accordance with the meat standard and the importing country's requirements. Meat safety inspectors are required to have minimum qualifications of a [Certificate 3 in Meat Processing \(Meat Safety\)](#) or equivalent. Additionally, ante-mortem and post-mortem inspections at all abattoirs that process meat for export are conducted by or supervised by an on-plant veterinarian.

The [National Arbovirus Monitoring Program](#) monitors the distribution of economically important arboviruses and associated insect vectors in Australia (AHA 2021d). Data is gathered through serological monitoring of cattle in sentinel herds, strategic serosurveys of other cattle herds and insect vector trapping. Any clinical signs consistent with LSD in these sentinel herds would immediately be investigated. During the period from September 2021 to August 2022, there were 97 sentinel cattle herds involved in the National Arbovirus Monitoring Program, 30 of which were in northern Australia (AHA 2022e). Inspection frequency of these sentinel herds is based on the likelihood of arbovirus transmission at each location, with herds in southern Australia at lower risk inspected twice yearly and herds in higher-risk northern Australia (e.g. Beatrice Hill) inspected weekly. These regular sentinel herd inspections constitute an additional passive surveillance mechanism for LSD in Australia.

4.1.3 Enhancement of general surveillance

The sensitivity of Australia's general surveillance system is further increased through various measures including:

- providing education during university training – veterinarians are trained to recognise and consider EADs
- providing extension activities to encourage [veterinarians](#), [producers](#) and public awareness of surveillance for EADs – for example, webinars, conferences, publications and correspondence from veterinary registration boards and farmer organisations. Animal Health Australia and Plant Health Australia jointly administer a program called [Farm Biosecurity](#) that seeks to encourage farmers to improve biosecurity, including reporting of EADs
- facilitating disease reporting and control by identifying those diseases that must be reported – the requirement to report notifiable animal diseases is contained in state and territory legislation. State and territory notifiable animal disease lists contain all the diseases on the [National list of notifiable animal diseases of terrestrial animals](#) but can include others that are of particular interest to an individual state or territory (DAFF 2022b). Suspect or diagnosed diseases on that list must be reported to veterinary authorities and penalties apply if reporting does not occur. The national notifiable disease list includes LSD
- providing an [Emergency Animal Disease Watch Hotline](#) – there is a widely publicised national free-call phone number that veterinarians, farmers and the public can ring to report suspected EAD outbreaks for a timely response

- not allowing routine vaccination for EADs (including LSD) in Australia – thus, clinical signs of disease would be more likely to be present and an EAD outbreak could be more readily detected through general surveillance.

4.1.4 National Significant Disease Investigation Program

The [National Significant Disease Investigation Program](#), managed by Animal Health Australia, facilitates investigation of significant disease events by non-government veterinarians. It also includes training of private veterinarians in disease investigation to increase the level of knowledge, skills and confidence to investigate and report on disease events. Significant disease events are defined as those clinically consistent with national notifiable animal diseases or diseases showing an increasing incidence and/or an expanding geographic or host range but not suspected to be an EAD. Where there is a genuine suspicion of an EAD, it is the veterinarian's legal responsibility to notify their state or territory animal health authority; this is outside the scope of National Significant Disease Investigation Program funding.

During 2021-22, 351 disease investigations arising through general surveillance activities were subsidised as part of the National Significant Disease Investigation Program. Key syndromes investigated were respiratory signs, abortion and stillbirth, and increased mortality. Training initiatives to enhance the quality of disease investigations by private veterinarians were conducted in New South Wales and the Northern Territory in 2021 (AHA 2022b).

4.1.5 Exotic animal disease exclusion testing

Confirmation of a diagnosis of LSD can be undertaken at the ACDP, which is the national emergency animal disease reference laboratory and is accredited by NATA to the ISO 17025:2017 standard. The ACDP conducts real-time polymerase chain reaction for rapid and reliable LSD virus detection, with a turnaround time of 4–5 hours. Serology testing is available to detect LSD virus antibody, with a turnaround time of 4–5 hours. Details of LSD diagnostic testing, including agent characterisation, are available in the *AUSVETPLAN Response strategy: Lumpy skin disease (version 5.0)* (AHA 2022c).

4.1.6 Wildlife health surveillance

[Wildlife Health Australia](#) administers Australia's general wildlife health surveillance system, in partnership with government agencies and non-government organisations. Wildlife Health Australia coordinates wildlife health surveillance information across Australia to support Australia's animal health industries, human health, biodiversity, trade and tourism. The information is collated from multiple sources into a national database, the [electronic Wildlife Health Information System](#). This includes submissions by state and territory Wildlife Health Australia coordinators and environment representatives, NAQS, veterinarians at zoo-based wildlife hospitals and sentinel wildlife clinics, university clinics and pathology departments, and researchers, other wildlife health professionals and Wildlife Health Australia members (AHA 2022d).

During 2022, 852 wildlife disease investigation events were added to the national database (AHA 2023).

4.1.7 Livestock industry research and development activities

The Australian livestock production industry is well-organised, with government-mandated research and development across all sectors. Each livestock sale attracts a levy that is matched by the Australian Government. This money is pooled and administered by the relevant research and

development organisation, with significant investment for research, development and extension (RD&E) into biosecurity and animal health.

The [National Primary Industries Research, Development and Extension Framework](#) ensures that national research capability is coordinated and collaborative to enhance outcomes for primary industries, including [beef](#) and [dairy](#), across Australia. Within the grassfed beef and cattle feedlot industries, RD&E is conducted through [Meat & Livestock Australia](#), with strategic oversight from [Cattle Australia](#) and the [Australian Lot Feeders' Association](#). The [projected investment](#) for 2022–23 for [grass-fed cattle](#) is \$62.5 million and for [grain-fed cattle](#) is \$13.8 million. [Dairy Moving Forward](#) is the dairy industry's framework for prioritising the investment of all providers of dairy RD&E on a national scale. In 2021–22, [Dairy Australia](#) invested \$64 million across its [7 strategic priorities](#). [AgriFutures Australia](#) directs RD&E for smaller Australian industries that do not have a dedicated research body, such as the buffalo industry. In 2020–21, \$24,000 was invested in research projects through the AgriFutures [Buffalo Program](#).

For all commercial livestock, some industry levy money is provided to Animal Health Australia, which brings together government and the livestock industries to deliver animal health and biosecurity.

These arrangements enhance the general surveillance system by improving the access of people involved in the livestock production sector to world-leading animal health and biosecurity research and training opportunities, and enhancing awareness of EADs, which facilitates early reporting of potential EAD outbreaks.

4.2 Surveillance in northern Australia

Northern Australia faces unique animal health biosecurity challenges, including its proximity to neighbouring countries with differing animal health statuses, migratory birds and wind patterns, significant feral animal populations, and limited infrastructure and accessibility (AHA 2022d). To help address the unique biosecurity risks facing northern Australia, Australia implements several biosecurity-related and surveillance programs in this area.

4.2.1 Northern Australia Quarantine Strategy

The department's [NAQS](#) program was established in 1989 to provide an integrated approach toward the complex and unique biosecurity risk profile of northern Australia. The program covers northern aspects of the Northern Territory, Queensland (including the Torres Strait) and Western Australia; it does not include southern regions (AHA 2021a). It is a multidisciplinary program that has conducted surveillance for exotic plant and animal pests and diseases for over 30 years, and employs almost 30 specialist scientists, including 6 veterinarians and an aquatic scientist, to lead the delivery of the surveillance program (AHA 2022b).

The objectives of NAQS are to (AHA 2022d):

- identify and evaluate the unique biosecurity risks facing northern Australia
- develop and implement measures for the early detection of targeted risk species
- contribute to national and international initiatives relevant to the strategy
- manage the biosecurity aspects of movement through the Torres Strait risk pathway

- engage with stakeholders, particularly Aboriginal and Torres Strait Islander communities, on measures that support effective biosecurity surveillance.

To achieve these objectives for animal health, NAQS undertakes a variety of activities, including animal health surveys, public awareness activities through the 'Biosecurity Top Watch' initiative, collaboration with external stakeholders, and participation in surveillance and monitoring activities through capacity building in neighbouring countries (AHA 2022d).

Plans for all surveillance operations and public awareness initiatives are underpinned by NAQS' target list of animal pests and diseases. A risk assessment framework is used to assess the relative likelihood of entry, establishment and spread of target pests and diseases, and is performed in consultation with government, industry, academia and private sector experts. Reviews occur at least annually to reflect changes in regional or global biosecurity risk profiles. The NAQS target list includes LSD virus (AHA 2022d).

One surveillance activity unique to NAQS is the active targeted survey of feral animal populations across northern Australia. These surveys involve low-altitude aerial observation of feral animals by veterinarians. A subset of individual animals is humanely euthanised for post-mortem examination and sampled to test for a number of diseases exotic to Australia. Abnormal clinical signs or pathology detected during these surveys undergoes further diagnostic work-up and exotic disease exclusion testing (AHA 2022b).

In addition to targeted feral animal health surveillance, NAQS also delivers the following animal health surveillance activities (AHA 2022b):

- targeted surveys of domestic animals in the Torres Strait–Northern Peninsula Area of Queensland, including routine sample collection and testing for a number of diseases exotic to Australia. As for feral animal surveys, any abnormal clinical signs or pathology detected during these surveys undergoes further diagnostic work-up and exotic disease exclusion testing.
- targeted and general biosecurity public awareness
- ad hoc disease investigations in response to biosecurity or animal health concerns reported by third parties, such as Indigenous rangers, pastoralists or members of the public.

In addition to its own animal health surveillance activities, NAQS works collaboratively with a broad range of stakeholders to conduct surveillance, including (AHA 2022b):

- Indigenous ranger groups delivering surveillance activities on a fee-for-service basis via the NAQS Indigenous Ranger Biosecurity Program
- private veterinarians working in northern Australia, via the Northern Australia Biosecurity Surveillance network, a program overseen by a multi-agency working group led by NAQS.

Data is routinely reported into the [National Animal Health Information System](#) and the [electronic Wildlife Health Information System](#) (AHA 2022d).

4.2.2 Indigenous ranger groups

A network of Aboriginal and Torres Strait Islander ranger groups across northern Australia conducts fee-for-service biosecurity tasks, providing invaluable coverage and knowledge of vast tracts of remote land that would otherwise be impossible to survey or gather biosecurity risk information on (AHA 2021a). This Indigenous ranger network raises public awareness throughout northern Australia to support the early detection of EADs, including LSD.

4.2.3 Northern Australia Biosecurity Surveillance network

The [Northern Australia Biosecurity Surveillance network](#) (NABSnet) aims to enhance the national animal health surveillance system, increase information sharing and collaboration in extensive cattle production areas in northern Australia and improve significant disease investigations in northern Australia. The network holds annual masterclasses to provide training in areas such as EAD recognition and disease surveillance, investigation and response activities. Veterinarians in the network also have access to an experienced veterinary advisor to support them in investigating livestock events (AHA 2021a). Governance support to the Northern Australia Biosecurity Surveillance network is provided by NAQS (AHA 2022d).

4.2.4 Northern Australia Coordination Network

In 2022, the Australian Government announced that a [Northern Australian Coordination Network](#) would be established to help manage the threat of foot-and-mouth disease (FMD) and LSD. It brings together the Australian, Northern Territory, Queensland and Western Australia governments and northern livestock industry associations to improve Australia's surveillance and preparedness coordination. The objective of the Northern Australian Coordination Network is to provide information to industry and stakeholder groups across northern Australia on how to identify these diseases and how to report signs of disease quickly. It has been established for an initial 2-year period.

4.3 Evidence of freedom from lumpy skin disease infection

LSD has never occurred in Australia and vaccination against LSD is not permitted (AHA 2023). The absence of LSD detections in Australia in the presence of strong general surveillance (as described in Section 4.1) signals ongoing freedom from LSD infection. As summarised below, Australia has undertaken 142 disease investigations for LSD between 1 January 2022 and 30 June 2023, and since 1 January 2022 over 10.5 million cattle and buffalo have been inspected at export abattoirs and prior to export by sea. Targeted surveillance for emergency animal diseases, including LSD, is also ongoing in feral populations in northern Australia.

WOAH does not have a process for officially recognising member countries as free of LSD infection. However, member countries can demonstrate freedom in accordance with Article 11.9.3. of the WOAH Terrestrial Animal Health Code (WOAH 2022a). Countries scrutinising Australia's freedom from LSD infection (in accordance with the standards of the WOAH Terrestrial Animal Health Code) can have confidence in this status for 2 main reasons:

- Australia values its international reputation for animal health and takes self-reporting seriously by reporting outbreaks reliably when they do occur. This is supported by a long

history of timely disease notifications. For example, Japanese encephalitis in pigs in 2022 was reported as soon as the outbreak was detected (WOAH 2022b)

- Australia's surveillance system achieves a high surveillance sensitivity. The absence of reports of LSD by veterinarians, farmers and the public strongly supports Australia's free status.

4.3.1 Disease investigations of suspected cases of LSD

Australia invested in improving awareness for LSD in 2022 given the global spread of the disease, including in Asia.

During 2022, 90 investigations were conducted into suspected LSD events, as a subset of national notifiable animal disease investigations in domestic animals (Table 5Table 5). A further 52 investigations into suspected LSD events were conducted between 1 January and 30 June 2023 (Table 6). All results of these investigations were negative.

Table 5 Investigations for suspected lumpy skin disease infection in domestic animals during 2022

Species	State or territory	Number of investigations	Number positive	Number negative
Cattle	National total	89	0	89
	New South Wales	29	0	29
	Victoria	5	0	5
	Queensland	35	0	35
	South Australia	1	0	1
	Western Australia	13	0	13
	Tasmania	0	0	0
	Northern Territory	6	0	6
	Australian Capital Territory	0	0	0
Buffalo	National total	1	0	1
	New South Wales	0	0	0
	Victoria	0	0	0
	Queensland	0	0	0
	South Australia	0	0	0
	Western Australia	0	0	0
	Tasmania	0	0	0
	Northern Territory	1	0	1
	Australian Capital Territory	0	0	0

Source: Animal Health Australia unpublished data. Note that more than 1 disease may be investigated for a single disease event (an outbreak of morbidity or mortality). In addition, a single investigation may involve more than 1 animal.

Table 6 Investigations for suspected lumpy skin disease infection in domestic animals from 1 January to 30 June 2023

Species	State or territory	Number of investigations	Number positive	Number negative
Cattle	National total	52	0	52
	New South Wales	17	0	17
	Victoria	2	0	2
	Queensland	14	0	14
	South Australia	1	0	1
	Western Australia	9	0	9
	Tasmania	0	0	0
	Northern Territory	9	0	9
	Australian Capital Territory	0	0	0
Buffalo	National total	0	0	0
	New South Wales	0	0	0
	Victoria	0	0	0
	Queensland	0	0	0
	South Australia	0	0	0
	Western Australia	0	0	0
	Tasmania	0	0	0
	Northern Territory	0	0	0
	Australian Capital Territory	0	0	0

Source: Animal Health Australia unpublished data. Note that more than 1 disease may be investigated for a single disease event (an outbreak of morbidity or mortality). In addition, a single investigation may involve more than 1 animal.

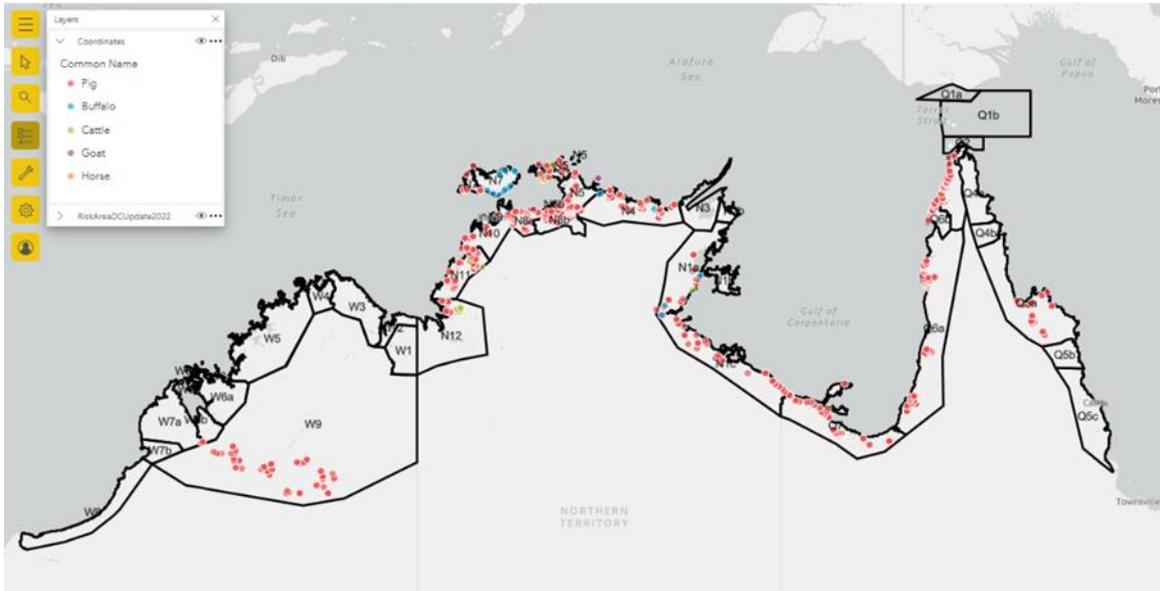
4.3.2 Feral animal surveillance undertaken by NAQS

In 2022, a total of 15 feral animal surveys were conducted (Figure 2) across northern Australia. Surveys are conducted via low-altitude aerial sampling by helicopter and involve observing and sampling a subset of feral animals. The animals are humanely euthanised, and post-mortem examinations and sampling for routine exotic animal disease serological testing is completed. Some of the diseases routinely tested for include Japanese encephalitis virus, classical swine fever, African swine fever, Aujeszky's disease and surra. Animals identified as sick or lame from the aerial observations are targeted, to increase the likelihood of disease detection. A total of 1258 feral animals across 6 species were sampled in 2022, including 16 feral cattle and 24 water buffalo. Thirty-one healthy cattle and buffalo were sampled for LSD exposure, with negative results (Table 7). A further 9 animals were identified with skin lesions that may be consistent with LSD infection. Skin lesions were biopsied on post-mortem and tested at ACDP by PCR. All results were negative.

Table 7 NAQS disease testing for LSD in feral cattle and buffalo in 2022

Jan-Mar 2022		Apr-Jun 2022		Jul-Sep 2022		Oct-Dec 2022	
Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
4	0	21	0	10	0	5	0

Figure 2 Animals sampled during NAQS feral animal surveys in 2022



Source: NAQS, unpublished data.

Between 1 January and 4 August 2023, NAQS has undertaken 6 feral animal surveys, and feral cattle or buffalo were sampled in 3 of these. These included surveys in the Tiwi Islands in the Northern Territory, the northern Kimberley region of Western Australia and the Darwin to Kakadu region of the Northern Territory. In total, 20 feral cattle and buffalo have been tested for LSD, and 4 of those 20 were tested with the PCR due to presence of lesions. All results were negative.

4.3.3 Antemortem inspection at export abattoirs

A government employed departmental On Plant Veterinarian (OPV) is a full-time presence at all Tier 2 export abattoirs¹. The OPV is responsible for ante-mortem inspection and verification of post-mortem inspection procedures and processor hygiene practices. Ante-mortem inspection involves the visual inspection of cattle in the establishment lairage prior to slaughter. Visual inspection of skin is estimated to detect clinical signs of disease in 67 to 75% of cases within 21 to 30 days of infection (EFSA et al. 2018), demonstrating that visual clinical inspection is effective in detecting LSD if present.

In 2022, OPVs conducted ante-mortem inspections on over 5.8 million head of cattle and buffalo in Australia (

¹ Tier 2 arrangements apply to red meat abattoirs that export to countries where the importing country requires oversight be undertaken by the Australian Government.

Table 8). Over 3.7 million head of cattle and buffalo have been inspected between 1 January and 31 July 2023 (Table 9). No LSD infection has been detected.

Table 8 Number of cattle and buffalo inspected by on plant veterinarians in 2022

Animal class ¹	Establishment state	Number of establishments	Number of animals
	National total		5,834,923
Calf	Tasmania	3	33,168
	Victoria	33	179,943
Cow/Bull	New South Wales	22	263,507
	Northern Territory	2	7,029
	Queensland	25	481,055
	South Australia	10	6,803
	Tasmania	3	59,245
	Victoria	33	392,787
	Western Australia	13	85,948
	New South Wales	22	988,094
Steer/Heifer	Queensland	25	2,201,325
	South Australia	10	133,791
	Tasmania	3	126,465
	Victoria	33	639,714
	Western Australia	13	236,049

¹ Note that cow/bull classification includes cattle and buffalo.

Table 9 Number of cattle and buffalo inspected by on plant veterinarians between 1 January 2023 and 31 July 2023

Animal class	Establishment state	Number of establishments	Number of animals inspected
	National total		3,796,712
Calf	Tasmania	3	4,785
	Victoria	33	128,195
	Western Australia	13	254
Cow/Bull	New South Wales	22	209,007
	Queensland	25	342,966
	South Australia	10	5,914
	Tasmania	3	46,679
	Victoria	33	273,789
	Western Australia	13	44,624
	New South Wales	22	606,904
Steer/Heifer	Queensland	25	1,382,765
	South Australia	10	80,586
	Tasmania	3	81,532
	Victoria	33	454,989
	Western Australia	13	133,723

¹ Note that cow/bull classification includes cattle and buffalo.

4.3.4 Pre-export inspection at registered establishments

Australian Government accredited veterinarians and departmental veterinary officers are responsible for undertaking pre-export inspections at registered establishments prior to the loading of livestock for export by sea to all importing countries. An inspection is a visual assessment of an animal's eligibility for export in accordance with the importing country requirements and the Australian Standards for the Export of Livestock (ASEL). All livestock prepared for export are inspected and ASEL requires that any animal displaying clinical signs of infectious or contagious

disease or external parasites are ineligible for export and must be removed from a consignment. ASEL also requires that each animal be inspected immediately prior to loading onto the vessel at the port to ensure that only eligible livestock are loaded. It is a condition of a livestock export licence that the holder complies with ASEL.

In the 2022 calendar year, a total of 597,179 cattle and 10,776 buffalo were inspected prior to export by sea (Table 10). In the period 1 January and 30 June 2023, a total of 288,631 cattle and 2,885 buffalo were inspected prior to export by sea (Table 11).

Table 10 Number of cattle and buffalo prepared for export by sea inspected during 2022

Species	State or territory	Number of registered establishments (REs) ¹	Number of animals inspected ²
Cattle	National total	27	597,179
	New South Wales	N/A	N/A
	Victoria	9	137,866
	Queensland	8	69,402
	South Australia	1	3,248
	Western Australia	12	160,888
	Tasmania	N/A	N/A
	Northern Territory	7	225,775
	Australian Capital Territory	N/A	N/A
Buffalo	National total	4	10,776
	New South Wales	N/A	N/A
	Victoria	N/A	N/A
	Queensland	N/A	N/A
	South Australia	N/A	N/A
	Western Australia	N/A	N/A
	Tasmania	N/A	N/A
	Northern Territory	4	10,776
	Australian Capital Territory	N/A	N/A

¹ Number of REs reported is the number of REs used for the assembled head prepared (not representative of the total number of REs in each jurisdiction). Some REs may be used for both cattle and buffalo and will be counted separately for both species.

² Number of animals inspected is based on information from department issued Export Permits.

Table 11 Number of cattle and buffalo prepared for export by sea inspected between 1 January 2023 and 30 June 2023

Species	State or territory	Number of registered establishments (REs) ¹	Number of animals inspected ²
Cattle	National total	26	288,631
	New South Wales	N/A	N/A
	Victoria	6	38,617
	Queensland	3	71,641
	South Australia	N/A	N/A
	Western Australia	11	69,447
	Tasmania	N/A	N/A
	Northern Territory	6	108,926
	Australian Capital Territory	N/A	N/A
Buffalo	National total	3	2,885
	New South Wales	N/A	N/A
	Victoria	N/A	N/A
	Queensland	N/A	N/A
	South Australia	N/A	N/A
	Western Australia	N/A	N/A
	Tasmania	N/A	N/A
	Northern Territory	3	2,885
	Australian Capital Territory	N/A	N/A

¹ Number of REs reported is the number of REs used for the assembled head prepared (not representative of the total number of REs in each jurisdiction). Some REs may be used for both cattle and buffalo and will be counted separately for both species.

² Number of animals inspected is based on information from department issued Export Permits.

5 Lumpy skin disease prevention, preparedness and response

Australia has a key focus on preventing entry of LSD virus into Australia and, if entry occurs, on rapidly detecting, controlling and then eradicating disease.

5.1 Prevention of lumpy skin disease incursion

The spread of LSD virus is primarily by biting arthropods, including biting flies (*Stomoxys* spp., *Haematobia* spp.), mosquitoes (*Culicidae* spp.), biting midges (*Ceratopogonidae* including *Culicoides* spp.) and ticks (*Amblyomma* spp. and *Rhipicephalus* spp.) (Sprygin et al. 2019). Transmission is widely thought to be mechanical and there is evidence for transstadial and transovarial transmission in ticks (Lubinga et al. 2014). Generally, any haematophagous arthropod is considered capable of mechanical transmission of LSD virus, noting that physical and behavioural characteristics such as size and feeding behaviour will affect vector competence (Sprygin et al. 2019). Additionally, LSD virus may be spread via contaminated fomites, shared water sources and contact with secretions and excretions of infected animals, including semen and possibly milk (Sprygin et al. 2019). LSD virus is environmentally resistant, surviving in desiccated crusts for up to 35 days and in air-dried hides for at least 18 days (WOAH 2021).

Given these modes of transmission, potential routes for the introduction of LSD into Australia include the importation or arrival of:

- infectious arthropod vectors, including via long-distance windborne dispersal or as hitchhiker pests on arriving ships or aircraft (Hall, Torpy, Nye et al. 2022)
- contaminated dried bovine hides or other bovine products
- contaminated fomites or stockfeed
- contaminated genetic material
- infected bovines or possibly carcasses
- illegally imported infectious attenuated vaccines with subsequent reversion to virulence.

Australia has a robust biosecurity system and strict import conditions in place so the introduction of LSD through the legal importation of these commodities is very unlikely. Australia's ocean borders provide natural protection against LSD virus spreading through feral or illegal animal movements. Illegal introduction of contaminated bovine products may pose a risk. Such products could be brought in by passengers on aircraft, ships or via the post.

Australia's activities to prevent entry of any EAD (including LSD), which include actions to address both regulated and unregulated pathways, along with measures to prevent illegal introduction, are implemented across the biosecurity continuum:

- offshore
- at the border

- onshore.

Following the notification of FMD in Indonesia in 2022, Australia [heightened offshore, border and onshore biosecurity measures](#), which also contributes to preventing the introduction of other EADs such as LSD. Although Indonesia is several hundred kilometres from Australia and separated by ocean, the department implemented a number of [urgent measures](#) to reduce the risk of FMD entering Australia.

5.1.1 Offshore

Intelligence

Intelligence is continually gathered on the animal health status of overseas countries using, for example, WOAH disease notifications, direct communication with trading partners, published and grey literature and the [International Biosecurity Intelligence System](#). This helps Australia in the early identification of new and emerging biosecurity threats to help manage biosecurity risks. It provides an understanding of the animal health status of overseas countries so that action can be taken as needed.

Staff in the department have extensive connections with international experts, which provides valuable intelligence on the status of disease outbreaks globally and the available measures applied for disease prevention, control and eradication (Inspector-General of Biosecurity 2022). The department undertakes analyses to help provide early warning assessment of emerging or changing biosecurity threats associated with specific commodities, trade routes and pests and diseases (Inspector-General of Biosecurity 2022).

Assistance to neighbouring countries

Australia works with neighbouring countries to achieve mutually beneficial biosecurity outcomes. Australia provides funding and support to help its near neighbours prevent, prepare for, detect, manage and respond to EAD outbreaks and strengthen the overall biosecurity capacity of the region. This includes providing training, capacity building and surveillance support. This provides an early warning system for the occurrence of EADs, including LSD, in these countries and helps to reduce the impact and spread of these diseases in the region.

In March and May 2022, the Australian Chief Veterinary Officer visited Indonesia and met with representatives of the Indonesian Government to discuss the ongoing LSD outbreak and offer assistance with their outbreak response (Australian Veterinary Association 2022). [Industry support](#) is also being provided in-country through Meat & Livestock Australia, who are active in Indonesia. The department is engaged with the Food and Agriculture Organization of the United Nations (FAO) Indonesia country office to coordinate bilateral and international efforts in support of Indonesia's LSD virus outbreak response; this includes a secondment to the FAO Indonesia country office to provide additional expertise to assist in the detection, control and prevention of FMD and LSD. (Inspector-General of Biosecurity 2022). Australia has contributed funding to assist Indonesia with procurement of LSD vaccines following a request for support from Indonesia's Ministry of Agriculture (Australian Veterinary Association 2022). Furthermore, Australia has provided a \$1 million grant to boost Indonesia's exotic animal disease testing capability, including for LSD and FMD.

Through the [Australian Indonesian Health Security Partnership](#), Australia is supporting containment activities for LSD in Indonesia (Inspector-General of Biosecurity 2022). This partnership has built on

the earlier accomplishments of the Australian Indonesia Partnership for Emerging Infectious Diseases between 2011 and 2018, which helped build Indonesia's emergency disease management response, animal health information system, disease surveillance and veterinary services (Inspector-General of Biosecurity 2022). The department also cooperates with several additional Australian capacity building programs including the [Indonesia Australia Red Meat and Cattle Partnership](#), the [Australia Indonesia Partnership on Promoting Rural Incomes through Support for Markets in Agriculture](#), the [Indo-Pacific Centre for Health Security](#) and the [Australian Centre for International Agricultural Research](#).

Department staff also visited Timor-Leste (April and November 2022, and March and May 2023) and Papua New Guinea (June, September and October 2022, and June 2023) to support LSD awareness planning, diagnostics and outbreak response. Australia is supporting LSD field surveillance and preparedness (including risk assessment) in Papua New Guinea and Timor-Leste due to their shared land borders with Indonesia (Inspector-General of Biosecurity 2022). Timor-Leste and Papua New Guinea now have active community awareness campaigns for LSD, and the capability to conduct LSD field sampling and diagnostic testing (serology and PCR) in country. With department support, Timor-Leste recently carried out an LSD survey of the 3 municipalities bordering West Timor (January to July 2023), and Papua New Guinea held a workshop to familiarise animal health staff and cattle industry stakeholders with LSD disease investigation and sampling protocols (June 2023).

The department is engaged with international research projects on LSD virus, including understanding the potential role of biting midges as LSD virus vectors in Thailand and characterising different strains of LSD virus to improve diagnostic tests and vaccines with the Pirbright Institute, United Kingdom (Inspector-General of Biosecurity 2022).

Risk analyses and import conditions

Risk analyses are undertaken by the department to assess the level of biosecurity risk that may be associated with importation of a good into Australia, and to identify appropriate measures to manage those risks to achieve Australia's appropriate level of protection. Australia's appropriate level of protection is expressed as providing a high level of protection aimed at reducing risk to a very low level, but not to zero. If the level of biosecurity risk cannot be reduced to achieve Australia's appropriate level of protection, importation of the goods into Australia will not be permitted until suitable risk management measures are identified.

Risk analyses conducted by the department are consistent with Australia's international biosecurity obligations including those under the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures and WOH. Risk analyses go towards meeting Australia's international obligations while addressing the various risks that goods may pose. Risk analyses may take the form of a biosecurity import risk analysis or a non-regulated risk analysis (such as scientific review of existing policy and import conditions, or scientific advice). Further information on how Australia [conducts a biosecurity risk analysis](#) is available on the department's website.

Risk management measures are applied through the imposition of conditions on goods being imported into Australia, and import conditions are reviewed when the level of risk changes. Import conditions for goods that are allowed into Australia are regulated by the department. Australia's import conditions can be found in the [Australian Biosecurity Import Conditions system](#).

For example, importation of live bovines or their germplasm is not permitted from countries where LSD is present (AHA 2022c). Risk management measures are in place for some other bovine-derived commodities such as hides and skins.

There are strict import conditions and post-arrival quarantine processes for the import of zoo animals into Australia. Only approved zoos and wildlife parks can import exotic or unusual animals for zoological, breeding or conservation purposes and not all species are permitted for importation. Each importation requires a biosecurity import permit, issued by the department. Imported animals must undergo post-arrival quarantine. Zoos can operate and manage biosecurity risks associated with post-arrival quarantine on-site under an approved arrangement, managed by the department. Any waste created during the quarantine isolation period, including bedding and excrement, must be disposed of as biosecurity waste or, if appropriate, disinfected according to department directions. Approval must be sought from the department prior to removing any biological material from the approved arrangement site, including samples for testing. The department undertakes regular compliance monitoring and auditing activities at all approved arrangement sites. More information about the [approved arrangement](#) process can be found on the department's website. Imported animals must complete a minimum mandatory quarantine isolation period immediately after arrival into Australia (as noted on the import permit). Release from biosecurity control processes must be authorised by the department.

5.1.2 Border

Returning livestock export vessels

Australia has an extensive livestock export industry, exporting cattle, buffalo and sheep by boat (DAFF 2022a). Due to the nature of the cargo and the destinations these vessels may have visited, returning livestock vessels are classed as high biosecurity risk (e.g. if carrying infected vectors or contaminated waste). All livestock vessels are inspected at berth on every visit to Australia, irrespective of the vessel's history or last port of call (DAFF 2022e). Vessels must also be thoroughly cleaned, disinfected with sodium carbonate and disinfected prior to arrival (DAFF 2022e). Various other risk mitigation strategies are used such as insect fogging for vector-borne diseases.

In response to the LSD outbreak in Indonesia in 2022, industry and the department's biosecurity officers were formally advised to be vigilant in managing the biosecurity risk of returning livestock vessels from Indonesia. The department issued [targeted communications to vessel masters and shipping agents](#) to ensure any returning livestock vessels were compliant with Australia's requirements. Following the subsequent notification of FMD in Indonesia, [additional biosecurity measures](#), such as disinfectant footbaths, were implemented for all commercial and military vessels departing from Indonesia.

Cargo, passengers and mail

The department is responsible for managing the biosecurity risks associated with goods, containers, aircraft and ships arriving in Australia. Robust border controls, including screening, assessments and inspections, are in place to prevent, detect and intercept biosecurity risks at Australia's border.

Biosecurity risks associated with shipping are managed through the Maritime Arrivals Reporting System. All commercial vessels coming to an Australian first point of entry must first submit online details of biosecurity status and last port of call pre-arrival (Inspector-General of Biosecurity 2018). The department then assesses risks and applies necessary inspections, treatments and certification.

The department operates a vessel compliance scheme through the Maritime Arrivals Reporting System to facilitate risk-based, targeted inspections; each ship arriving in Australia will require biosecurity inspection unless a risk-based assessment exempts that voyage (Inspector-General of Biosecurity 2018). The biosecurity risk of aircraft and air cargo carrying hitchhiker arthropods and contaminants is considered to be relatively low; these risks are effectively managed through oversight of aircraft disinsection measures and pratique assessment (Inspector-General of Biosecurity 2018).

Hitchhiker pests and contaminants may be present on the external and internal surfaces of sea containers. High (and increasing) numbers of containers arrive in Australia each year, mostly arriving at the ports of Melbourne, Sydney and Brisbane (Inspector-General of Biosecurity 2018).

Contamination risks are managed according to the [Biosecurity \(Conditionally Non-prohibited Goods\) Determination 2021](#).

Cargo arriving in Australia can often be cleared by the department using declarations and information provided by the importer. The department will issue the importer with a directive that goods are released from biosecurity control or if any actions are required (e.g. inspection, treatment, isolation or hold pending further information). Goods that do not meet import requirements and cannot be treated are directed for export or disposal at the importer's expense.

Passengers travelling to Australia are required to complete an incoming passenger card, which is a legal document. Passengers need to declare if they are carrying certain food, plant material or animal products. Passengers who declare they are carrying such goods, and those who have undertaken an activity overseas that could present a biosecurity risk, are referred for biosecurity assessment. Declared goods are assessed by a biosecurity officer and may be inspected. Biosecurity officers may direct the goods for treatment, export or destruction. Amnesty bins are offered at passenger ports where risk goods can be disposed of within the airport or seaport but before entry into Australia. Penalties apply for providing false or misleading information to a biosecurity officer or on the incoming passenger declaration, or for failing to answer questions about the goods or comply with directions given by a biosecurity officer. These penalties have recently been increased in recognition of the significant cost to Australia of a pest or disease incursion caused by deliberate non-compliance with Australia's biosecurity measures.

The department uses X-ray, detector dogs and manual inspection to assess all goods that arrive at Australia's international mail centres. If goods do not meet import conditions, they will be immediately destroyed or sent back to the overseas sender. Some goods may require treatment before they are permitted into Australia (at the importer's expense).

Strict control measures are imposed on the collection, storage, transportation and treatment of biosecurity waste.

Strengthening prevention measures at the border

The incursion of FMD into Indonesia in 2022 prompted the Australian Government to [strengthen existing measures and impose new measures at the Australian border](#), which also contributes to preventing the introduction of other EADs such as LSD. These general measures included (DAFF 2022c):

- deploying biosecurity detector dogs in Darwin and Cairns airports

- expanding and targeting social media campaigns, informing travellers of their biosecurity responsibilities
- additional training of airport biosecurity staff
- enhancing mail profiling and inspections
- deploying 18 new biosecurity officers to airports and mail centres across Australia.

5.1.3 Onshore

Strategies are in place to minimise the risk of exposure of bovines to LSD if LSD virus were to enter Australia.

Sea containers that have been identified for delivery to rural or split rural areas are subject to heightened biosecurity measures on arrival, including a mandatory [rural tailgate inspection](#) for hitchhiker arthropods at a metropolitan location prior to delivery. This involves an inspection of all external surfaces and checks of the doors, seals and floor area close to the door for signs of biosecurity risk material.

Infectious LSD virus and vaccines have historically not been permitted in Australia for research purposes. Recently, the department has undertaken a review of the steps required to safely import infectious LSD virus to enable testing of overseas vaccine candidates and for future vaccine and diagnostic test development (Inspector-General of Biosecurity 2022). The virus has been imported and will be held only at the ACDP, a built-for-purpose high containment facility (DAFF 2022d). The ACDP is one of the world's most advanced biocontainment laboratories. Biosecurity and biosafety are assured by means of a comprehensive system of engineering controls, with multiple redundancies to ensure containment cannot be compromised and the continuity of operations (Inspector-General of Biosecurity 2022). Since it was first opened in 1985, no pathogens held at the ACDP have ever escaped the facility (DAFF 2022d). Furthermore, transmission of LSD via laboratory specimens is not considered a risk (AHA 2022c).

As part of the [EADRA](#), livestock industries develop, implement and maintain biosecurity plans at industry, regional and farm levels for their sector. The farm-level biosecurity plans identify measures to mitigate the risks of disease entry or spread. The plan for each EADRA party is initially endorsed by the other EADRA parties and is subject to ongoing review and maintenance. The plans are designed for producers to evaluate their own biosecurity requirements and to implement biosecurity practices suitable for their circumstances. The practices listed in the plans have been incorporated as standards into a range of industry quality assurance and verification programs. Farm-level biosecurity plans can be found on the [Animal Health Australia](#) and [Farm Biosecurity](#) websites (AHA 2021a).

5.2 Preparedness for and response to lumpy skin disease

An overview of Australia's EAD preparedness and response arrangements is provided in Section 1.4. Preparedness and response activities specific to feral bovines are discussed further in Section 6.2.

5.2.1 Preparedness

Staff within the department have high levels of technical knowledge of the threat to Australia posed by LSD (Inspector-General of Biosecurity 2022). In response to the incursion of LSD into Indonesia, the department established an LSD taskforce (Australian Veterinary Association 2022) to:

- coordinate and oversee the department's LSD preparedness, response and communications activities
- develop a [National Lumpy Skin Disease Action Plan](#) to be implemented through consultation and targeted working groups drawn from industry and the states and territories
- inform government–industry roundtables and webinars about the risks of LSD to Australia's livestock industries, industry preparedness and prevention.

Activities within the *National lumpy skin disease action plan* include:

- developing of national LSD diagnostic capacity
- establishing a national LSD surveillance strategy to ensure early detection of LSD incursion and support demonstration of evidence of absence of LSD. This includes developing surveillance strategy for free-roaming cattle populations and insect vector monitoring programs
- developing accurate epidemiological models for LSD
- critically reviewing the [AUSVETPLAN](#) response strategy for LSD
- identifying and securing supply of suitable vaccines and implementation of approval processes, as well as developing an appropriate vaccination strategy to be applied in an outbreak.

Most states and territories have additional regional FMD and LSD working groups to progress state and territory preparedness activities.

Research and funding

In addition to funding support for biosecurity announced in earlier budgets, in response to incursions of FMD and LSD in Indonesia in 2022, the 2022-23 October Federal Budget measure 'Bolstering Australia's biosecurity system' included:

- \$61.6 million over 2 years from 2022–23 to strengthen Australia's frontline biosecurity capability, including in northern Australia, and support domestic preparedness and biosecurity outcomes in neighbouring countries
- \$14 million in emergency funding for frontline biosecurity preparedness in Australia, as well as funding to continue to support to Indonesia, Timor-Leste and Papua New Guinea to prevent and respond to the spread of FMD and LSD
- \$46.7 million to support continuous improvement in Australia's livestock traceability systems, by maintaining Australia's world-class system and ensuring that Australia can recover quickly from any disease incursions
- \$11.7 million over 4 years from 2022–23 (and \$3.3 million per year ongoing from 2026–27) to expand Australia's detector dog capability at the border, by investing in an additional 20 detector dogs and handlers.

Building on this \$134 million targeted investment in biosecurity, the 2023-24 Budget delivers on the government's election commitment to strengthen Australia's biosecurity system with long-term, predictable and sustainable funding.

This funding supports activities within the *National Lumpy Skin Disease Action Plan* and accelerated modelling and research on insect vectors to better understand and predict highest-risk incursion locations and seasons for LSD and guide surveillance (Australian Veterinary Association 2022). Funds are also directed towards enhancing laboratory preparedness.

Laboratory preparedness

Laboratory preparedness activities for LSD include (Australian Veterinary Association 2022):

- the accelerated development of LSD diagnostic tests with a focus on northern Australia. This includes assessment and validation of existing LSD serological assays such as enzyme-linked immunosorbent assays, establishing viral genome sequencing capacity for LSD and development of immunohistochemistry tests
- the development of national LSD diagnostic capability and proficiency testing for state and territory laboratories.

Currently, no LSD vaccines are approved for use in Australia (DAFF 2022d). The department has reviewed available vaccines for suitability for use into Australia and is working with the Australian Pesticides and Veterinary Medicines Authority on the development of an emergency use permit to facilitate the rapid importation and roll-out of a vaccination program if required, as part of an outbreak response (Australian Veterinary Association 2022).

The department is providing funding support for research into new technology vaccines and for testing of overseas vaccine candidates (Australian Veterinary Association 2022).

Industry preparedness

Following the notification of LSD in Indonesia in 2022, the [Red Meat Advisory Council](#) activated the red meat industry's crisis response process. A cross-industry taskforce was established to ensure coordination and collaboration across all affected industry sectors. The key objectives and activities of this taskforce were to (MLA 2022; Beef Central 2022):

- undertake a whole-of-industry high-level and overarching coordination and collaboration role with respect to the management of identified LSD-related risks
- establish committees to undertake necessary identified bodies of work including technical, operational and communications
- ensure collaboration and coordination between industry sectors and alignment with existing LSD/response frameworks and plans
- be the primary point for industry advice, advocacy and communications on LSD with the Australian Government Minister for Agriculture.

A range of communications materials have been developed and shared through social media channels and the department's website to raise community awareness about the risk of LSD virus (Inspector-General of Biosecurity 2022). The department additionally hosted a series of workshops for industry in 2022 (Inspector-General of Biosecurity 2022).

Exercises

The Australian, state and territory governments and industry, conduct regular exercises to assess and improve EAD response plans and procedures. In 2022–23, several Australian Government agencies

are involved in [Exercise Paratus](#). This is a series of desktop exercises looking at how agencies escalate, coordinate and use relevant legislation in an EAD scenario. The program will culminate with a major functional exercise (DAFF 2022c).

5.2.2 Response

The response strategy for LSD was reviewed in 2022 as part of the activities of the *National lumpy skin disease action plan*.

The detailed response strategy in the event of an LSD outbreak in Australia is given in the [AUSVETPLAN Response strategy: Lumpy skin disease \(version 5.0\)](#). The following is a summary of Australia's current response policy (AHA 2022c).

The policy is to eradicate LSD in the shortest possible time, while minimising social, economic, animal welfare and environmental impacts, using stamping out, with or without vaccination, supported by a combination of strategies, including:

- *immediate quarantine* of animals, animal products and fomites (facilities, equipment and other items) on infected premises and dangerous contact premises
- rapid recognition and laboratory confirmation of cases
- immediate assessment of the epidemiological situation
- implementation of legislated *declared areas* for disease control purposes and to minimise the spread of infection
- *quarantine and movement controls* over animals, animal products and fomites in declared areas, to minimise the spread of infection
- *tracing and surveillance* to determine the source and extent of infection (including, as necessary, in feral animals), and to provide proof of freedom
- immediate stamping out on infected premises and dangerous contact premises based on risk assessment to reduce disease transmission – *modified stamping out* (stamping out of clinically affected animals with nodules) is the priority
- assessment of likely vector species, their distribution and their ecology
- *management of insect vectors* to minimise mechanical transmission of the virus
- *enhanced biosecurity* on all premises with cattle and buffalo
- *valuation and destruction* of cattle and buffalo on infected premises and potentially on dangerous contact premises, subject to risk assessment
- *compensation* for the market value of animals that have died from the disease or animals or property been destroyed for disease control purposes
- *sanitary treatment and/or disposal* of destroyed animals and contaminated animal products, to remove sources of infection
- *decontamination and/or disposal* of fomites to minimise the spread of the virus from infected animals and premises

- *vaccination*, if available, to support eradication efforts
- provision of *epidemiological and other information* to support the resumption of international trade
- *zoning and/or compartmentalisation* (where appropriate) to support resumption of market access
- *management of feral cattle and buffalo populations*, where required, based on the epidemiological assessment
- a public awareness campaign
- *industry engagement* to improve understanding of the issues, facilitate cooperation and address animal welfare issues.

Vaccination, if available, is recommended to support disease control procedures, because stamping out alone may not be sufficient to eradicate the disease. However, if an incursion is detected very early and there has been very limited spread, stamping out alone may be a feasible option. If vaccine is not available, an aggressive response should be mounted as quickly as possible, using all the strategies listed above, to attempt to eradicate the disease. The nature of the disease means that this may ultimately result in large numbers of cattle being slaughtered without complete control of the disease being achieved.

Under the government–industry [EADRA](#) for cost-sharing arrangements, LSD is included as a Category 3 disease. Category 3 diseases are those for which costs will be shared 50% by government and 50% by industry.

6 Australia's feral bovine populations

6.1 Feral bovines in Australia

There are 3 species of the family Bovidae that can be found feral in Australia:

- *Bos taurus* (subspecies either *Bos taurus indicus* or *Bos taurus taurus*) – domestic cattle
- *Bos javanicus* – banteng cattle, also known as Bali cattle
- *Bubalus bubalis* – water buffalo, also known as Asian buffalo.

The potential epidemiological importance of feral bovines in Australia in the event of an LSD outbreak is debated.

In general, domestic cattle are a closely managed and valuable farmed livestock species. There are some small populations of feral domestic cattle in some areas adjacent to grazing regions (e.g. in some national parks), especially in the north of Australia. However, these populations remain small and circumscribed as they are harvested for sale or culled to reduce environmental impact. Their population densities are low compared with managed cattle.

[Feral banteng cattle](#) are found in the Northern Territory, largely in one geographic location – the Cobourg Peninsula. There are only several thousand individual animals. Contact rates between banteng cattle and domestic cattle in northern Australia are not known, although the beef cattle density in this region is low (0–0.1 per square km).

Water buffalo are found across extensive areas of the Northern Territory (see Figure 3). The population in the 1980s was estimated at 350,000. However, populations were significantly reduced during Australia's national Brucellosis and Tuberculosis Eradication Campaign (Jesser et al. 2016). Numbers are increasing again; in 2019, the Northern Territory buffalo population was estimated at approximately 161,000 head and increasing by an estimated 27,000 head per year (Fitzgerald 2019). Free-ranging swamp buffalo constitute the majority of the Northern Territory buffalo industry (described in Section 2.1) (MacDonald et al. 2021). The level of contact between buffalo and domestic cattle is not known; however, there is likely to be congregation around watering points at least during the dry season. When mixed in a paddock, they will tend to stay as separate species and not interact (Lemcke 2017).

Figure 3 Estimated distribution of feral water buffalo in Australia



Source: Department of Sustainability, Environment, Water, Population and Communities (2011).

Buffalo cause extensive damage to drainage channels and compete with native species for food and habitat, as well as spreading invasive weeds. The main approach to reducing the buffalo population is via harvesting, which provides local jobs and income for the traditional owners (MacDonald et al. 2021). Harvesting is done in the dry season using either modified catching vehicles or helicopter mustering into temporary yards (MacDonald et al. 2021). However, currently only larger animals are removed, resulting in minimal impacts on overall population size. At harvesting, feral buffalo are required to be fitted with radio frequency identification tags for traceability before being transported, as for other commercial livestock.

6.2 Emergency animal disease preparedness and response in feral bovines

The [AUSVETPLAN Wild animal response strategy \(version 3.3\)](#) sets out the management strategies and overall control procedures for wild terrestrial animals (AHA 2011). In addition, disease-specific advice relating to feral bovines is provided in the [AUSVETPLAN Response strategy: Lumpy skin disease \(version 5.0\)](#) (AHA 2022c).

In the event of an LSD outbreak in Australia, the epidemiological situation would immediately be assessed; management of feral cattle and buffalo populations would be implemented where required, based on this assessment (AHA 2022c). Tracing and surveillance efforts to determine the extent of infection would be undertaken in feral populations as necessary; this surveillance would include clinical, serological, virological and molecular approaches (AHA 2022c). Aerial shooting is likely to be the most commonly employed method of control in feral bovine populations that cannot be mustered (AHA 2022c). These activities will be conducted to ensure that animals are not induced to disperse further. Additionally, the use of Judas animals proved highly efficient and cost-effective for cattle and buffalo during Australia's national Brucellosis and Tuberculosis Eradication Campaign in

the Northern Territory (AHA 2011). The Judas technique is commonly used to locate remnant individual animals or groups of feral goats in low-density populations. This technique involves attaching a radio collar to an animal and releasing it with the expectation that it will join up with others of its species.

The success of the Brucellosis and Tuberculosis Eradication Campaign demonstrates Australia's ability to manage infectious diseases in feral bovine populations. In 1997 Australia officially declared freedom from bovine tuberculosis, following the successful 27-year intensive Brucellosis and Tuberculosis Eradication Campaign. Australia is currently the only major exporter of livestock that has successfully eradicated bovine tuberculosis. The success of this campaign can be attributed to several factors, including a compelling rationale for eradication, an agreed final outcome, industry commitment and financial support, a business model for program planning, implementation and review, consistent and transparent technical standards underpinned by a strict regulatory regime and applied research, the critical role of abattoir surveillance, effective elimination of residual infection and objective measures of program progress (More et al. 2015).

7 Conclusion

LSD has never occurred in Australia and Australia is free from LSD infection in accordance with the provisions of the WOAHP Terrestrial Animal Health Code. LSD is nationally notifiable in Australia.

Australia is free of many of the WOAHP-listed diseases that affect bovines. This can be attributed to a robust biosecurity system, geographical isolation providing a natural biosecurity barrier and successful implementation of disease eradication programs.

Australia's animal health surveillance system and underpinning activities support early detection and provide evidence for freedom from LSD infection. Trading partners can have confidence in Australia's status as free from LSD infection. Australia has a demonstrated history of timely disease notifications and Australia's surveillance system achieves a high surveillance sensitivity. The absence of reports of LSD strongly supports Australia's free status, as does data generated from targeted surveillance activities.

Australia has one of the highest rates of registered veterinarians per capita in the world and has competent veterinary and laboratory services. The organisation of, and arrangements between, the livestock production sector, industry bodies and governments, together with significant research and extension work conducted over years and mandatory reporting requirements, enhances awareness and early reporting of potential EADs. Many exclusion tests are undertaken for LSD each year.

Australia has a key focus on preventing entry of LSD into Australia and, if entry occurs, on rapidly detecting, reporting, controlling and then eradicating disease. Australia's activities to prevent entry of LSD are implemented across the biosecurity continuum, including through the application of import conditions, controls on incoming cargo, passengers and mail, and implementation of rural tailgate checks to mitigate incursions of hitchhiker arthropod vectors that may carry LSD virus.

Established surveillance, preparedness and response arrangements mean that Australia would promptly detect and respond effectively to an outbreak of LSD if it were to occur. This would include timely notification to trading partners. Australia would implement a rapid response with the aim of regaining a disease-free status. Were infection to transmit to feral bovines, there are effective tools researched in Australia that could be used to conduct surveillance and rapidly control feral populations to reduce or prevent disease transmission.

The Australian Government has committed to long-term sustainable funding for biosecurity through new investments which will bolster Australia's preparedness for biosecurity threats, such as LSD.

In summary, Australia is free of LSD infection. Australia's excellent animal health surveillance system and effective EAD response arrangements mean a change in animal health status would be detected and dealt with rapidly. Australian bovines and bovine products represent a negligible risk of LSD to trading partners.

Abbreviations and acronyms

Acronym	Definition
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
ACDP	CSIRO Australian Centre for Disease Preparedness
AHA	Animal Health Australia
ASEL	Australian Standards for the Export of Livestock
AUSVETPLAN	Australian Veterinary Emergency Plan
DAFF	Department of Agriculture, Fisheries and Forestry
DAWR	Department of Agriculture and Water Resources (now Department of Agriculture, Fisheries and Forestry)
EAD	emergency animal disease
EFSA	European Food Safety Authority
EADRA	Emergency Animal Disease Response Agreement
FAO	Food and Agriculture Organization of the United Nations
FMD	foot-and-mouth disease
FRSC	Food Regulation Standing Committee
LEADDR	Laboratories for Emergency Animal Disease Diagnosis and Response
LLS	Local Lands Services
LSD	lumpy skin disease
NABSnet	Northern Australia Biosecurity Surveillance network
NAQS	Northern Australia Quarantine Strategy
NLIS	National Livestock Identification System
OPV	On Plant Veterinarian
RD&E	research, development and extension
REs	Registered Establishments
WOAH	World Organisation for Animal Health

References

ABARES (2021) *Agricultural commodities and trade data*, Australian Bureau of Agricultural and Resource Economics and Sciences, Australian Bureau of Agricultural and Resource Economics and Sciences, Department of Agriculture, Water and Environment, Australian Government, ACT, https://www.agriculture.gov.au/abares/research-topics/agricultural-outlook/data#_2021, accessed 7 August 2023.

— (2022) *Agricultural commodities: June quarter 2022*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, Australia, <https://doi.org/10.25814/cwww-5f62>, accessed 7 August 2023

— (2023) *Agricultural commodities: June quarter 2023*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, Australia, <https://doi.org/10.25814/ksf4-zc16>, accessed 7 August 2023.

ABS (2022a) 'Agricultural commodities, Australia', <https://www.abs.gov.au/statistics/industry/agriculture/agricultural-commodities-australia/latest-release>, accessed 7 August 2023.

— (2022b) '3101.0 National, state and territory population', <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/mar-2022>, accessed 7 August 2023.

— (2023) 'International Trade in Goods and Services, Australia', <https://www.abs.gov.au/statistics/economy/international-trade/international-trade-goods-and-services-australia/jun-2023>, accessed 7 August 2023.

AHA (2011) *Wild animal response strategy (version 3.3). Australian veterinary emergency plan (AUSVETPLAN), Edition 3*, Animal Health Australia, Canberra, ACT, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/AVP_Wild-An-Resp-Strategy_v3.3_2011-1.pdf, accessed 7 August 2023.

— (2012) *Australian animal welfare standards and guidelines — land transport of livestock, Edition 1 Version 1.1*, Animal Health Australia, Canberra, Australia, <https://www.animalwelfarestandards.net.au/land-transport/>, accessed 7 August 2023.

— (2013) *Management manual: Laboratory preparedness (Version 4.0)*, Animal Health Australia, Australian Veterinary Emergency Plan [AUSVETPLAN], edition 4, Canberra, ACT, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/AVP_Lab_v4.0_2013-1.pdf, accessed 7 August 2023.

— (2014) *AUSVETPLAN Enterprise manual: Zoos*, Animal Health Australia, Canberra, ACT, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/AVP_Zoo_v3.0_2014-1.pdf, accessed 7 August 2023.

— (2016) 'Australian animal welfare standards and guidelines for cattle', https://www.animalwelfarestandards.net.au/files/2011/01/Cattle-Standards-and-Guidelines-Endorsed-Jan-2016-061017_.pdf, accessed 7 August 2023.

— (2019) *Animal health in Australia 2018*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/Animal-Health-in-Australia-2018_.pdf, accessed 7 August 2023.

— (2020) *Exhibited Animals: Animal Welfare Standards*, <https://www.animalwelfarestandards.net.au/exhibited-animals/>, accessed 7 August 2023.

— (2021a) *Animal health in Australia system report, first edition*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2021/04/AHAH2001_Dan-AHiA-2020-Systems-Report_FA2_Digital-min.pdf, accessed 7 August 2023.

— (2021b) *Collaborative disease investigations*, Animal Health Australia, Canberra, ACT, <https://animalhealthaustralia.com.au/collaborative-disease-investigations/>, accessed 7 August 2023.

— (2021c) *Supporting market access*, Animal Health Australia, Canberra, Australia, <https://animalhealthaustralia.com.au/supporting-market-access/>, accessed 7 August 2023. —

— (2021d) *National Arbovirus Monitoring Program, NAMP 2020-2021 Report*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2022/03/NAMP-2020-21-Report.pdf, accessed 7 August 2023.

— (2022a) *National register of accredited veterinarians, accreditation program for Australian veterinarians*, Animal Health Australia, Canberra, ACT, <https://apav.animalhealthaustralia.com.au>, accessed 7 August 2023.

— (2022b) *Animal health in Australia annual report 2021*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2022/06/AHiA-Annual-Report-2021.pdf, accessed 7 August 2023.

— (2022c) *Response strategy: Lumpy skin disease (version 5.0)*, Animal Health Australia, Australian Veterinary Emergency Plan [AUSVETPLAN], edition 5, Canberra, ACT, <https://animalhealthaustralia.com.au/wp-content/uploads/2022/08/Lumpy-Skin-Disease.pdf>, accessed 7 August 2023.

— (2022d) 'Animal Health Surveillance Quarterly', *Animal Health Australia*, 27(1), <https://www.sciquest.org.nz/browse/publications/article/171697>, accessed 7 August 2023.

— (2022e) *National Arbovirus Monitoring Program, NAMP 2021-2022 Report*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2023/03/NAMP-2021-22-Report.pdf, accessed 7 August 2023.

— (2023) *Animal health in Australia annual report 2022*, Animal Health Australia, Canberra, Australia, https://animalhealthaustralia.com.au/wp-content/uploads/dlm_uploads/2023/05/AHiA-2022-Annual-Report.pdf, accessed 7 August 2023.

Australian Competition and Consumer Commission (2016) *Cattle and beef market study—Interim report*, Australian Competition and Consumer Commission, Canberra, Australia, https://www.accc.gov.au/system/files/1128%20Beef%20and%20cattle%20report_D08.pdf, accessed 7 August 2023.

Australian Veterinary Association (2022) *Countering the threat of lumpy skin disease to Australia*, <https://www.ava.com.au/news/ead/countering-the-threat-of-lumpy-skin-disease-to-australia/>, accessed 7 August 2023.

Beef Central (2022) *Lumpy Skin Disease triggers industry crisis response process*, Beef Central, <https://www.beefcentral.com/news/lumpy-skin-disease-threat-triggers-red-meat-industry-crisis-response-process/>, accessed 7 August 2023.

DAFF (2022a) *All livestock exports*, <https://www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/live-animals/live-animal-export-statistics/livestock-exports-by-market>, accessed 7 August 2023.

— (2022b) *National list of notifiable animal diseases*, <https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable>, accessed 7 August 2023.

— (2022c) *Action by governments – FMD prevention and preparedness - DAFF*, <https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/fmd/governmentaction>, accessed 7 August 2023.

— (2022d) *Lumpy skin disease*, <https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/lumpy-skin-disease>, accessed 7 August 2023.

— (2022e) *Commercial vessel biosecurity reporting*, <https://www.agriculture.gov.au/biosecurity-trade/aircraft-vessels-military/vessels/commercial-vessels>, accessed 7 August 2023.

Dairy Australia (2021) *In focus 2021: the Australian dairy industry*, Dairy Australia Limited, Southbank, Victoria, <https://cdn-prod.dairyaustralia.com.au/-/media/project/dairy-australia-sites/national-home/resources/2021/11/19/dairy-industry-in-focus-2021/dairy-industry-in-focus-2021.pdf>, accessed 7 August 2023.

Dairy Australia (2022) *In focus 2022: the Australian dairy industry*, Dairy Australia Limited, Southbank, Victoria, <https://www.dairyaustralia.com.au/industry-statistics/industry-reports/australian-dairy-industry-in-focus>, accessed 7 August 2023.

DAWR (2018) *National animal health surveillance business plan 2016-2020*, Department of Agriculture and Water Resources, Australian Government, Canberra, ACT, <https://www.agriculture.gov.au/agriculture-land/animal/health/surveillance-diagnostics#:~:text=The%20National%20Animal%20Health%20Surveillance,and%20outlines%20additional%20priority%20activities>, accessed 7 August 2023.

Department of Sustainability, Environment, Water, Population and Communities (2011) 'The feral water buffalo (*Bubalus Bubalis*)', <https://www.agriculture.gov.au/sites/default/files/documents/buffalo.pdf>, accessed 7 August 2023.

EFSA (2018). Lumpy skin disease: scientific and technical assistance on control and surveillance activities. EFSA Journal 2018;16(10):e05452, 40 pp. <https://doi.org/10.2903/j.efsa.2018.5452>, accessed 7 August 2023.

Fitzgerald D (2019) 'More than 160,000 feral buffalo roaming the Top End, with the population on the rise', Australian Broadcasting Corporation, <https://www.abc.net.au/news/rural/2019-11-21/nt-buffalo-population-on-the-rise/11713352>, accessed 7 August 2023.

FRSC (2007) 'Australian standard for the hygienic production and transportation of meat and meat products', <https://www.publish.csiro.au/ebook/download/pdf/5553>, accessed 7 August 2023.

Hall, R, Torpy, J, Nye, R, Zalcmán, E & Cowled B (2022) Quantitative risk assessment for the introduction of lumpy skin disease virus into Australia via non-regulated pathways Final report, <https://www.agriculture.gov.au/sites/default/files/documents/ausvet-lsd-quantitative-assessment.pdf>, accessed 7 August 2023.

Heath T (2008) 'Number, distribution and concentration of Australian veterinarians in 2006, compared with 1981, 1991 and 2001', *Australian Veterinary Journal*, 86(7):283–289, <https://doi.org/10.1111/j.1751-0813.2008.00314.x>, accessed 7 August 2023.

Henderson A, Perkins N and Banney S (2013) *Determining property-level rates of breeder mortality in northern Australia: literature review*, Meat & Livestock Australia Limited, North Sydney, NSW, https://www.mla.com.au/contentassets/ec07dba1026a41619057f5d94ca05257/b.nbp.0664_literature_review_final_report.pdf, accessed 7 August 2023.

Inspector-General of Biosecurity (2018) *Hitchhiker pest and contaminant biosecurity risk management in Australia*, Department of Agriculture and Water Resources, Canberra, Australia, https://www.igb.gov.au/sites/default/files/documents/hitchhikers-contaminants-report_0.pdf, accessed 7 August 2023.

— (2022) *Assurance review for arrangements to import live lumpy skin disease virus to CSIRO's Australian Centre for Disease Preparedness*, Department of Agriculture, Fisheries and Forestry, Canberra, Australia, https://www.igb.gov.au/sites/default/files/documents/igb-review-lumpy-skin-disease_0.pdf, accessed 7 August 2023.

ISC (2021) *National Livestock Identification System (NLIS)*, Integrity Systems Company, Meat and Livestock Australia, 22 June 2022, <https://www.integritysystems.com.au/identification--traceability/national-livestock-identification-system/>, accessed 7 August 2023.

Jesser P, Markula A and Csurhes S (2016) *Invasive animal risk assessment: Water buffalo Bubalus bubalis*, Department of Agriculture and Fisheries Biosecurity Queensland, https://www.daf.qld.gov.au/_data/assets/pdf_file/0018/62640/IPA-Water-Bufferalo-Risk-Assessment.pdf, accessed 7 August 2023.

Lemcke B (2017) *The Australian water buffalo manual*, Department of Primary Industry and Resources Northern Territory Government, Northern Territory, <https://www.agrifutures.com.au/wp-content/uploads/publications/17-003.pdf>, accessed 7 August 2023.

LLS (2022) *NSW local land services: What we do*, <https://www.lls.nsw.gov.au/what-we-do>, accessed 7 August 2023.

Lubinga J, Tuppurainen E, Coetzer J, Stoltz W and Venter E (2014) 'Evidence of lumpy skin disease virus over-wintering by transstadial persistence in *Amblyomma hebraeum* and transovarial persistence in *Rhipicephalus decoloratus* ticks', *Experimental and Applied Acarology*, 62(1):77–90, <https://doi.org/10.1007/s10493-013-9721-7>, accessed 7 August 2023.

MacDonald N, Lemcke B, Bilato L, Jans B and Bristow M (2021) *AgriFutures buffalo program strategic RD&E plan (2021-2025)*, AgriFutures Australia, Wagga Wagga, NSW, <https://agrifutures.com.au/wp-content/uploads/2021/03/21-004.pdf>, accessed 7 August 2023.

MLA (2021) *State of the Industry Report: The Australian red meat and livestock industry*, Meat & Livestock Australia, North Sydney, NSW, https://www.mla.com.au/globalassets/mla-corporate/prices--markets/documents/trends--analysis/soti-report/2789-mla-state-of-industry-report-2021_d11_single.pdf, accessed 7 August 2023.

— (2022) *How the red meat industry is responding to the threat of Lumpy Skin Disease | Meat & Livestock Australia*, MLA Corporate, <https://www.mla.com.au/news-and-events/industry-news/how-the-red-meat-industry-is-responding-to-the-threat-of-lumpy-skin-disease/>, accessed 7 August 2023.

More SJ, Radunz B and Glanville RJ (2015) 'Lessons learned during the successful eradication of bovine tuberculosis from Australia', *The Veterinary Record*, 177(9):224–232, <https://doi.org/10.1136/vr.103163>, accessed 7 August 2023.

Saalfeld K (2014) *Feral buffalo (Bubalus bubalis): distribution and abundance in Arnhem Land, Northern Territory*, Department of Land Resource Management, Palmerston, Northern Territory, Australia, https://nt.gov.au/_data/assets/pdf_file/0005/445199/feral-buffalo-arnhem-land-survey-report.pdf, accessed 7 August 2023.

Schneider H, Batho H, Stemshorn B and Thiermann A (2016) *OIE PVS evaluation report of the veterinary services of Australia*, Performance of Veterinary Services Evaluation, World Organisation for Animal Health, France, https://rr-asia.woah.org/wp-content/uploads/2020/05/pvs_australia.pdf, accessed 7 August 2023.

Sergeant E and Perkins N (2015) *Epidemiology for field veterinarians: an introduction*, CABI, Wallingford, Oxfordshire; Boston, MA.

Sprygin, Pestova Y, Wallace D, Tuppurainen E and Kononov A (2019) 'Transmission of lumpy skin disease virus: A short review', *Virus Research*, 269:197637, <https://doi.org/10.1016/j.virusres.2019.05.015>, accessed 7 August 2023.

WOAH (2021) 'Lumpy skin disease', <https://www.woah.org/app/uploads/2021/03/lumpy-skin-disease.pdf>, accessed 7 August 2023.

— (2022a) 'Chapter 11.9. Infection with lumpy skin disease virus', in *Terrestrial Animal Health Code*, World Organisation for Animal Health, https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_lsd.pdf, accessed 7 August 2023.

— (2022b) *Immediate notification: Japanese encephalitis (Australia)*, World Organisation for Animal Health, Paris, France, <https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON365>, accessed 7 August 2023.