NATIONAL ARBOVIRUS MONITORING PROGRAM 2023–2024 REPORT

OBJECTIVES OF THE NATIONAL ARBOVIRUS MONITORING PROGRAM

The National Arbovirus Monitoring Program (NAMP) has three specific objectives:

1. **Market access** – to facilitate the export of live cattle, sheep, goats and camelids, and their reproductive material, to countries that apply import conditions to mitigate the risk of introducing bluetongue, Akabane and bovine ephemeral fever (BEF) viruses.

2. **Bluetongue virus (BTV) early warning** – to detect incursions of exotic strains of BTV and its vectors (*Culicoides* species biting midges) that have the potential to adversely affect Australian livestock production and trade, by surveillance of the northern BTV-endemic area.

3. **Risk management** – to detect changes in the seasonal distribution of endemic bluetongue, Akabane and BEF viruses and their vectors in Australia, to inform livestock producers and support trade.

NAMP monitors the distribution of economically important arboviruses of livestock (cattle, sheep, goats and camelids) and their associated insect vectors within Australia. Arboviruses are viruses transmitted by arthropods such as mosquitoes, ticks, sandflies and midges.

Arboviruses monitored by NAMP include bluetongue, Akabane and BEF viruses. Clinical bluetongue disease is an uncommon occurrence in Australian sheep and has never been reported in any other susceptible animal species in Australia.

Australia's economy benefits from exporting ruminant livestock and their reproductive material (semen and embryos). This trade depends on mutual confidence between Australia and its trading partners that any risks to the animal health status of the importing country can be accurately assessed and properly managed. NAMP provides credible data on the nature and distribution of important specific arbovirus infections in Australia for use by the Australian Government, Australia's trading partners, and livestock exporters and producers. NAMP underpins Australian Government export certification that ruminants are sourced from areas that do not support transmission of these specified arboviruses. In addition, NAMP data are used during market access negotiations.

NAMP is jointly funded by the cattle, sheep and goat industries, the livestock export industry, and the state, territory and Australian governments.

NAMP coordinators and management would like to thank all the producers and collaborators who assisted in gathering the valuable monitoring data that underpin this report. This assistance is critical in developing and maintaining market access.

OPERATION OF NAMP

NAMP data are gathered throughout Australia by serological monitoring of cattle in sentinel herds, strategic serological surveys of other cattle herds (serosurveys), and trapping of insect vectors.

Blood samples from groups of young cattle that have not previously been exposed to infection with these arboviruses are tested at regular intervals for evidence of new infection with bluetongue, Akabane and BEF viruses. The program seeks to align blood sampling frequency to the probability of arbovirus transmission (the greater the likelihood of viral transmission, the more frequent the sampling). Insect traps to detect *Culicoides* species are positioned near the monitored herds during the period of testing, or near herds where conditions are favourable for *Culicoides* species survival.

Monitoring sites (Figure 1) are selected to determine arbovirus distribution – sites are located along the border between areas where infection is expected and not expected, and in areas where infection occurs sporadically.

Areas that are known to be endemically infected are sampled to detect any new strains of virus and to assess the seasonal intensity of infection with each arbovirus.

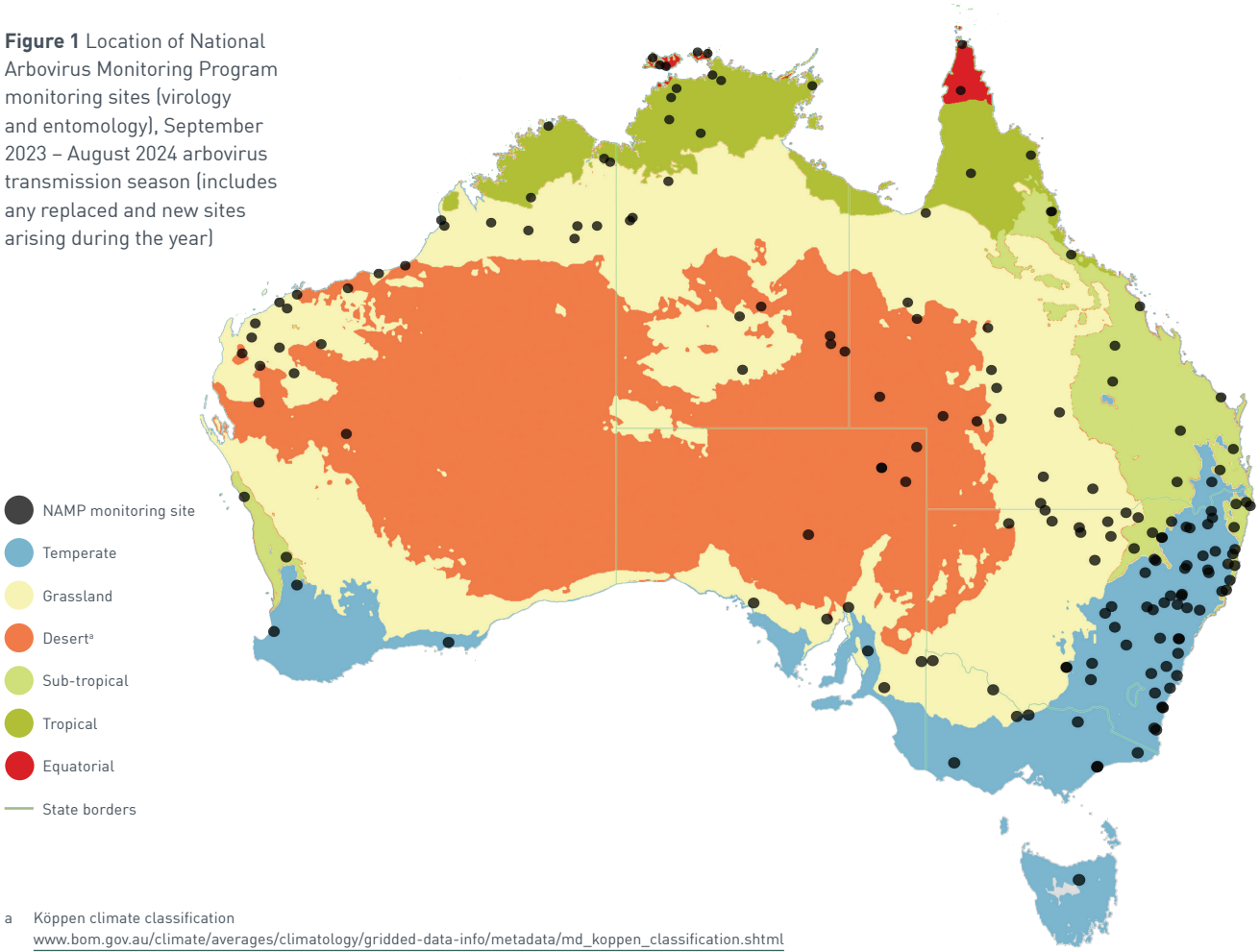
Serotyping, virus isolation and molecular testing are applied strategically in herds in New South Wales, the Northern Territory, Queensland and Western Australia after BTV seroconversions are detected. Beatrice Hill, in the far north of the Northern Territory, is a focus for exotic BTV surveillance – all blood samples collected at this location are subjected to virus isolation. NAMP surveillance data relating to early warning of bluetongue infection are supplemented by targeted surveillance activities conducted by the Northern Australia Quarantine Strategy (NAQS) in remote coastal regions of northern Australia (the Northern Territory, northern Queensland and Western Australia).

EPIDEMIOLOGY

Bluetongue, Akabane and BEF viruses are non-contagious and are biologically transmitted by their insect vectors. Climatic factors (rainfall, temperature, and prevailing wind speed and direction) influence the distribution of potential vectors. The arboviruses are transmitted only if vectors are present in sufficient numbers.

The biting midge *Culicoides brevitarsis* is the main vector for both BTV and Akabane virus. There is a close correlation between the southern limits of *C. brevitarsis*

Figure 1 Location of National Arbovirus Monitoring Program monitoring sites (virology and entomology), September 2023 – August 2024 arbovirus transmission season (includes any replaced and new sites arising during the year)



a Köppen climate classification
www.bom.gov.au/climate/averages/climatology/gridded-data-info/metadata/md_koppen_classification.shtml

and the distribution of the two viruses. Other vectors of BTV in Australia include *C. actoni*, *C. dumdumi*, *C. fulvus* and *C. wadai*, but these are less widely distributed than *C. brevitarsis*.

The mosquito *Culex annulirostris* is generally considered to be the main vector for BEF virus in Australia. *Culex annulirostris* has different ecological thresholds from *C. brevitarsis*, particularly in its tolerance to lower temperatures, which accounts for its wider distribution and the occurrence of BEF in regions not affected by BTV or Akabane virus, such as southern Australia.

Australian research since the mid-1970s has provided a detailed understanding of the epidemiology of BTV strains in Australia and their *Culicoides* species biting-midge vectors. These vectors enter northern Australia during significant weather events, occasionally resulting in new BTV serotypes in northern Australia.

The climatic conditions in many regions in Australia do not support the specific *Culicoides* vectors that can transmit BTV and Akabane virus. These conditions have a significant effect on vector distribution, which accounts for variations in the boundary between areas where viral transmission occurs and areas free of transmission.

MONITORING RESULTS FOR 2023–2024

This section summarises and explains the results of vector and virus monitoring and describes the limits of distribution of bluetongue, Akabane and BEF viruses in the 2023–2024 arbovirus transmission season (September 2023 to August 2024). The numbers of monitoring sites for sample collection in each state and territory are shown in Table 1.

Table 1 Number of active NAMP monitoring sites, by state and territory, September 2023 – August 2024

Jurisdiction	Sentinel herds	Serosurvey sites	Insect traps
New South Wales	44	1	36
Northern Territory	8	7	15
Queensland	20	6	18
South Australia	8	0	5
Tasmania	1	0	1
Victoria	8	0	6
Western Australia	16	9	17
TOTAL	**105**	**23**	**98**

BLUETONGUE VIRUS AND VECTOR DISTRIBUTION

The limits of BTV transmission in Australia are shown on the interactive Bluetongue Virus Zone Map,[1] which defines the areas in which no viral transmission has been detected for the past two years.

Bluetongue virus transmission is endemic in northern and northeastern Australia (New South Wales, the Northern Territory, Queensland and parts of Western Australia), and remains undetected in South Australia, Tasmania and Victoria (Figure 2). No new serotypes were detected in Australia from samples collected during the 2023–2024 season; types detected during the period were BTV-1, 4, 5, 7, 15, 16, 20 and 21.

In the **Northern Territory**, the wet season saw above-average rainfall due to cyclonic activity, resulting in the highest rainfall on record being observed in some areas. Mean temperatures were above to very much above average for the north and south of the Northern Territory.

This year, seroconversions occurred in almost all the animals within the Territory's northern herds except for Victoria River, where one fifth of the herd remained negative. The serotypes detected were BTV-1, 4, 5, 7, 16, 20 and 21. Transmission was detected at two properties in the BTV Transmission Buffer Zone near Tennant Creek, resulting in an expansion of the BTV Transmission Zone towards Alice Springs.

The key vector species identified were *C. brevitarsis*, *C. actoni*, *C. wadai* and *C. fulvus*. Consistent with the previous season, the number of key vector species detected in the Northern Territory for 2023–2024 was generally lower than historic numbers. Following the sporadic detection of *C. nudipalpis* on the Cobourg Peninsula, an intensive survey was undertaken across the season to investigate its potential establishment. Results indicate that a large and reproducing population of *C. nudipalpis* exists on Croker Island. The population has not spread to the Cobourg Peninsula. No key *Culicoides* species vectors were recorded in the Northern Territory's BTV Transmission-Free Zone.

In **Western Australia**, rainfall was generally below average with hot, dry conditions reported across most of the state. The northern and eastern Kimberley regions experienced heavy rainfall and wet conditions over summer due to tropical low pressure and ex-cyclone activity. These wet conditions generally supported vector breeding, except for periods with intense rainfall when the breeding sites were dispersed. The hot, dry conditions in the western

1 namp.animalhealthaustralia.com.au

Kimberley region, Pilbara and much of the southwest likely facilitated reduced vector breeding during the arbovirus season.

Transmission of BTV in Western Australia was detected only in the central and eastern Kimberley regions, well within the BTV Transmission Zone. BTV-21 was identified as the predominant serotype, followed by BTV-16 and BTV-1, which were only identified in the central Kimberley region.

No exotic species of *Culicoides* were found at trapping sites in Western Australia. Low numbers of *C. brevitarsis* and *C. wadai* were captured at several sites across the Kimberley region. Similar to previous years, low numbers of *C. brevitarsis* were also collected at a site south of Broome, within the BTV Transmission Buffer Zone.

In **Queensland**, significantly warmer and wetter-than-average conditions were reported. Temperatures remained high, and the onset of summer saw very high rainfalls throughout most of the state. Most notably, high and sustained rainfall combined with the drainage of floodwater from the north through to the southwest alleviated the previously declared drought conditions. Scheduled monitoring will determine whether the ranges of vectors and arboviruses expand into these southwest Queensland areas.

Bluetongue virus transmission was detected initially in the northern coastal areas, followed by central coastal areas and then the south. Consistent with prior years, there were no detections in the northwest and central pastoral areas. The predominant strain identified was BTV-16. There was also evidence of BTV-1, 15 and 21 in the northern and central coastal areas.

Monitoring found *C. brevitarsis* to be the most prevalent vector species overall in Queensland as usual, followed by *C. wadai*. Lower numbers of *C. fulvus* were captured in Innisfail and *C. actoni* in Cooktown; both these vectors were also found in Townsville. No exotic species of *Culicoides* were found at any of the trapping sites in Queensland.

In **New South Wales**, rainfall was generally average to above average across the state, with wetter conditions being recorded from the North West to the South Coast regions. The above-average rainfall likely provided suitable conditions to support the mosquito population and BEF transmission. Maximum temperatures were generally very much above average from July to September 2023 before reducing to above average from October 2023 to April 2024. From April to July 2024, temperatures across the state were generally average. Freezing overnight temperatures were recorded on the Southern Tablelands from April 2024 and on the Northern Tablelands and more widely from May 2024. Winter and spring conditions were mild, and this potentially facilitated earlier and increased populations of *C. brevitarsis*.

Transmission of BTV in New South Wales commenced earlier than expected, with first detections recorded on the North Coast in December 2023 and January 2024, reaching Camden on the coastal plain in February 2024, and the Upper Hunter Valley by March 2024. Transmission over the season was extensive, with seroconversions detected on the South Coast near Bega and at Sutton Forest, and at Coonabarabran in the northwest for the first time, expanding the BTV Transmission Zone. Similar to previous seasons, the serotypes detected were BTV-1, 16 and 21.

The principal vector of BTV in New South Wales, *C. brevitarsis*, was detected at a wide range of sites this season. For the first time in several years, *C. brevitarsis* was recorded at Dubbo, Armidale and Mudgee, and it was also recorded for the first time at Goulburn. *Culicoides* species were generally detected earlier than expected and numbers also reached their peak earlier in the season.

In **Victoria**, rainfall varied with winter and autumn generally having below-average rainfall, followed by above-average rainfall through spring and summer. Overall, warmer temperatures were reported across the state with maximum and minimum temperatures being generally above average. However, autumn saw

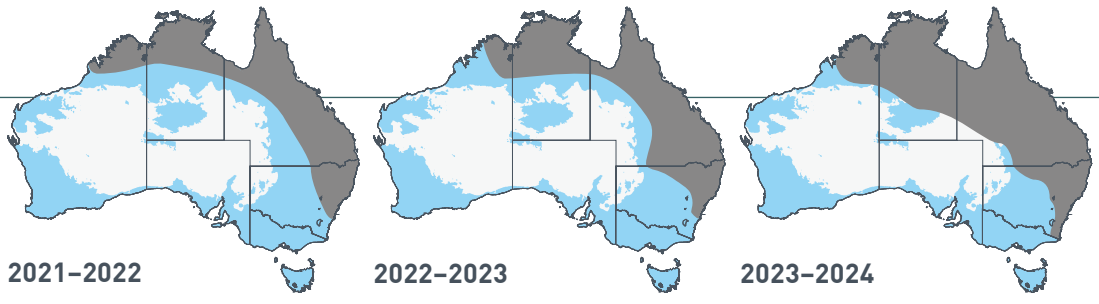


Figure 2 Distribution of bluetongue virus in Australia, Sep 2021 – Aug 2024

a Köppen climate classification

temperatures drop in the north, northwest and far west with minimum temperatures reported as below average.

In **South Australia**, warmer-than-average temperatures were reported across the state with rainfall varying seasonally. Spring and autumn saw drier conditions with below-average rainfall, the exception being in the north of the state, which experienced above-average rainfall in autumn. Summer saw wetter conditions across the state except for the drier northern pastoral district, which had experienced more rain during autumn.

In **Tasmania**, significantly warmer and drier conditions than average were reported. Most of the state had average to below-average rainfall each month, with Hobart reporting its third driest February on record. The annual maximum and minimum temperatures were in the warmest 10% of historical records across the state.

No *Culicoides* species known to be capable BTV vectors were detected in Victoria, South Australia or Tasmania, which is consistent with the serological evidence of virus absence.

AKABANE VIRUS DISTRIBUTION

The distribution of Akabane virus (Figure 3) varies within the limits of its vector, *C. brevitarsis*, occurring endemically in northern Australia and showing a distinct seasonal spread in New South Wales and southern parts of Queensland.

In the **Northern Territory**, there was no evidence of Akabane virus transmission outside the northern endemic region (note that no surveillance sampling was conducted in the known endemic region).

In **Western Australia**, transmission of Akabane virus was detected in animals in the Kimberley, consistent with previous years. There were two seroconversions detected in single non-clinical animals in the Pilbara: one on the coast and another further inland.

In **Queensland**, Akabane virus was detected earlier than usual and widely across the state, extending from the northern and central coast to the central and southern inland sites.

In **New South Wales**, Akabane virus transmission was widespread and detected at all sites in northern, central and coastal regions of the state where BTV transmission was detected, as well as at Bourke in northwestern New South Wales and near Bathurst and Goulburn on the Central and Southern Tablelands. A small number of cases of Akabane disease have been confirmed in the North West, Central West and Hunter regions.

In Victoria, South Australia and Tasmania, no Akabane virus transmission was detected.

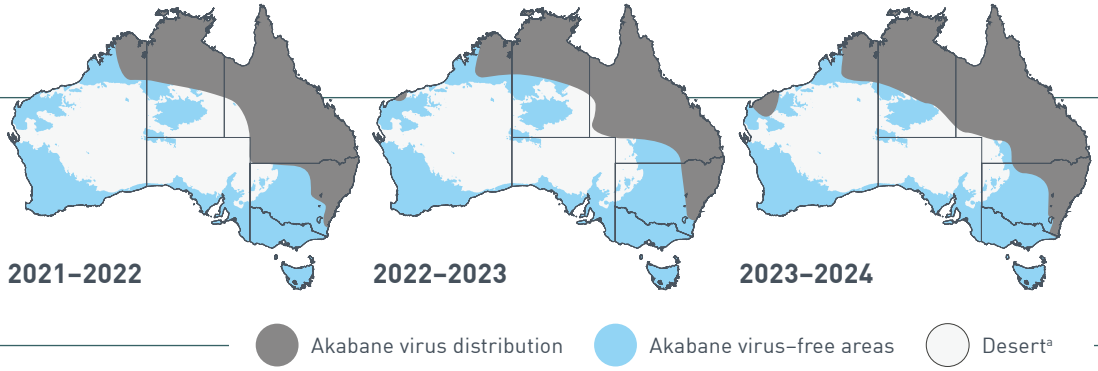


Figure 3 Distribution of Akabane virus in Australia, Sep 2021 – Aug 2024

a Köppen climate classification

BOVINE EPHEMERAL FEVER VIRUS DISTRIBUTION

In northern Australia, BEF virus is endemic and clinical disease can occur in both the dry and wet seasons (spring, summer or autumn). Significant rainfall and flooding events throughout much of southeast Australia facilitated BEF transmission in the 2023–2024 season (Figure 4). Cold winters limit occurrence of the virus by restricting the distribution of its mosquito vector.

In the **Northern Territory**, BEF activity was widespread, first detected in Beatrice Hill and subsequently detected across the north and to Alice Springs.

In **Western Australia**, BEF was detected in animals in the Kimberley and Pilbara regions, with no observations of clinical signs in cattle this season.

In **Queensland**, BEF was distributed widely across the state. Additionally, clinical BEF was diagnosed on 42 occasions across the state, a decrease from last year.

In **New South Wales**, BEF virus monitoring was undertaken at selected NAMP sites on the south coast and in inland regions. Seroconversions were detected across the North West Slopes, Central West, Western Division, Sydney Basin and South Coast. Additionally, clinical cases were confirmed in the North Coast, North West, Northern Tablelands, Central West, Hunter, Central Tablelands, South East, Riverina and Murray Local Land Services regions.

In **South Australia**, BEF seroconversion was detected at one site in the far northeast of the state. Occasional positive results have been previously observed in this part of South Australia, usually following increased rainfall and flooding through the channel country. There were no other BEF antibody detections in any other location in South Australia this season. The positive detection is likely the result of flooding activity and displacement of vectors as has been noted in previous seasons, and is not a result of expanding distribution of BEF vectors.

In Victoria and Tasmania, no evidence of BEF transmission was detected.

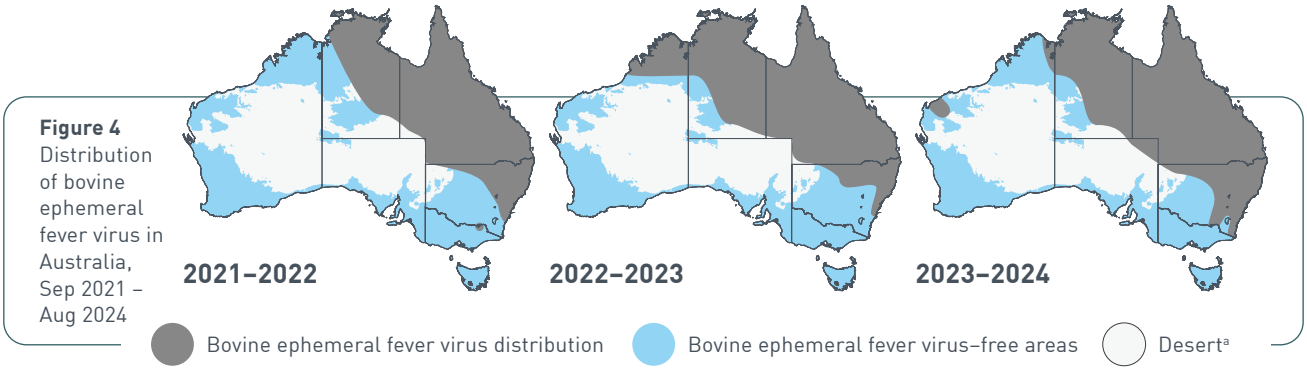


Figure 4 Distribution of bovine ephemeral fever virus in Australia, Sep 2021 – Aug 2024

a Köppen climate classification

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