

# **2024 Quota Submission for Commercially Harvested Macropods in Queensland**



Prepared by: Macropod Management Program, Queensland Parks and Wildlife Services and Partnerships, Department of Environment and Science

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## Executive summary

The commercial macropod harvest in Queensland is focused on three species (red kangaroo *Osphranter rufus*, eastern grey kangaroo *Macropus giganteus*, and common wallaroo *Osphranter robustus*) located in six zones: no harvest zone, and harvest zones 1 to 5.

The harvest is administered through a quota submission which is released annually and outlines proposed quotas for each species in each zone for the following calendar year. Quotas are set up to 20% of the estimated population for each species in each zone, depending on survey intensity and the standard error associated with population estimates.

This quota submission outlines the following factors that relate to macropod populations:

- population trends (estimates obtained through aerial surveys)
- review of previous harvests
- the extent of non-commercial harvest mortality
- the extent of areas not subject to any harvest
- rainfall trends.

For 2022, aerial surveys were conducted at 17 monitor blocks across Queensland. Since regionalisation of the Queensland commercial macropod harvest was introduced in 2003, an estimate of macropod population size in zones 1 and 5 (former western and eastern zones) has been made annually. The model used to estimate these populations is based on a small sample area and the reduced sampling effort is reflected in a conservative quota. This model was updated in 2012 to incorporate almost a decade of survey data and to generate trigger points for the commercial quota allocation.

Overall combined 2023 population estimate totals for all three species increased across the state. However regional differences were significant. Population estimates decreased for eastern grey kangaroos in zone 5 and increased in all other zones. For red kangaroos population estimates decreased in zones 1,2 and 5 yet increased in zones 3 and 4. Whilst the population estimates increased for common wallaroos in zones 3,4 and 5 they decreased slightly in zone 2 and markedly in zone 1. While there was a slight increase for the population estimate for eastern grey kangaroos in zone 2 the estimate remains below a predetermined trigger point. There is no quota allocated for this species in zone 2 for the 2024 harvest period.

Examination of long-term trends in population and block density estimates indicates that the 2023 estimates are comparable to fluctuations of previous years. Population estimates for all three commercially harvested species consistently number more than 1 million across the Queensland harvest zones.

In the 2022 harvest period, only 34.3% of the commercial harvest quota was utilised, with the highest percentage of quota used being 56.7% for common wallaroo in the central zone (the combination of zones 2,3 and 4). The overall harvest was male biased, with females comprising less than 24% of the overall harvest.

Figures available as at 12 August 2023 indicate that the harvest will be below quotas for each species in each zone in 2023. Non-commercial take under damage mitigation permits (DMPs) were also below the maximum available quota for the 2022 harvest period a trend that is likely to be repeated in 2023.

The three commercially harvested macropod species continue to be protected from harvesting within the harvest zones in national parks and state forests. The protected area within the harvest zones is 128,529km<sup>2</sup>. Macropods are further protected from harvest in Queensland within the non-harvest zones.

Drought declarations have ceased for the majority of the harvest zones with many areas showing an increase in macropod densities. However, the legacy of eight years drought still impacts some areas. This is reflected in the absence of a quota for eastern grey kangaroos in zone 2 for the 2024 harvest period.

This quota submission contains a summary of the recommended quotas for each of the species in each of the harvest zones for 2024. Additionally, the submission outlines the basis of how these quotas were determined.

**Population estimates for 2023 and proposed sustainable use quotas for the 2024 commercial harvest. Note estimates in red signify a trigger point has been reached.**

Species	Population estimate zone	2023 estimated population (rounded to the nearest 50)	2024 sustainable use quota (rounded to the nearest 50)	Proportion of population (% rounded to the nearest whole number)
Red kangaroo	Zone 1	992,700	99,250	10%
	Zone 2	3,117,800	623,550	20%
	Zone 3	1,494,750	298,950	20%
	Zone 4	529,000	105,800	20%
	Zone 5	237,500	23,750	10%
	Combined	6,371,750	1,151,300	18.1%
Eastern grey kangaroo	Zone 1	257,000	NA	NA
	Zone 2	490,450	0	NA
	Zone 3	779,350	116,900	15%
	Zone 4	3,871,650	580,750	15%
	Zone 5	4,194,500	419,450	10%
	Combined	9,592,950	1,117,100	11.6%
Common wallaroo	Zone 1	222,450	22,250	10%
	Zone 2	587,650	88,150	15%
	Zone 3	194,850	29,250	15%
	Zone 4	51,100	7,650	15%
	Zone 5	706,950	70,700	10%
	Combined	1,763,000	218,000	12.4%

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## Introduction

The commercial harvesting in Queensland of three macropod species—red kangaroo *Osphranter rufus*, eastern grey kangaroo *Macropus giganteus* and common wallaroo *Osphranter robustus*—is regulated through:

- *Environment Protection and Biodiversity Conservation Act 1999*
- Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2023–2027
- *Nature Conservation Act 1992*
  - Nature Conservation (Animals) Regulation 2020
  - Nature Conservation (Macropod) Conservation Plan 2017
- Harvest Period Notice for taking macropods
- *Animal Care and Protection Act 2001*
- *Food Production (Safety) Act 2000*.

The Department of Environment and Science (DES) administers the harvest of macropods in Queensland in accordance with the International Union for Conservation of Nature (IUCN) Recommendation 18.24, ‘the ethical, wise and sustainable use of some wildlife can provide an alternative or supplementary means of productive land-use, and can be consistent with and encourage conservation, where such use is in accordance with appropriate safeguards’ (IUCN 1990) and the Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2023–27, ‘to provide for the sustainable use of macropod species covered by the plan, in accordance with the principles of ecologically sustainable development’ (Anon 2022).

Management of the harvest is facilitated via a quota that sets the number of animals that can be taken. Quotas are established largely based on aerial surveys of the commercially harvested species and have been used in Queensland since 1975. The Director-General of DES declares a harvest period open annually via the harvest period notice and sets quotas for this period having regard to the Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2023–27. Quotas are provided to the Commonwealth Minister for The Environment for endorsement.

Quotas in Queensland are set up to 20% of the estimated population for each species in each zone. Harvesting at these levels will ensure a sustainable yield and long-term conservation of macropod populations.

From 2003 to 2022, quotas were set for each species for four harvest zones to ensure that harvest pressure is distributed across the range of the species. As of 2023 the quotas are set for each species in six harvest zones (figure 1):

Harvest zone from 2023 onwards	2003 – 2022 harvest zones
<ul style="list-style-type: none"> <li>• no harvest zone (quota zero)</li> <li>• zone 1 (formerly western zone)</li> <li>• zone 2 (formerly north region of central zone)</li> <li>• zone 3 (formerly south region of central zone)</li> <li>• zone 4 (formerly east region of central zone)</li> <li>• zone 5 (formerly eastern zone)</li> </ul>	<ul style="list-style-type: none"> <li>• no harvest zone (quota zero)</li> <li>• eastern harvest zone</li> <li>• central harvest zone</li> <li>• western harvest zone.</li> </ul>

This quota submission contains a summary of the recommended quotas for each of the species in each of the harvest zones for 2024. Additionally, the submission outlines the basis of how these quotas were determined.

The Harvest Period Notice for taking macropods in 2024 is due for release in December 2023. The release of this notice will allow the harvest period to be declared open on 1 January 2024. The notice will outline specific conditions for the 2024 harvest period.

The proposed quotas were calculated using a fixed proportion of the estimated macropod populations within the Queensland harvest areas. Proportions were adjusted for each species across the harvest zones in relation to the margins of error present in population estimates derived from aerial surveys. The maximum proportions used for each species were 15% of the populations for eastern grey kangaroos and common wallaroos and 20% of the population for red kangaroos. For zones 1 and 5,

where survey effort is less extensive, a more conservative maximum proportion of 10% was applied for all three species.

These sustainable-use harvest proportions are based on research and modelling undertaken by Caughley et al. (1987) and Hacker et al. (2002) and are currently accepted by the scientific community, DES and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEE) for determining state quota limits.

This quota submission also outlines the following factors that relate to macropod populations:

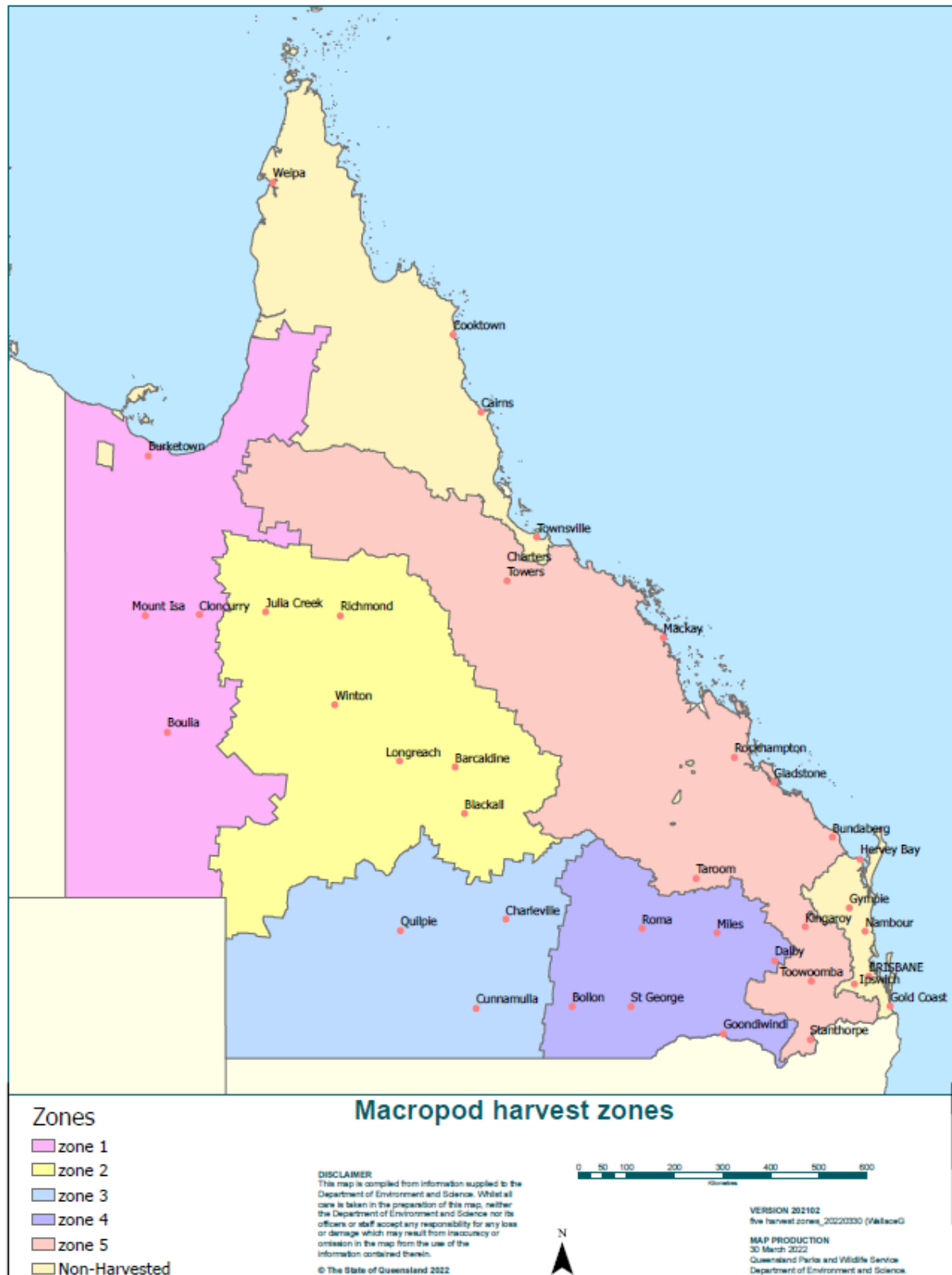
- population trends (estimates obtained through aerial surveys)
- review of previous harvests
- the extent of non-commercial harvest mortality
- the extent of areas not subject to any harvest
- rainfall trends.

## Proposed quotas

**Table 1. 2023 estimated populations and 2024 proposed quotas for each macropod species in each harvest zone. Note estimates in red signify a trigger point has been reached.**

Species	Population estimate zone	2023 estimated population (rounded to the nearest 50)	2024 sustainable use quota (rounded to the nearest 50)	Proportion of population (% rounded to the nearest whole number)
Red kangaroo	Zone 1	992,700	99,250	10%
	Zone 2	3,117,800	623,550	20%
	Zone 3	1,494,750	298,950	20%
	Zone 4	529,000	105,800	20%
	Zone 5	237,500	23,750	10%
	Combined	6,371,750	1,151,300	18.1%
Eastern grey kangaroo	Zone 1	257,000	NA	NA
	Zone 2	490,450	0	NA
	Zone 3	779,350	116,900	15%
	Zone 4	3,871,650	580,750	15%
	Zone 5	4,194,500	419,450	10%
	Combined	9,592,950	1,117,100	11.6%
Common wallaroo	Zone 1	222,450	22,250	10%
	Zone 2	587,650	88,150	15%
	Zone 3	194,850	29,250	15%
	Zone 4	51,100	7,650	15%
	Zone 5	706,950	70,700	10%
	Combined	1,763,000	218,000	12.4%

Figure 1. Queensland macropod harvest zones





Zone 1 consists of Boulia, Burke, Carpentaria, Cloncurry, Diamantina and Mount Isa local government areas.

Zone 2 consists of Barcaldine, Barcoo, Blackall-Tambo, Flinders, Longreach, McKinlay, Richmond and Winton local government areas.

Zone 3 consists of Bulloo, Murweh, Paroo and Quilpie local government areas.

Zone 4 consists of Balonne, Goondiwindi, Maranoa and Western Downs local government areas.

Zone 5 consists of Banana, Bundaberg, Burdekin, Central Highlands, Charters Towers, Croydon, Etheridge, Gladstone, Isaac, Livingstone, Lockyer Valley, Mackay, North Burnett, Rockhampton, Scenic Rim, Somerset, South Burnett, Southern Downs, Toowoomba and Whitsunday local government areas.

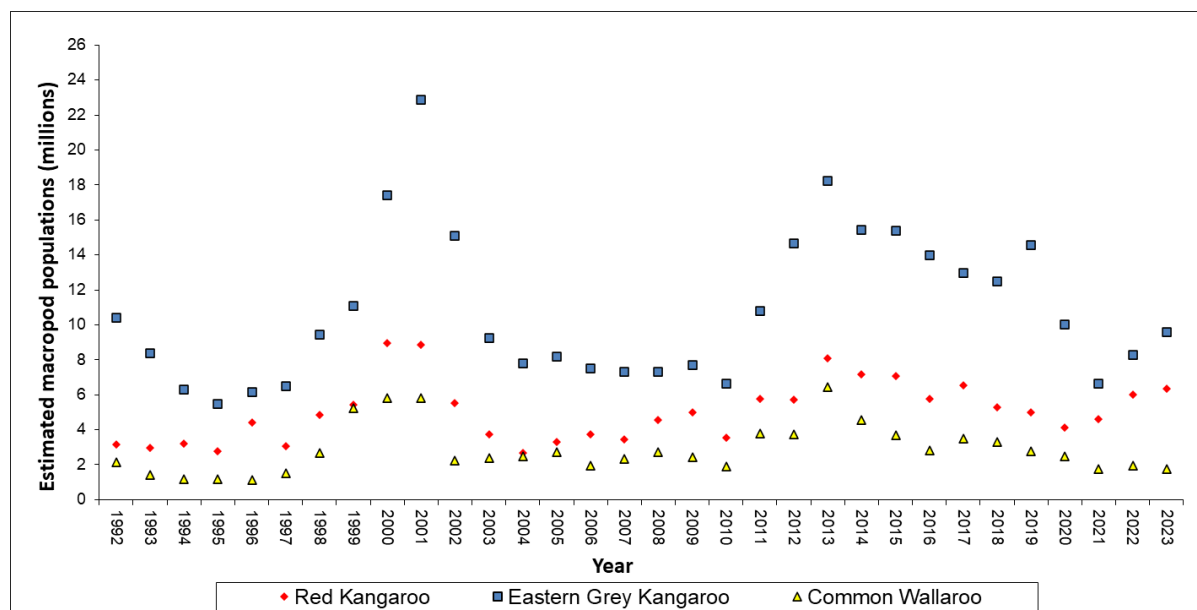
## Long-term population trends

### Population estimates

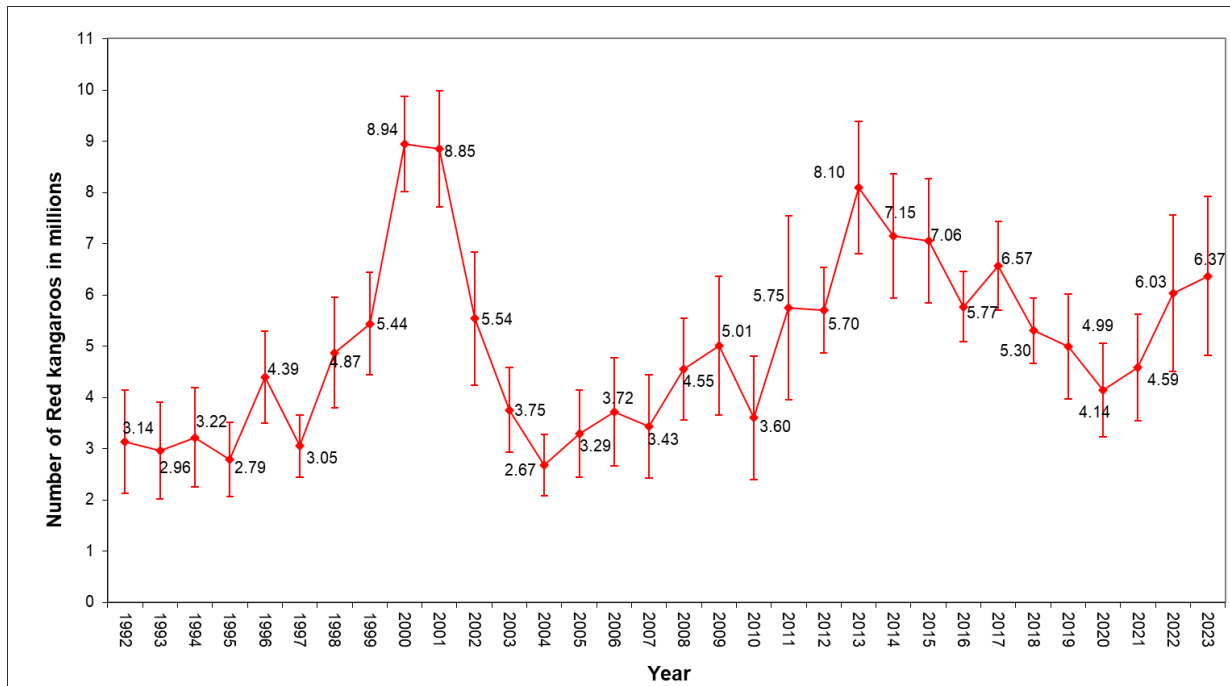
Since 1992, the Queensland Government has coordinated an annual program of aerial surveys to directly monitor populations of the three commercially harvested macropod species. These surveys occur over 22 representative monitor blocks across the state and are utilised to obtain population estimates that inform the quota. The methodology of the surveys is outlined in detail on the [Queensland Government website \(https://www.qld.gov.au/environment/plants-animals/wildlife-permits/macropods/macropods-quotas\)](https://www.qld.gov.au/environment/plants-animals/wildlife-permits/macropods/macropods-quotas). Since 2011 a correction factor of 1.85 has been applied to population estimates for common wallaroo in Queensland. Prior to this a correction factor of 1.2 was applied.

Current harvesting rates (quotas up to 20% of population estimates) are considered sustainable. None of the three commercially harvested species has shown a consistent decline in abundance since 1992 (figures 2, 3, 4 and 5), which would necessitate a reassessment of the harvest take and species conservation status. Whilst no consistent declines have been observed, the macropod populations in Queensland have fluctuated over time.

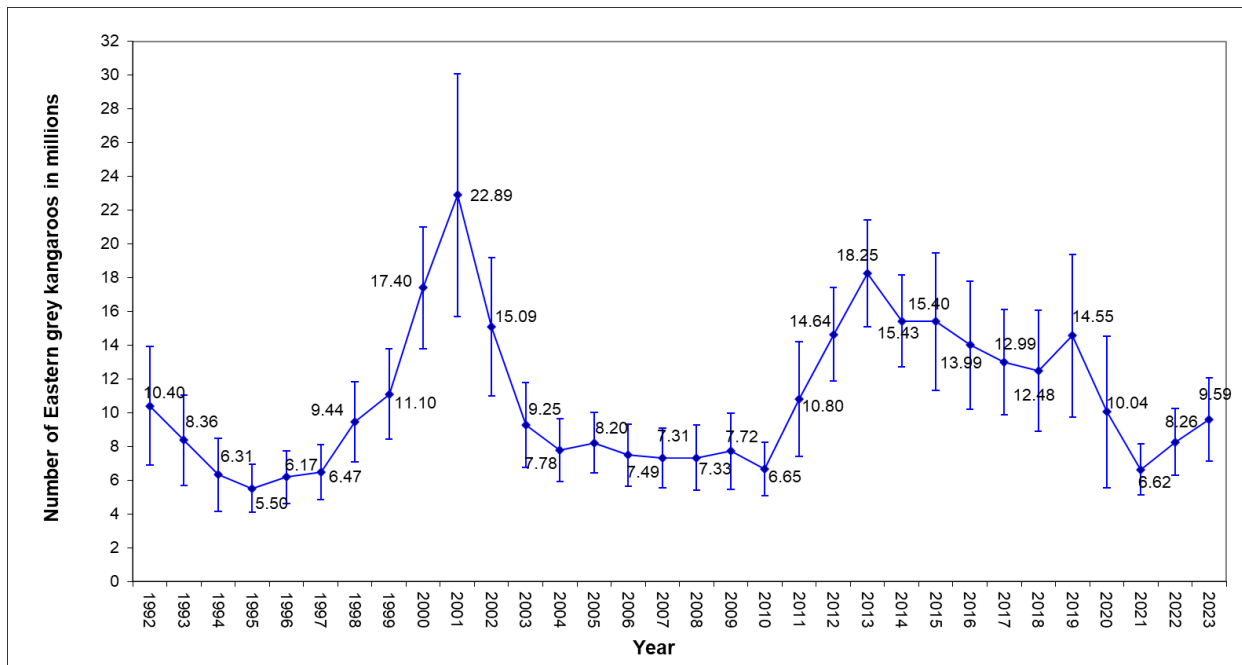
**Figure 2. Macropod population trends across all Queensland harvest zones since 1992**



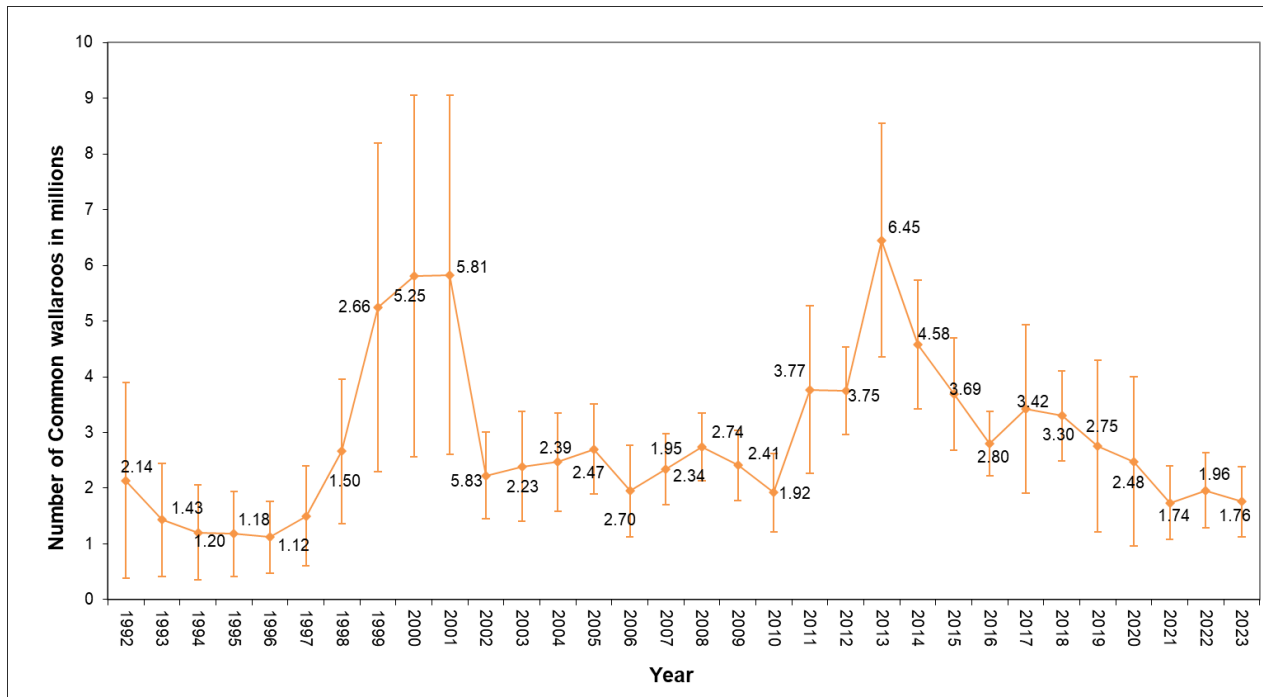
**Figure 3. Red kangaroo population estimates (with one standard error) since 1992**



**Figure 4. Eastern grey kangaroo population estimates (with one standard error) since 1992**



**Figure 5. Common wallaroo population estimates (with one standard error) since 1992. Estimates include a 1.85 correction factor for 2011 to 2023 and a 1.2 correction factor all other years**



### Density estimates

To contribute to ensuring commercially harvested macropod species are maintained across their distributions, density estimates are calculated for representative survey blocks as part of the aerial survey program (Appendix 1). For the purposes of interpreting this data, the density estimates for each species are presented in the harvest zones (figure 6).

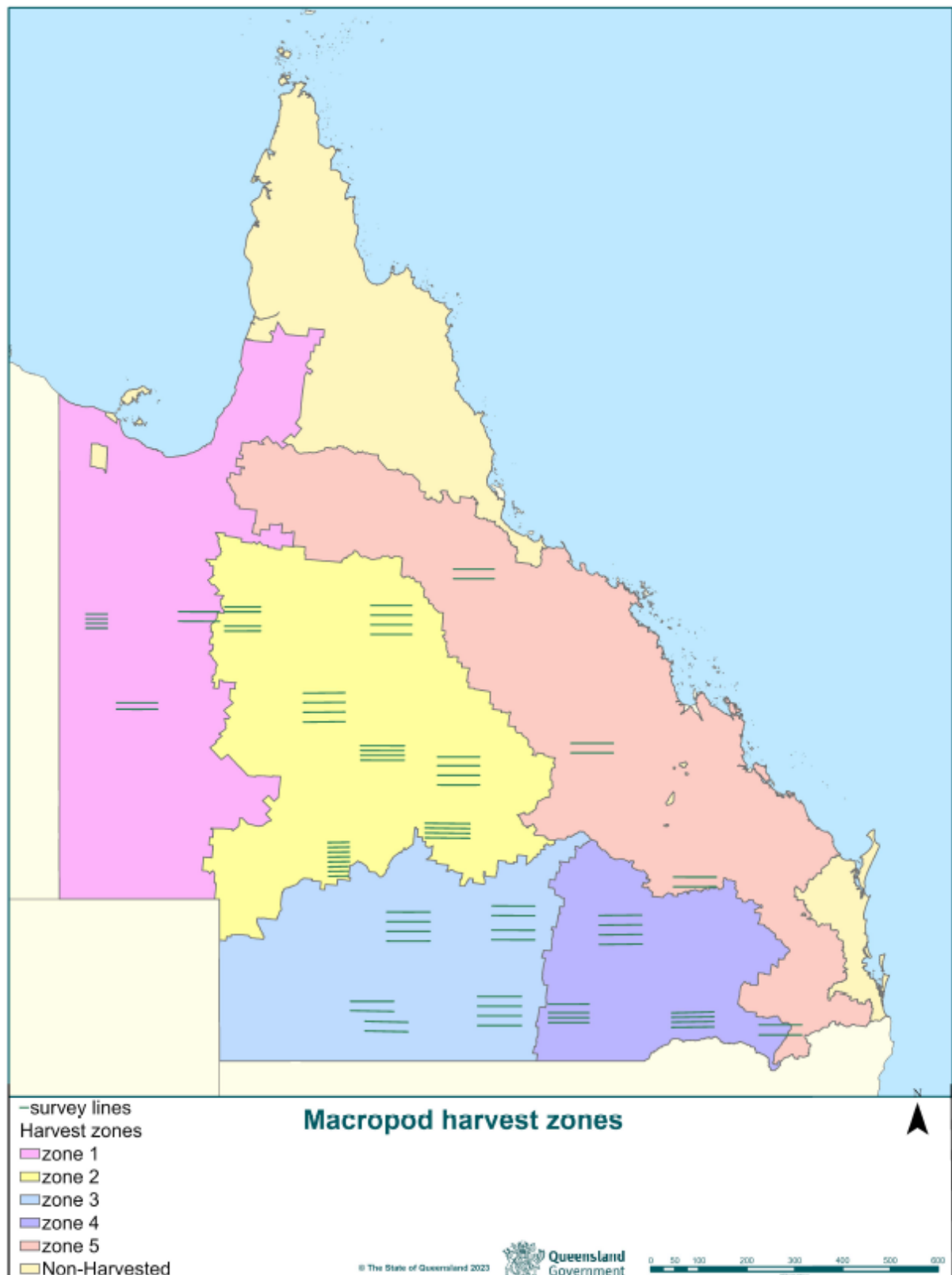
This data is monitored for any significant decreases in densities which is possible for all data collected since 2005. Examination of trends in density for the three commercially harvested macropod species in the areas outlined above for the period 2005–2023 demonstrates densities fluctuate over time (figures 7–11).

For red kangaroos densities are greatest in the zone 2 (figure 8), with densities lowest in the zone 5 (figure 11). Low densities in the zone 5 (eastern Queensland) are expected as this area incorporates the edge of the distributional range for this species.

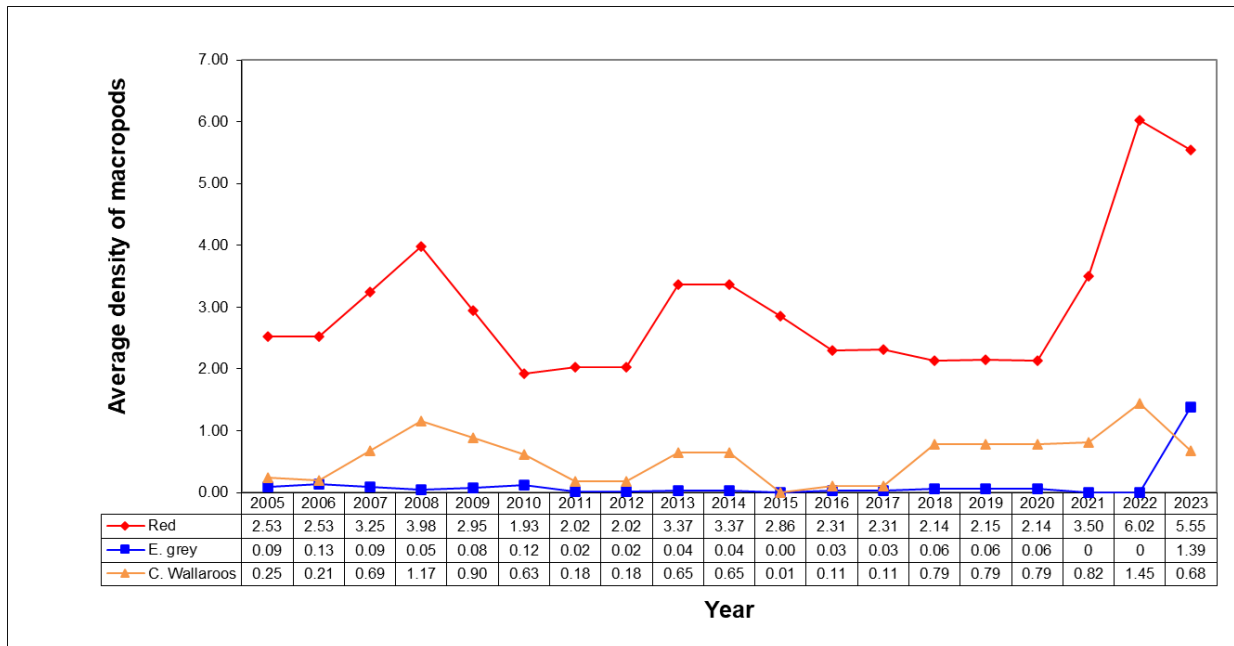
For eastern grey kangaroos highest densities are recorded in the zone 4 (figure 10) and zone 5 (figure 11). Eastern grey kangaroos occur in consistently low densities in zone 1 (western Queensland) at the edge of their distributional range. As such, there is no quota for eastern grey kangaroos in this zone (table 1). In 2022 no eastern grey kangaroos were counted in zone 1 during aerial surveys. This does not necessarily mean they are completely absent from the zone. It is more likely that the survey effort was insufficient to detect extremely low densities.

Common wallaroos occur in highest densities in the zone 2 (figure 8). This area is further divided into two regions for the purposes of estimating populations due to the considerably higher densities historically recorded around Blackall, Tambo and Longreach when compared to the rest of the zones (figure 8 and Appendix 1). Lowest densities for this species occur in zone 4 (figure 10). Density fluctuations for this species do not follow the same patterns as those exhibited by red and eastern grey kangaroos (figures 7–11).

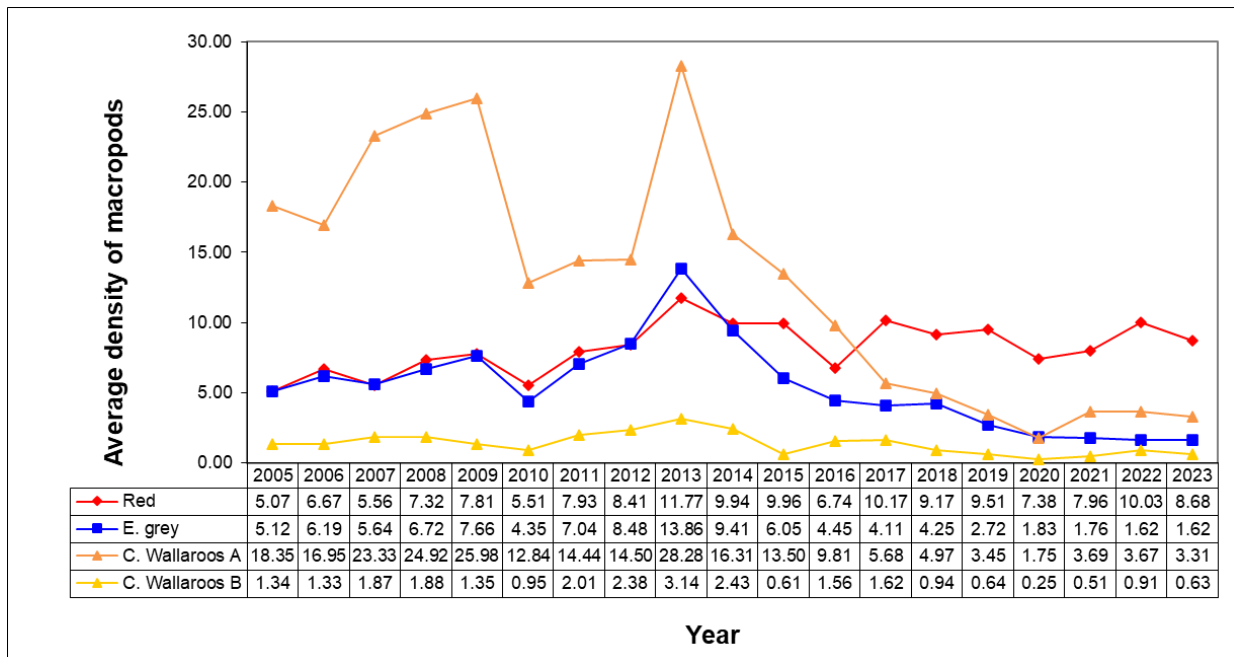
**Figure 6. Zones used to calculate population estimates of commercially harvested macropods**



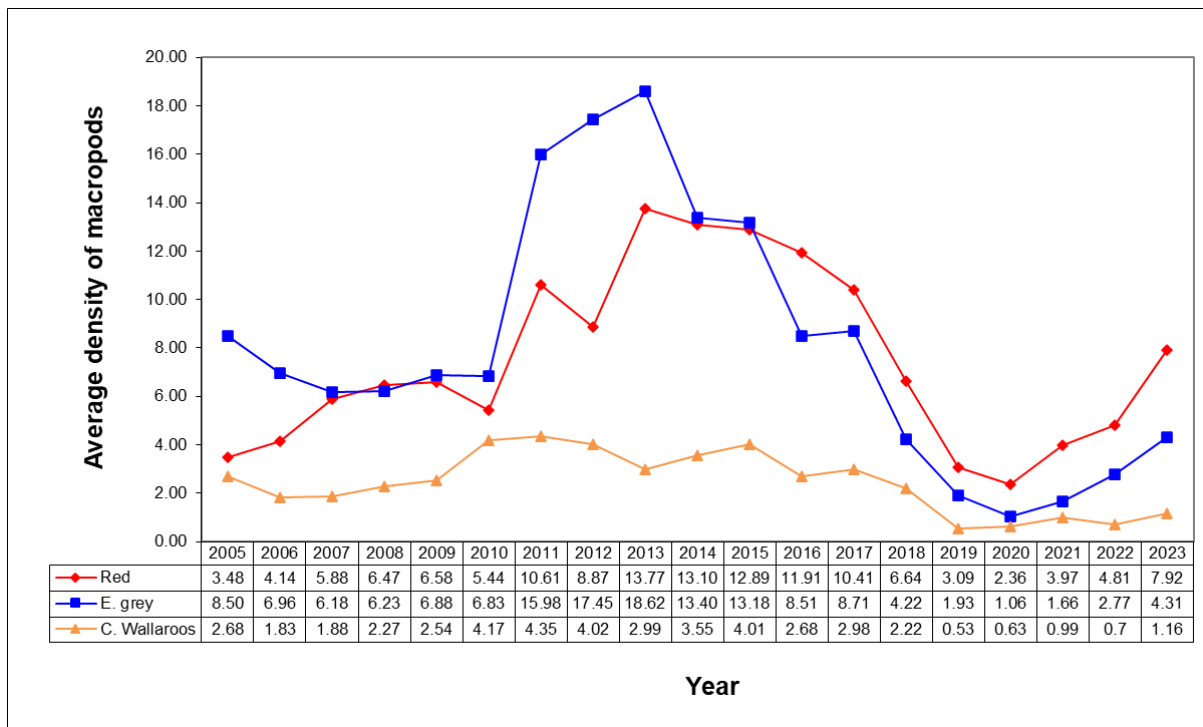
**Figure 7. Average density per km<sup>2</sup> of commercially harvested macropods in Zone 1 population estimate region from 2005 to 2023**



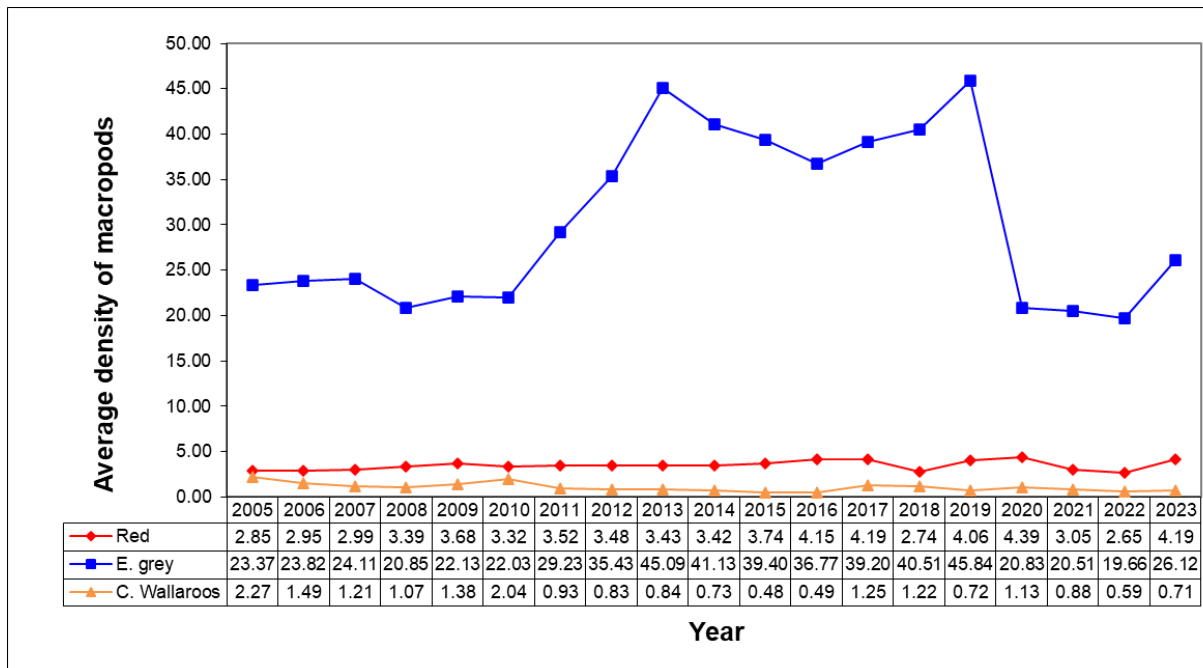
**Figure 8. Average density per km<sup>2</sup> of commercially harvested macropods in Zone 2 population estimate region from 2005 to 2023 (common wallaroos are represented by two areas in Zone 2)**



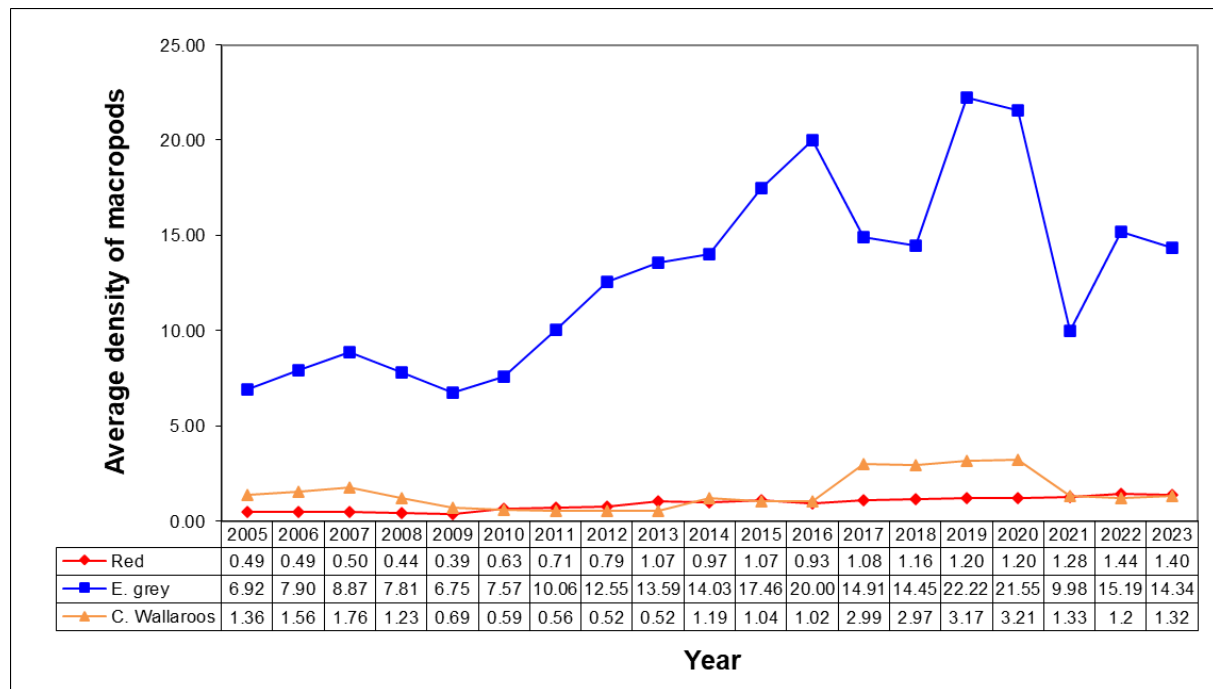
**Figure 9. Average density per km<sup>2</sup> of commercially harvested macropods in Zone 3 population estimate region from 2005 to 2023**



**Figure 10. Average density per km<sup>2</sup> of commercially harvested macropods in Zone 4 population estimate region from 2005 to 2023**



**Figure 11. Average density per km<sup>2</sup> of commercially harvested macropods in Zone 5 population estimate region from 2005 to 2023**



## Trigger points

Pre-determined trigger points for each of the commercial harvest quotas were introduced to the Queensland Wildlife Trade Management Plan for Export (Commercially Harvested Macropods 2013–17) and are also incorporated in the Queensland Wildlife Trade Management Plan for Export (Commercially Harvested Macropods 2023–27). Each trigger point represents a threshold level based on analysis of the long-term population estimate for each harvested species in each population estimate region.

Where an estimated population for a region falls below a trigger point of 1.5 standard deviations (SD) below the long-term average for that region then the harvest quota will be halved for that region in the next calendar year. If a population estimate falls below 2 SDs below the long-term average for that species in that region, then there will be no quota for the following year.

Table 2 shows the calculated trigger points for the 2024 harvest period for each species in each zone compared with the 2023 population estimates for those regions.

The estimated populations for eastern grey kangaroos in zone 2 is below 2 SDs. Consistent with the Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2023–27 there will be no harvest quotas for this species in this region in 2024.

**Table 2. Calculated trigger points for 2023 and the estimated populations of commercially harvested macropod species in each zone for 2023. Note estimates in red signify a trigger point has been reached.**

Species	Population estimate zone	2023 estimated population	2023 1.5 SD trigger point	2023 2 SD trigger point
Red kangaroo	Zone 1	992,723	198,748	154,167
	Zone 2	3,117,806	1,894,928	1,684,812
	Zone 3	1,494,764	618,793	494,663
	Zone 4	528,989	104,494	78,760
	Zone 5	237,484	76,508	62,631
Eastern grey kangaroo	Zone 1	256,988	NA	NA
	Zone 2	490,455	738,198	545,349
	Zone 3	779,372	500,368	359,282
	Zone 4	3,871,638	2,448,531	2,069,331
	Zone 5	4,194,518	1,351,635	1,033,731
Common wallaroo	Zone 1	222,467	28,640	17,196
	Zone 2	587,627	523,444	365,143
	Zone 3	194,849	120,585	83,498
	Zone 4	51,082	31,597	24,672
	Zone 5	706,936	219,892	160,367

*Note: There is no quota set for eastern grey kangaroos in zone 1.*



## Comparison between 2022 and 2023 population estimates

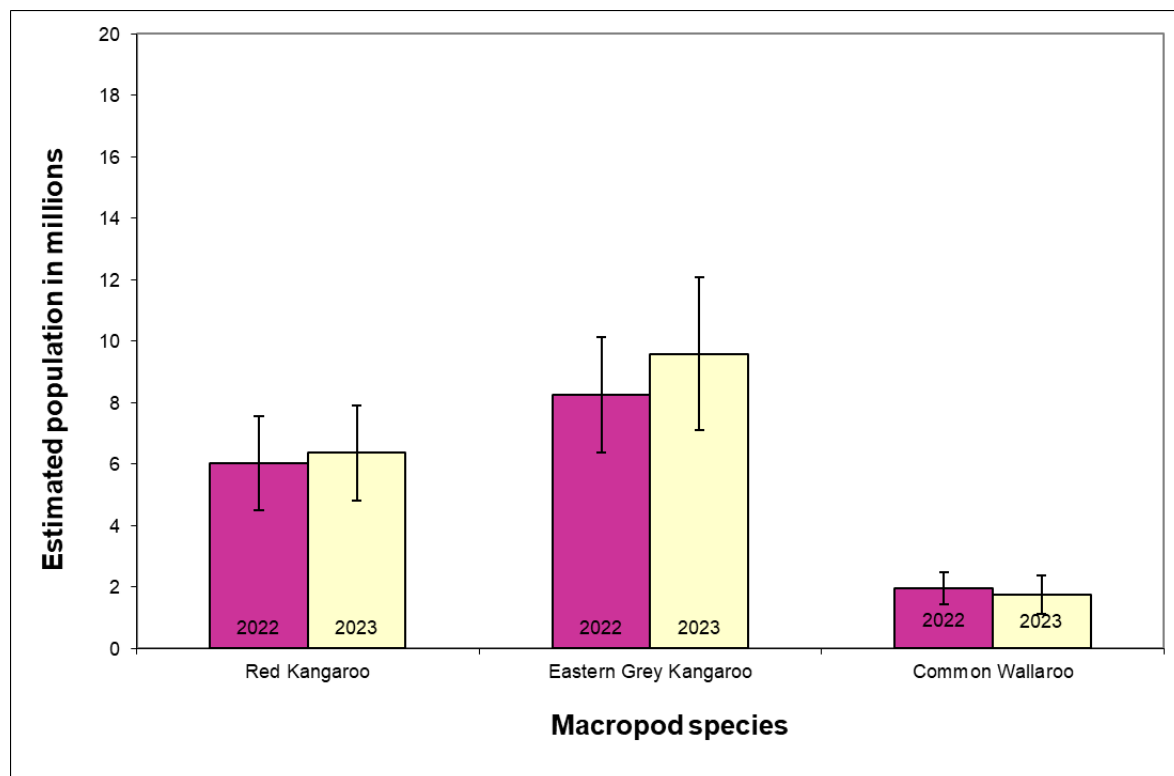
The total population estimates, combined across all three harvest zones, for all three harvest macropod species (red kangaroos, eastern grey kangaroos, and common wallaroos) have increased in 2023 compared to 2022 (figure 12). However, the total population estimates across all harvest zones does not reflect the regional variation that was pronounced in 2023 (table 3).

Since regionalisation of the Queensland commercial macropod harvest was introduced in 2003 an estimate of macropod population size in zone 1 and 5 (previously known as western and eastern zones, respectively) have been made. The model used to estimate these populations is based on a small sample area and the reduced sampling effort is reflected in a conservative quota (table 4). This model was updated in 2012 to incorporate almost a decade of survey data and to generate trigger points for the commercial quota allocation.

Red kangaroos increased in zones 3 and 4 but decreased in the other zones. Common wallaroos increased in zones 3,4 and 5, whilst they decreased in zones 1 and 2. Eastern grey kangaroos increased in all zones except zone 5 (table 3). In 2021 there were two population estimates that reached trigger points for one species (eastern grey kangaroos) compared to three population estimates over 2 species (eastern grey kangaroos and common wallaroos) falling below trigger points in 2022 (table 3). Whilst eastern grey kangaroo population estimate for 2023 in zone 2 is below a trigger point, the estimate has increased since 2022.

No quota will be proposed for eastern grey kangaroos in zone 1 because the population size in this harvest zone is small and at the geographic edge of this species distribution.

**Figure 12. Comparison of overall macropod populations in the commercial harvest zones 2022 and 2023 (with one standard error)**



**Table 3. Comparison between 2022 and 2023 macropod population estimates. Note estimates in red signify a trigger point has been reached.**

Species	Harvest zone	2022 population estimate (rounded to the nearest 50)	2023 population estimate (rounded to the nearest 50)
Red kangaroo	Zone 1	1,080,500	992,700
	Zone 2	3,439,150	3,117,800
	Zone 3	906,800	1,494,750
	Zone 4	337,950	529,000
	Zone 5	267,300	237,500
	Combined	6,031,700	6,371,750
Eastern grey kangaroo	Zone 1	0	257,000
	Zone 2	461,050	490,450
	Zone 3	499,750	779,350
	Zone 4	2,819,700	3,871,650
	Zone 5	4,486,550	4,194,500
	Combined	8,267,050	9,592,950
Common wallaroo	Zone 1	480,750	222,450
	Zone 2	672,650	587,650
	Zone 3	118,800	194,850
	Zone 4	43,200	51,100
	Zone 5	653,050	706,950
	Combined	1,968,450	1,763,000

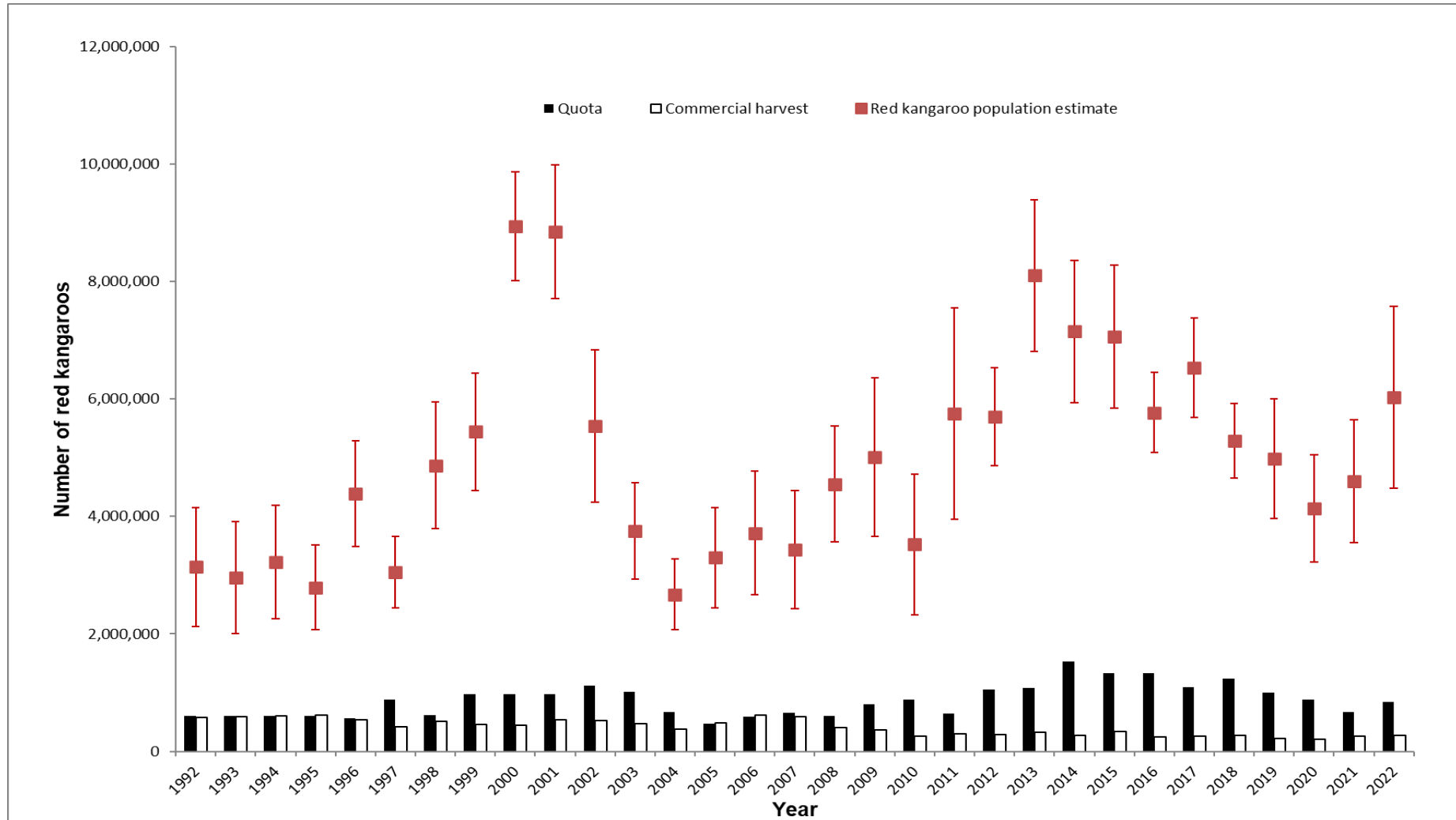
**Table 4. Comparison between 2023 and 2024 macropod harvest quotas. Note estimates in red signify a trigger point has been reached.**

Species	Harvest zone	2023 harvest quota	2024 harvest quota
Red kangaroo	Zone 1	108,050	99,250
	Zone 2	687,850	623,550
	Zone 3	181,350	298,950
	Zone 4	67,600	105,800
	Zone 5	26,750	23,750
	Combined	1,071,600	1,151,300
Eastern grey kangaroo	Zone 1	NA	NA
	Zone 2	NA	0
	Zone 3	37,500	116,900
	Zone 4	422,950	580,750
	Zone 5	448,650	419,450
	Combined	909,100	1,117,100
Common wallaroo	Zone 1	48,100	22,250
	Zone 2	100,900	88,150
	Zone 3	8,900	29,250
	Zone 4	6,500	7,650
	Zone 5	65,300	70,700
	Combined	229,700	218,000

**Long-term quota and harvest trends**

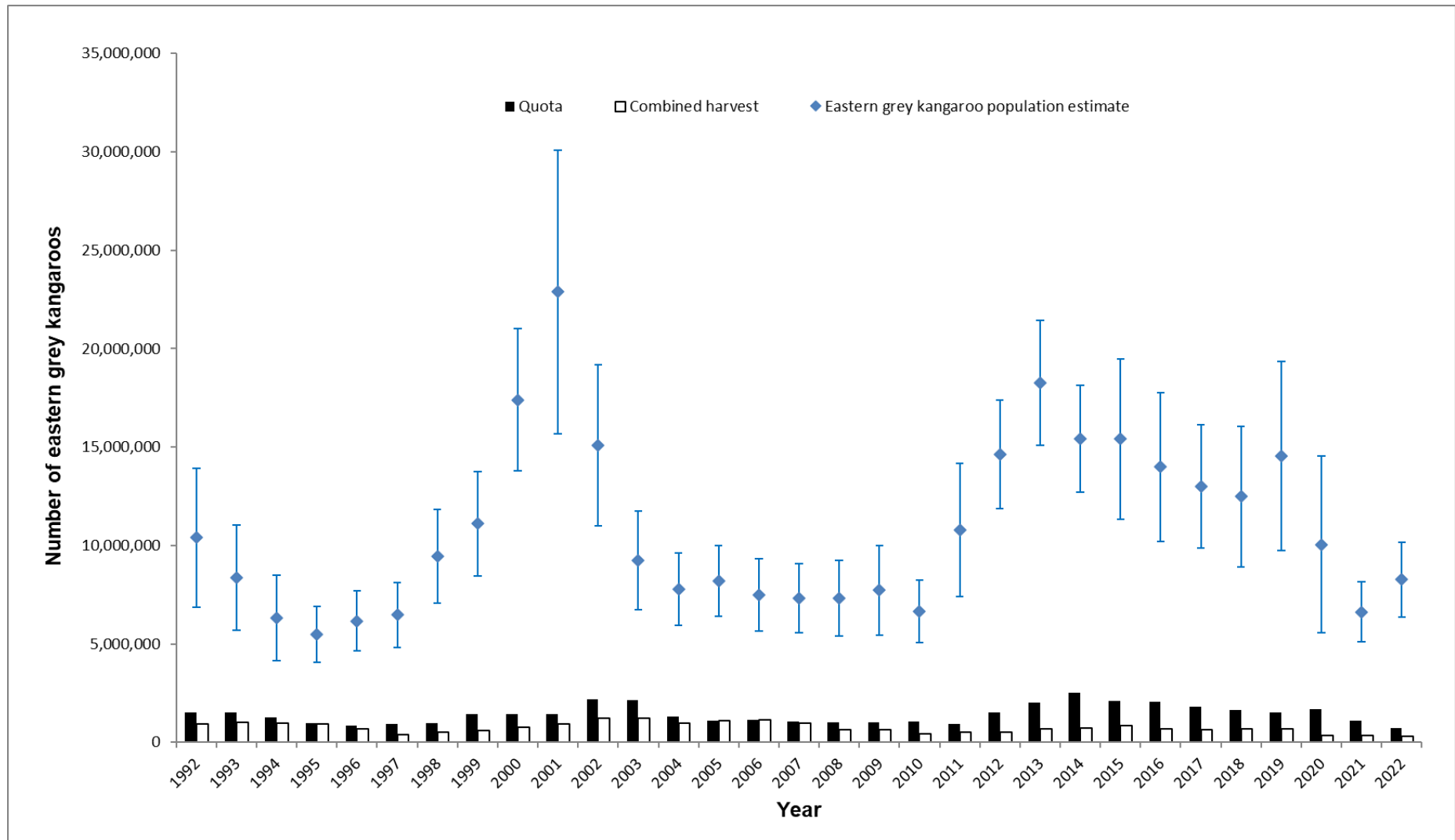
Figures 13 - 15 outline data on the three commercially harvested macropod species pertaining to estimated population, quota, and harvest for the years 1992 to 2022. Please note that population estimates are based on aerial surveys conducted in the previous year to the quota and harvest. Combined population estimates, quota and harvest data have been used for the period post-regionalisation in 2003, to enable comparison with data collated prior to this period.

**Figure 13. Long-term population estimates ( $\pm$  one standard error), quota and harvest data for the red kangaroo in Queensland**



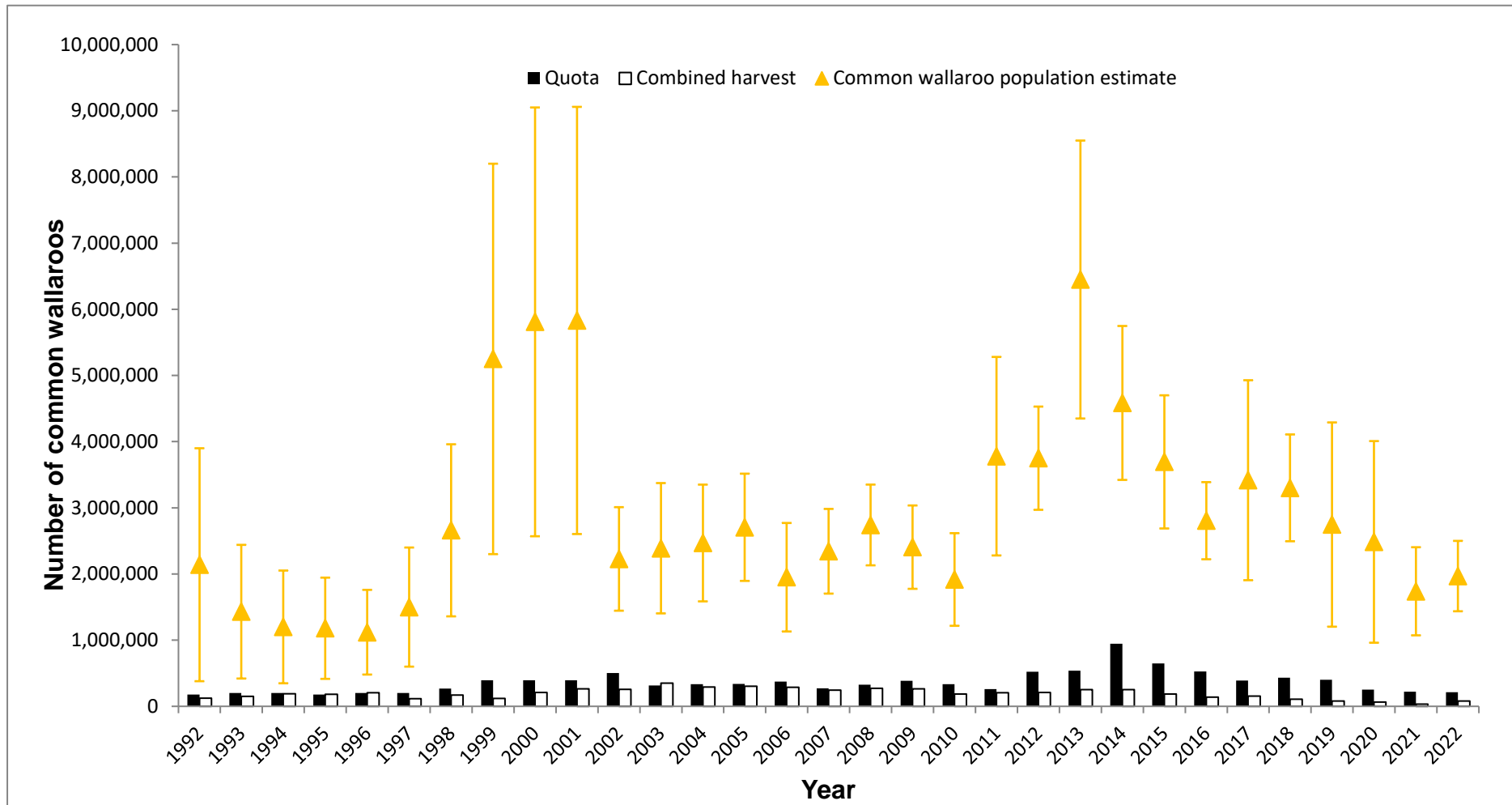
*Note: population estimates are based on aerial surveys conducted the year before the harvest was taken.*

**Figure 14. Long-term population estimates ( $\pm$  one standard error), quota and harvest data for the eastern grey kangaroo in Queensland**



Note: population estimates are based on aerial surveys conducted the year before the harvest was taken.

**Figure 15. Long-term population estimates ( $\pm$  one standard error), quota and harvest data for the common wallaroo in Queensland**



Note: population estimates are based on aerial surveys conducted the year before the harvest was taken.

As previously outlined, there has been no consistent decline in the populations of the three commercially harvested species since 1992 (figures 13 to 15). Of these species, the eastern grey kangaroo is consistently most abundant across the harvest zones, followed by the red kangaroo. Common wallaroos are the least numerous. Population estimates for all three species are in excess of one million across the harvest zones.

As quotas are set as a constant proportion of the populations, they fluctuate as population estimates fluctuate (figures 13 to 15). However, numerous factors influence harvest rates for commercial macropods. These include population levels, market forces, environmental conditions, and access by harvesters. As a consequence, there is no clear pattern or trend in the proportion of the quota harvested since 1992.

## Review of the 2022 harvest

Dealer returns for the year 2022 (entered up to 10 February 2023) indicate that there were 612,233 macropods taken in Queensland, which represents 34.3% of the overall combined quota. Of the animals harvested, there were 275,632 red kangaroos, 263,045 eastern grey kangaroos and 73,556 common wallaroos harvested (table 5 to 8). Quotas for individual species in each harvest zone were not exceeded in 2022. The maximum commercial take as a percentage of the approved quotas was 56.7% for common wallaroos in the central zone and 56.1% for red kangaroos in the eastern zone (tables 5 to 8).

**Table 5. Total harvest in 2022**

Species	Population estimate 2021	Quota 2022	Harvest take 2022	% quota used 2022	% population harvested 2022
Red kangaroo	4,595,150	837,150	275,632	32.9%	6%
Eastern grey kangaroo	6,625,550	734,750	263,045	35.8%	4%
Common wallaroo	1,738,700	211,950	73,556	34.7%	4.2%
Total	12,959,400	1,783,850	612,233	34.3%	4.7%

*Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quota.*

**Table 6. Harvest of red kangaroos in 2022**

Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	3,776,750	755,300	236,041	31.3%	6.2%
Eastern	228,050	22,800	12,797	56.1%	5.6%
Western	590,350	59,050	26,794	45.4%	4.5%
Total	4,595,150	837,150	275,632	32.9%	6.0%

*Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quota.*

**Table 7. Harvest of eastern grey kangaroos in 2022**

Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	3,697,250	441,900	173,574	39.3%	4.7%
Eastern	2,928,300	292,850	89,471	30.6%	3.1%
Western	NA	NA	NA	NA	NA
Total	6,625,550	734,750	263,045	35.8%	4.0%

*Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quota.*

**Table 8. Harvest of common wallaroos in 2022**

Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	762,550	114,350	64,842	56.7%	8.5%
Eastern	714,700	71,450	7,389	10.3%	1.0%
Western	261,450	26,150	1,325	5.1%	0.5%
Total	1,738,700	211,950	73,556	34.7%	4.2%

*Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quota.*

## Sex ratio by species and zone

The commercial harvest of macropods is typically biased towards males (figure 16) as they are usually larger and heavier than females. In 2022, the total harvest for each species was biased towards males by 71.5% or greater. Females composed less than 24% of the overall harvest (figure 17).



Figure 16. Overall sex ratio from 1997 to 2022

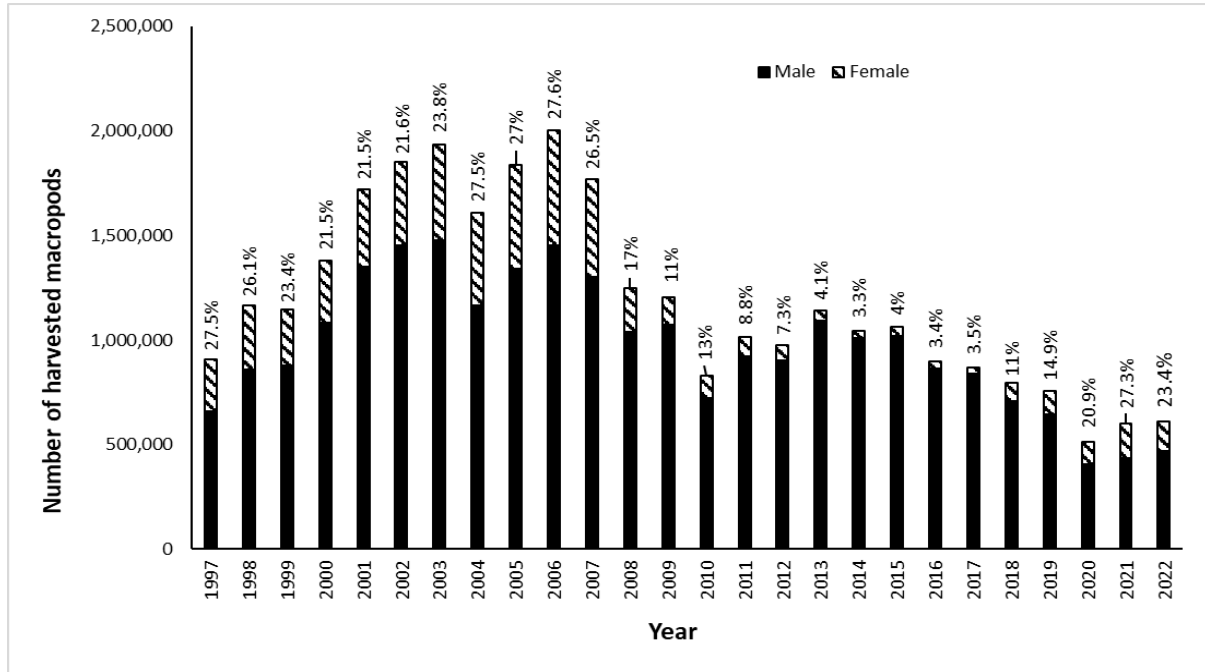
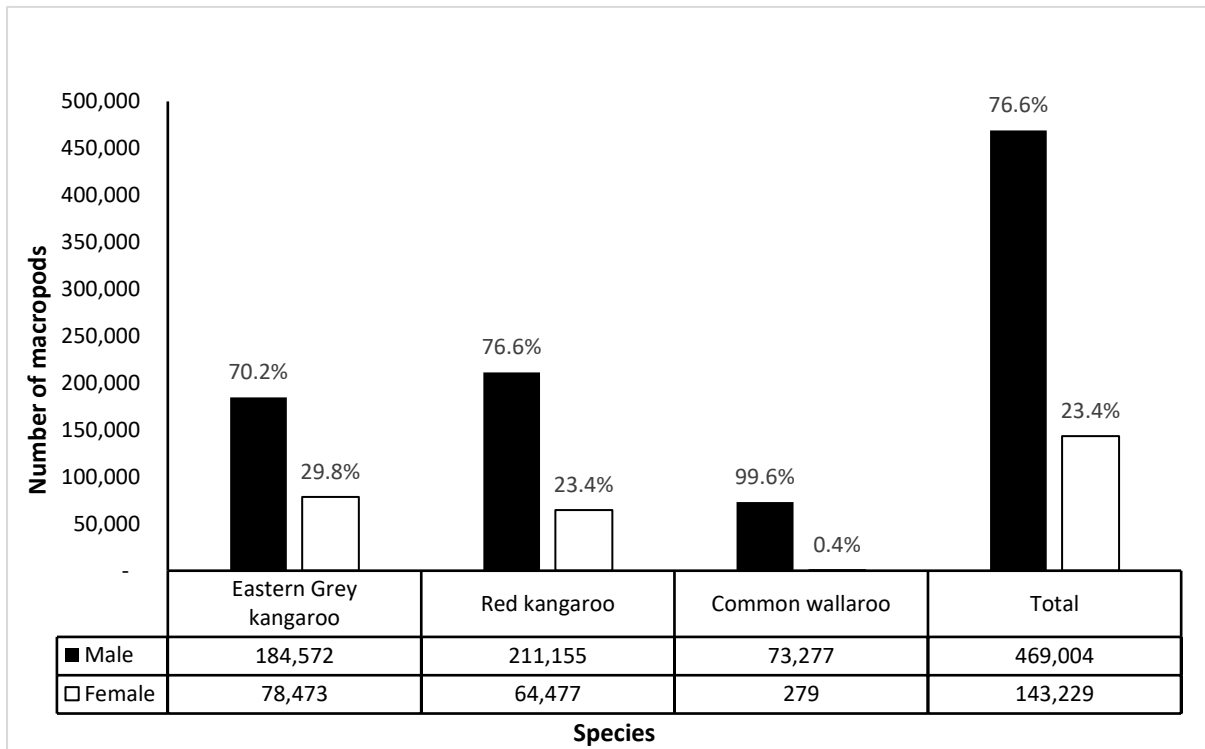


Figure 17. Proportion of 2022 harvest, male and female by species



## Harvest update for 2023

The total number of tags issued as at 31 July 2023 was 635,600. A comparison of tag sales and harvest returns in relation to quotas in each zone is provided in table 9. Reported harvest is based on data from dealer returns, entered up to 31 July 2023. The number of tags sold does not exceed the maximum quota for each species in each zone therefore it is not possible for the commercial harvest quotas to be over allocated. Tag sales are below quota for all species in all zones. The 2023 harvest will be comprehensively reported on in the Queensland Commercial Macropod Management Program Annual Report 2023, due for release in March 2024.

**Table 9. Tags issued and reported harvest for 2023 at 31 July**

Species	Harvest zone	2023 sustainable use quota (rounded to the nearest 50)	Tags issued to 31 July 2023	Reported harvest to 31 July 2023
Red kangaroo	1	108,050	27,150	16,538
	2	687,850	135,200	91,368
	3	181,350	49,500	33,238
	4	67,400	53,300	28,243
	5	26,750	11,850	4,791
Eastern grey kangaroo	1	NA	NA	NA
	2	NA	NA	NA
	3	37,500	25,400	12,474
	4	422,950	164,050	114,102
	5	448,650	86,450	48,029
Common wallaroo	1	48,100	3,050	989
	2	100,900	49,350	26,295
	3	8,900	8,900	4,672
	4	6,500	6,500	3,435
	5	65,300	14,900	4,281

## The extent of non-commercial harvest mortality

There are many forms of macropod mortality outside of the commercial harvest. It is possible for DES to collect and report data on two forms of non-commercial harvest mortality which can be considered when determining commercial quotas. These include Damage Mitigation Permits (DMPs) and disease outbreak mortality.

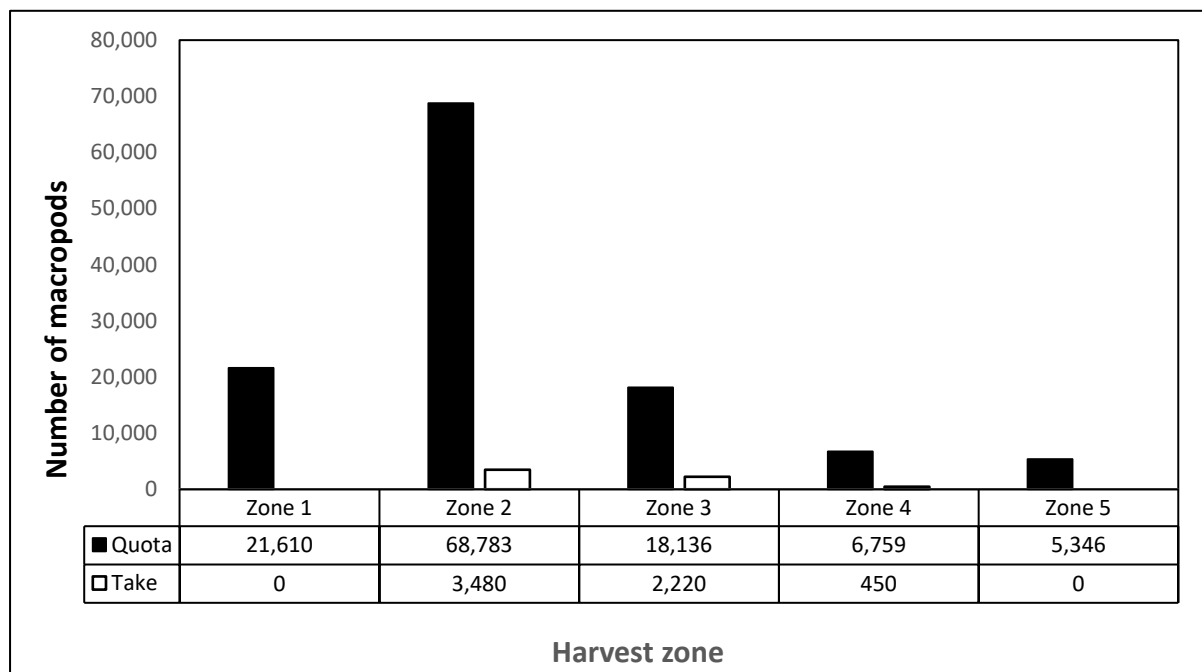
### Damage mitigation permit

A Damage Mitigation Permit (DMP) may be granted where a protected animal (including commercially harvested macropods) is causing, or may cause, damage or loss; or represents a threat to human health or wellbeing. The total number of harvest macropods allowed to be taken under these permits are limited to a maximum of 2% of the estimated population for each species. As of 2022 the 2% maximum refers to the population estimate in each zone rather than the entire harvest area.

Restricting the granting of DMPs in this way provides a clear limit that ensures the lethal take of harvest macropods operates as a sustainable program. Further restrictions are also in place on the limit allocated to individuals in zones where the population estimated are below trigger points. The new assessment guidelines is on the department website

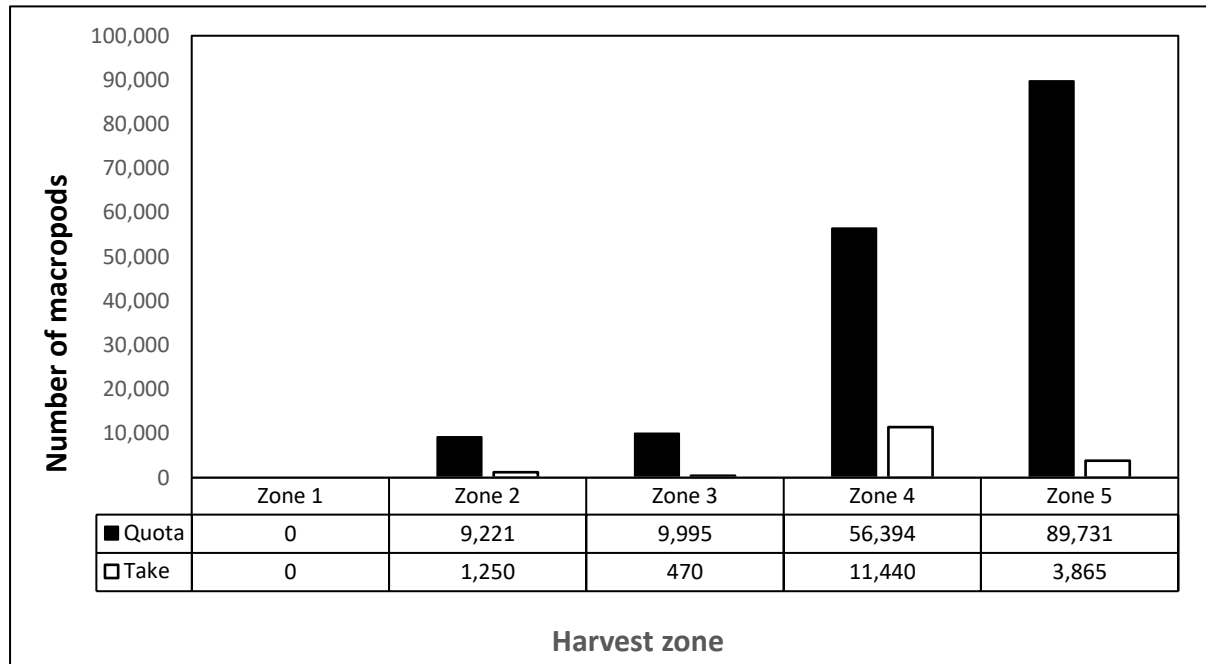
(<https://environment.des.qld.gov.au/licences-permits/plants-animals/damage-mitigation-permits>). All DMP permits state that macropods must be taken in a way specified in the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-commercial Purposes. Uptake of DMPs in 2023 is below the available quota (figures 18 to 20) and has fluctuated over the last 10 years (figure 21).

**Figure 18. DMP macropod quota and take of red kangaroo for 2023 at 31 July**



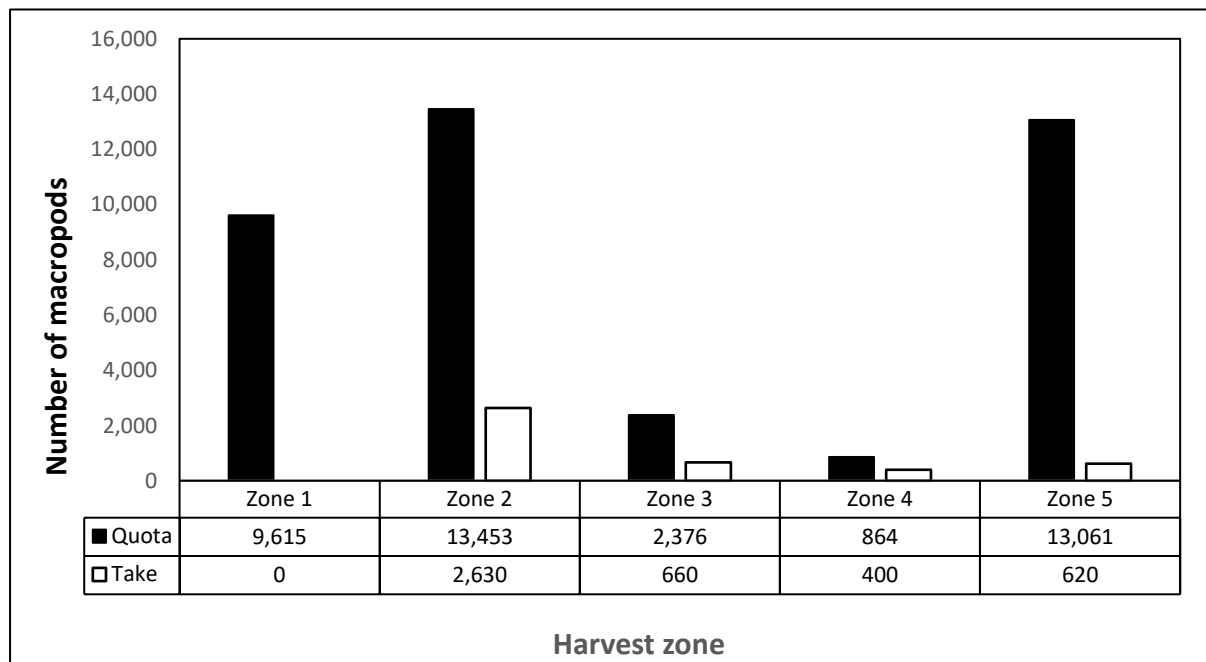
*Note: Figures are as recorded on 31 July 2023*

**Figure 19. DMP macropod quota and take of eastern grey kangaroo for 2023 at 31 July**

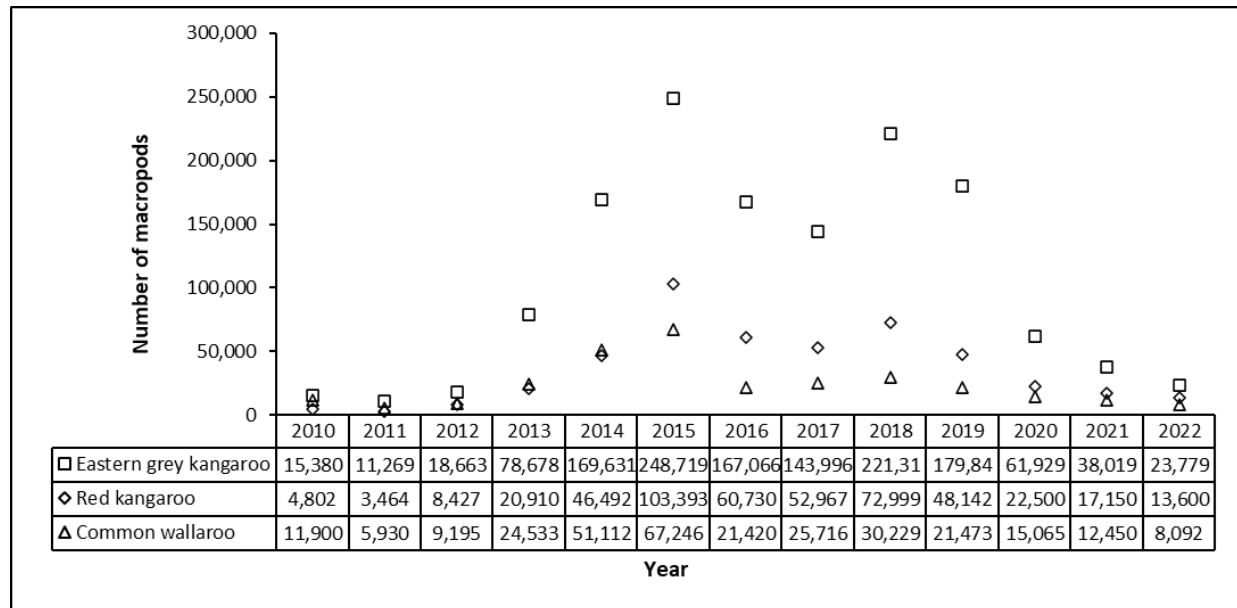


Note: Figures are as recorded on 31 July 2023

**Figure 20. DMP macropod quota and take of common wallaroo for 2023 at 31 July**



Note: Figures are as recorded on 31 July 2023

**Figure 21. Macropods approved to be taken under a DMP 2010–2022**

### Disease outbreak mortality and its significance

No incidence of significant disease mortalities has been recorded for macropod populations in Queensland during 2022 or 2023. The department continues to liaise with Wildlife Health Australia and other Queensland government agencies to monitor any emerging health issues for commercially harvested macropods in Queensland.

### Proportion of the population not subject to harvesting

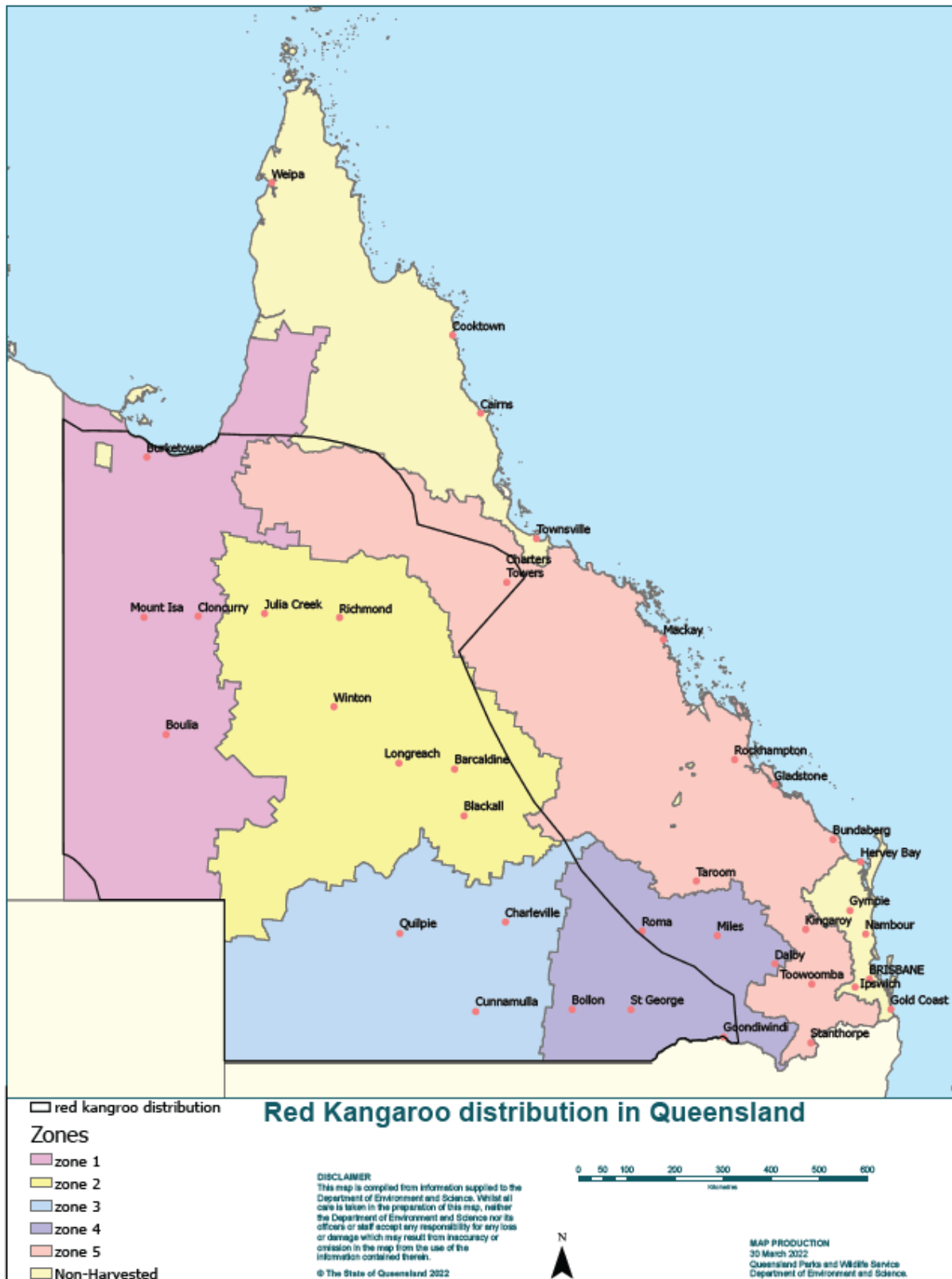
Commercial harvesting of macropods only occurs in five harvest zones in Queensland. Cape York Peninsula and the south east corner of Queensland are designated Non-harvest zones (figure 1). Within the five commercial harvest zones macropods cannot be harvested within National Parks, State Forests, Conservation Parks, Resources Reserves, Timber Reserves and Forest Reserves. Table 10 outlines the size of these land tenures within the commercial harvest zones.

Figures 22 to 24 show the general distribution of each of the commercially harvested macropods in relation to the population estimate regions. Red kangaroos are harvested in zone 1 to 4 and in the north of zone 5 (figure 22). Eastern grey kangaroos are only harvested in zone 2 to 5 (figure 23). Common wallaroos have the broadest distribution (figure 24) throughout Queensland and can be harvested in all zones.

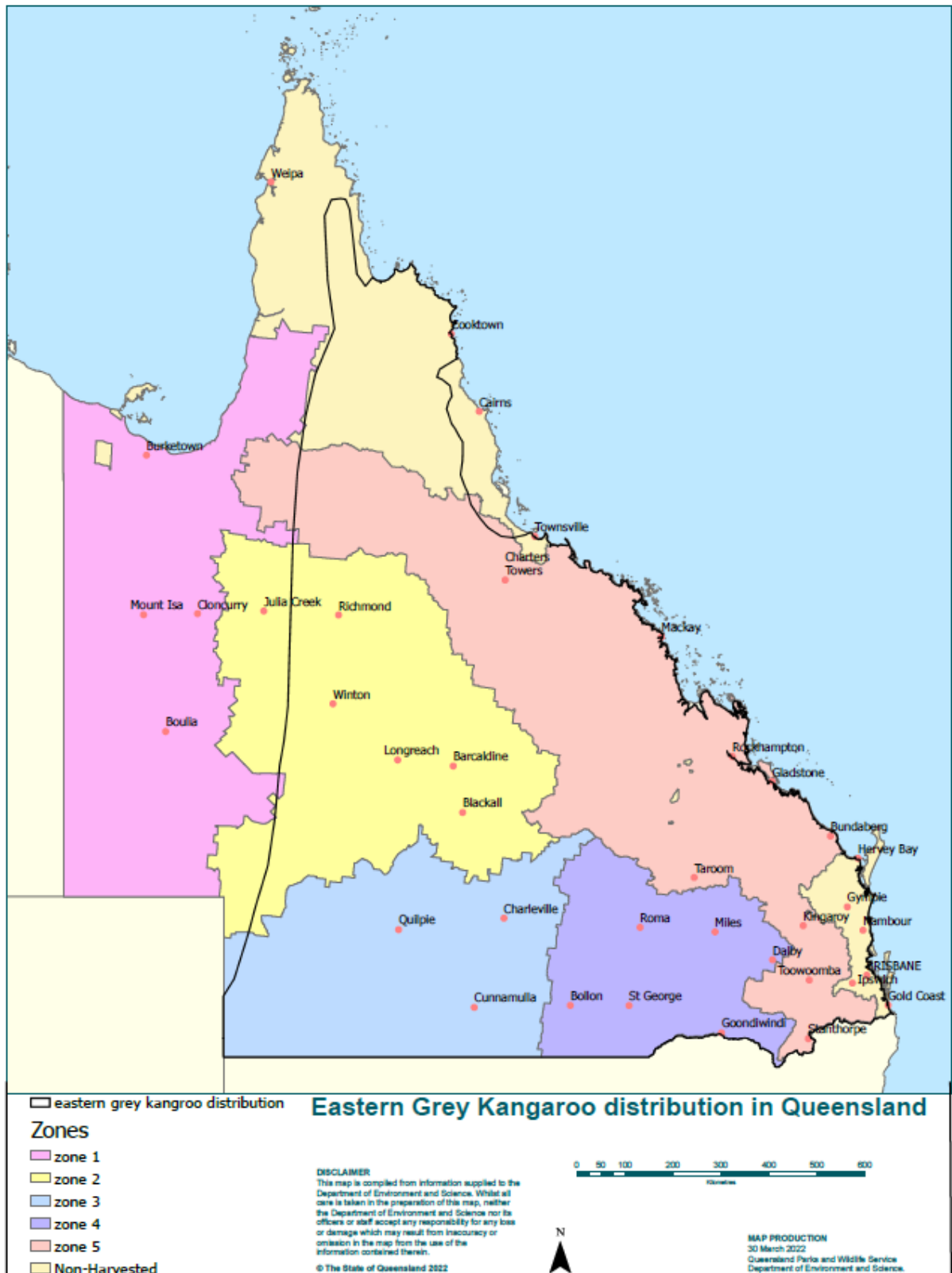
**Table 10. Area of land tenures within the Queensland commercial harvest zones where harvesting of macropods is not permitted (at 1 February 2023)**

	Zone 1 km <sup>2</sup>	Zone 2 km <sup>2</sup>	Zone 3 km <sup>2</sup>	Zone 4 km <sup>2</sup>	Zone 5 km <sup>2</sup>	Total km <sup>2</sup>
National Park	20,629	4,239	5,657	1,925	17,018	93,294
State Forest	NA	NA	320	1,471	16,354	30,977
Conservation Park	79	14	3	13	459	859
Resources Reserves	965	129	NA	8	926	2,236
Forest Reserve	NA	NA	NA	NA	203	500
Timber Reserve	78	238	213	NA	121	663
Total km <sup>2</sup>	21,751	4,620	6,193	12,418	35,081	128,529

Figure 22. Red kangaroo (*Osphranter rufus*) distribution

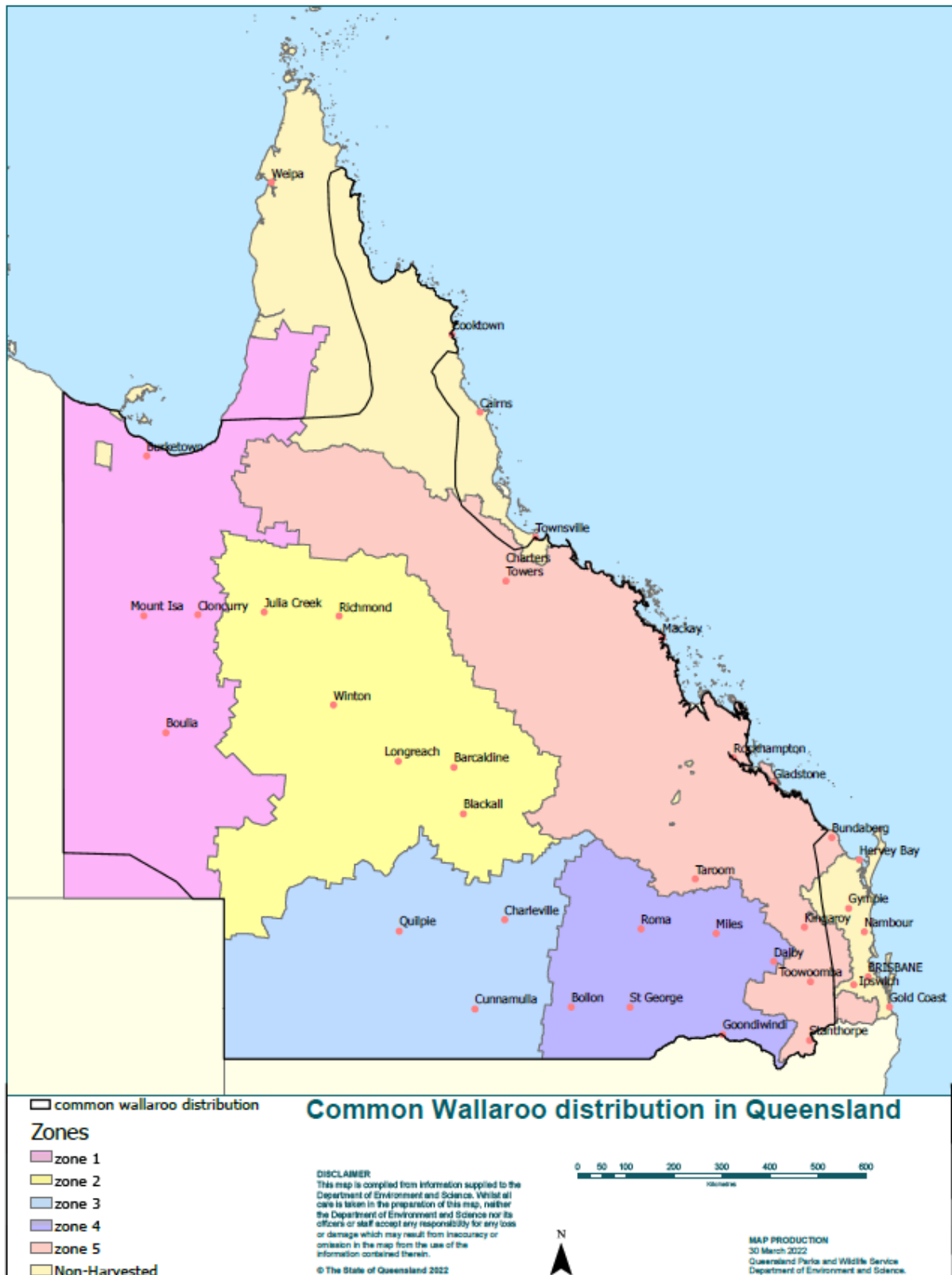


**Figure 23. Eastern grey kangaroo (*Macropus giganteus*) distribution**





**Figure 24. Common wallaroo (*Osphranter robustus*) distribution**



## Climate trends

Queensland's temperatures in 2022 were above average across the north of the state with cooler than average temperatures recorded in the south. Rainfall across the state was also higher than average and the highest recorded for most areas since 2011. 2022 was the highest total rainfall recorded in a calendar year in the south east of the state. Figure 25 displays the total rainfall in Queensland for 2022. The main climate influences active during 2022 were La Niña (Bureau of Meteorology 2023). La Niña continued to be climate driver through the first quarter of 2023, which was followed by a neutral El Niño–Southern Oscillation (ENSO) (neither La Niña nor El Niño).

Due to the widespread rainfall to many areas the majority of the Queensland harvest zones are no longer drought declared (see figure 26). Macropod population densities are unlikely to respond to the widespread rainfall in just 12 months but small increases were observed in some areas during the 2023 aerial surveys. The majority of the macropod harvest zones were drought declared for an extended period with the recovery of natural habitats and wildlife populations expected to take time.

**Figure 25. Queensland rainfall totals (mm) from 1 January to 31 December 2022**

Queensland Rainfall totals (mm) 1 January to 31 December 2022  
Australian Bureau of Meteorology

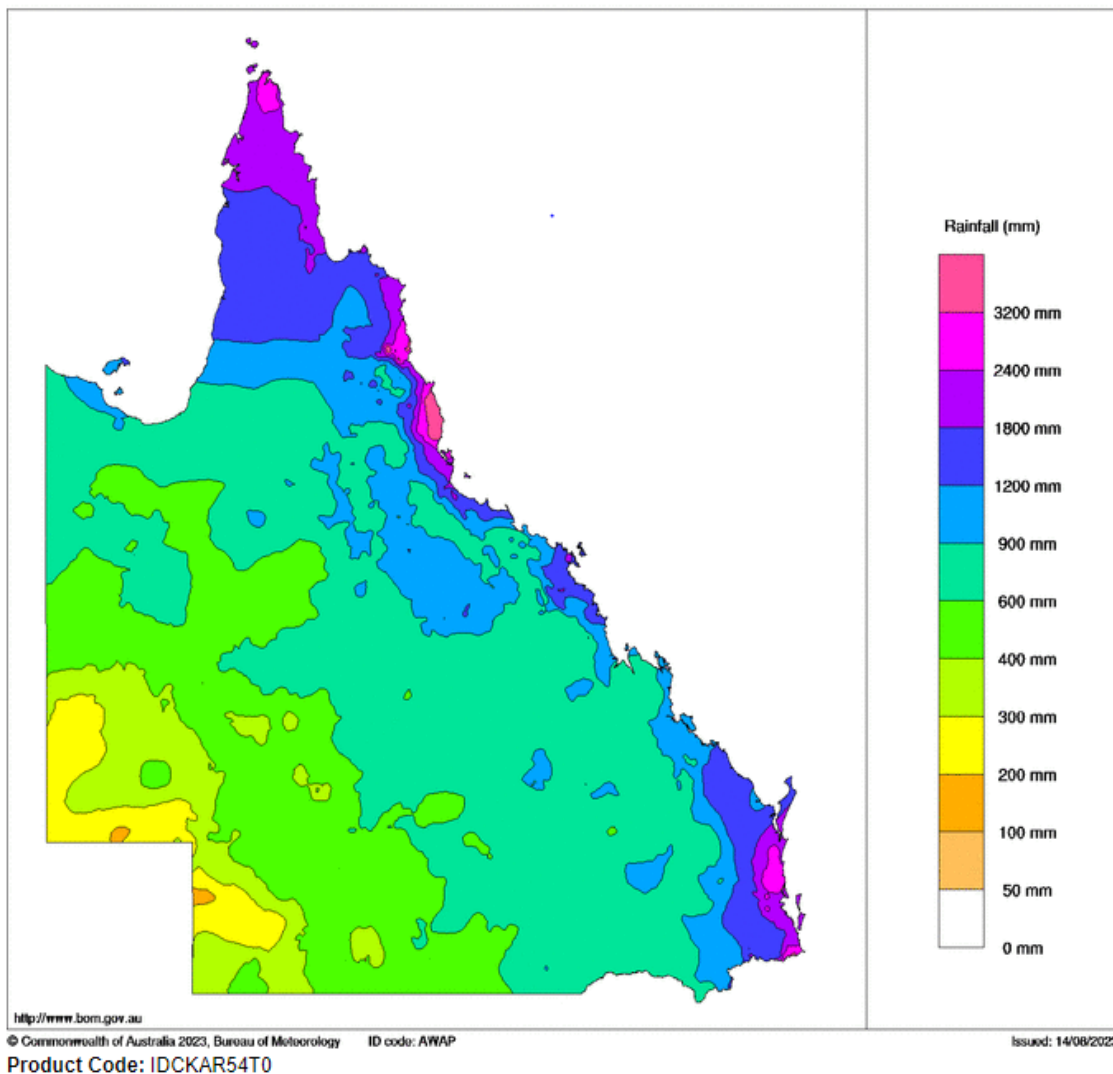
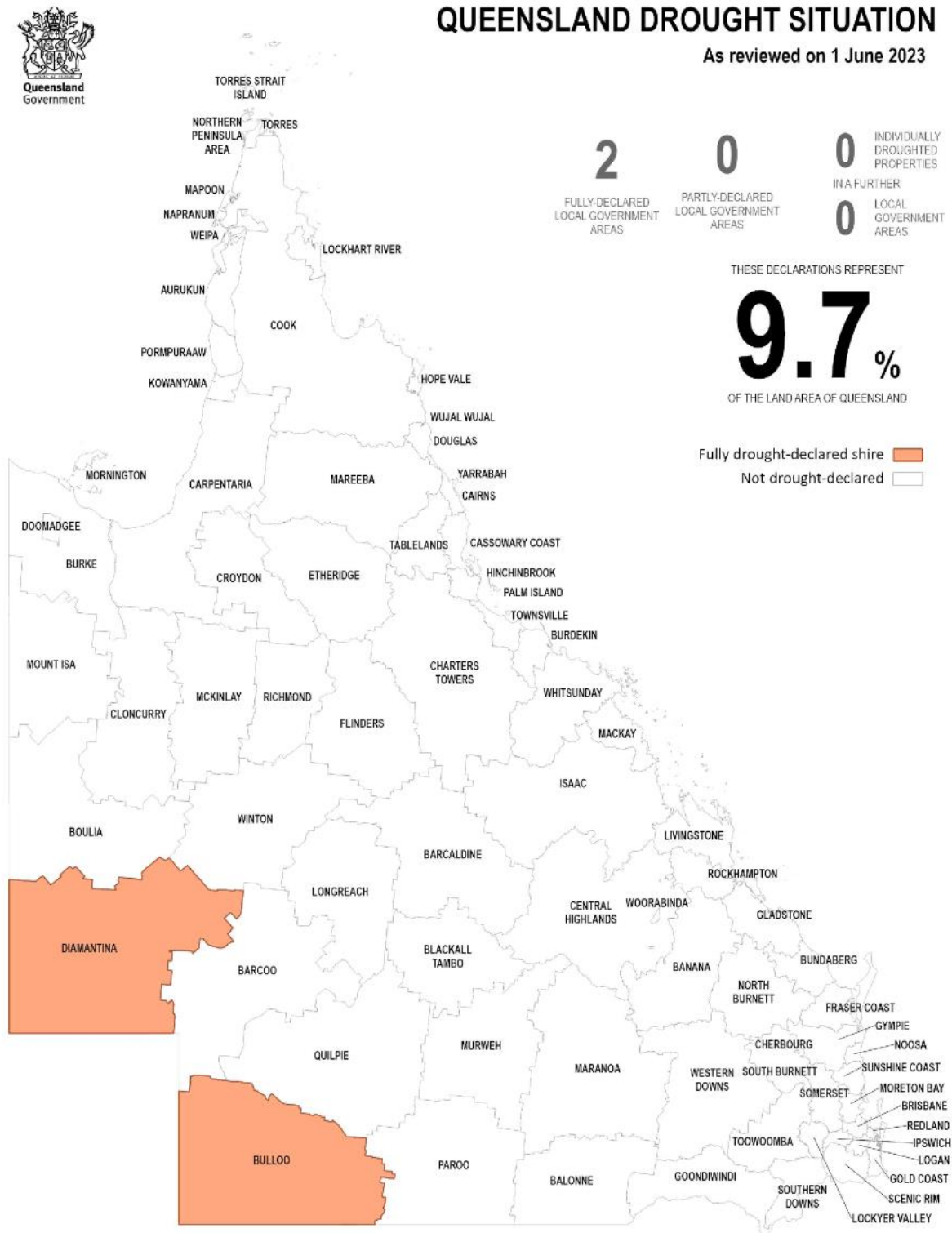


Figure 26. Queensland drought declarations at 1 June 2023



## Summary and conclusion

The proposed quotas for the 2024 commercial macropod harvest in Queensland have been formulated by following an established methodology, which is largely based on constant proportions of population estimates and monitoring of long-term population trends. Population estimates are derived from representative aerial surveys across the harvest zones that are informed by the best available science.

Long-term trend data relating to population size since 1992, when Queensland began an annual program of helicopter surveys, demonstrates there has been no consistent increase or decline in the populations of red kangaroos, eastern grey kangaroos or common wallaroos in Queensland. However, populations do fluctuate over time. Population estimates indicate that more than 1 million macropods of each species occur in the harvest areas. Thus, current harvest rates can be viewed as not having a long-term detrimental impact on populations.

Since regionalisation of the Queensland commercial macropod harvest was introduced in 2003, an estimate of macropod population size in zones 1 and 2 has been made. The model used to estimate these populations is based on a small sample area and the reduced sampling effort is reflected in conservative quotas. This model was updated in 2012 to incorporate almost a decade of survey data and to generate trigger points for the commercial quota allocation. The population estimates in zones 1 and 5 (previously the western and eastern zones, respectively) are a function of both the new model and the survey data for 2023. Aerial surveys were conducted at 17 monitor blocks across Queensland in 2023.

Overall combined population estimate totals for all three species increased across the state.

Population estimates decreased marginally for eastern grey kangaroos in zone 5 and increased in all other zones in 2023. Whilst the population estimate increased for eastern grey kangaroos in zone 2 the eastern grey population estimate remains below a predetermined trigger point. There is no quota for this species in zone 2 for 2023.

The red kangaroo population estimate increased in zones 3 and 4 during 2023 and decreased in all other zones. Despite the decreases observed no trigger points were reached for red kangaroos and harvest quotas have been set for all harvest zones.

Common wallaroo population estimates increased in zones 3, 4 and 5 but decreased in zones 1 and 2. No trigger points were reached for common wallaroos, and they can be harvested in all zones during the 2024 harvest period. Although overall combined population estimates for all three species increased across the state regional variations were observed for all three species.

For the 2022 commercial harvest period no quotas were exceeded, with the maximum percentage of quota utilised being 56.7% for common wallaroos in the central zone (now zones 2,3 and 4). Sex ratios from harvest data continue to be biased towards males with the overall percentage of females harvested below 24%. Thus, the last completed harvest period provides no indication of adverse pressure on populations that would influence proposed quotas.

For the 2023 harvest period as at 31 July tag sales are below quota for all species in all zones.

Usage of DMPs in 2022 were below the 2% of the population estimate quota for all species for all zones. The current percentages for usage of DMP quotas for 2023 are also below the quota limit of 2% for all species in each region and zone.

The three commercially harvested macropod species are protected from harvesting within the harvest area through protected area. These 'refuges' occur in patches throughout the distributional ranges of all three species. Macropods are further protected from harvest in Queensland within the non-harvest zones.

Much of the harvest zones are no longer drought declared although the legacy of eight years drought is significant in terms of wildlife abundance. Though some areas received significant rainfall and localised flooding throughout the year, some areas recorded the wettest year ever in 2022. Macropod population densities are unlikely to respond to the widespread rainfall over the next 12 months but may increase in the coming years if wetter than average conditions continue. The main climate influences active during 2022 were (Bureau of Meteorology 2023). La Niña continued to be climate driver through the first quarter of 2023, which was followed by a neutral El Niño–Southern Oscillation (ENSO) (neither La Niña nor El Niño).

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## Appendixes

### Appendix 1. Densities per km<sup>2</sup> of the commercially harvested macropod species 2004–2023

Eastern grey kangaroo																				
Block	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Barcaldine	20.61	13.17	22.77	17.65	23.15	29.50	12.87	23.92	24.09	44.10	24.96	19.3	14.71	13.65	15.19	5.03	5.08	5.71	6.50	5.43
Blackall	7.57	7.10	6.22	7.51	8.28	11.19	7.08	6.08	9.87	19.41	10.59	8.75	5.29	4.97	3.16	1.64	2.07	0.38	0.98	2.32
Bollon	25.66	25.31		30.53		31.74	30.14		47.2		32.01	24.9		27.58		29.50		12.95	7.78	16.12
Boulia																			0	0
Charleville	17.51	19.91	15.96	12.05	11.20	12.95	12.23	28.11	25.12	26.77	11.77	8.4	10.47	9.32	5.25	2.13	1.78	3.67	3.97	3.04
Charters		1.63		5.02		5.33	5.57		3.37		3.14	2.01		1.53		1.32		2.45	4.25	6.46
Cloncurry	0.01		0.16		0.02		0.21	0.012		0.07		0.00	0.06		0.12			0.00	0.00	0.04
Cunnamulla	13.20		9.97		11.44		11.64	32.82		41.04		35.8	18.73		9.15	5.10	2.46	2.53	6.09	
Emerald		3.95		3.41		4.05	5.04		2.75		7.01	5.29		7.88		7.67		3.94	6.25	4.15
Hughenden	0.77	0.58		1.16		0.97	0.79		0.53		1.17	1.41		1.01		1.43		1.47	0.73	1.16
Hungerford	1.16	1.10		0.77		0.94	0.65		2.20		4.00	3.79		3.36		0.13		0.08	0.95	1.48
Inglewood		8.72		18.62		9.75	12.33		29.10		32.73	49.8		42.02		66.87		23.77	28.21	37.58
Julia Creek	1.08	0.87	1.05		0.76		0.28	0.28		0.84		0.84	0.2		0.49			0.06	0.00	0
Longreach	9.05	8.48		6.63		6.61	6.13		18.07		20.17	5.25		3.85		4.67		3.60	2.77	1.92
Mt Isa																			0	0
Quilpie	1.86		0.97		1.42		2.79	1.57		3.61		4.65	2.66		0.87	0.34	0.00	0.37	0.05	
Roma	25.05	24.98	25.46	25.12		23.43	19.30		27.16		40.56	32.2		31.74		39.34		23.10	22.62	30.46
Taroom	8.12	13.37		8.44		7.87	7.36		14.98		13.24	12.6		8.19		13.00		9.74	22.03	9.16
Westmar	25.53		23.17		21.18		22.08	37.25		62.54		77.9	66.07		82.67		30.64	24.76	27.02	
Windsorah	1.58	2.69	1.14	1.39	2.39	1.26	0.86	2.68	1.24	1.80	0.79	1.02	2.13	1.34	0.29	0.10	0.06	0.07	0.03	0.31
Winton	4.86	2.98	3.74		4.78		2.43	3.57		6.61		5.79	4.46		5.11		1.50	1.02	0.32	

Red kangaroo																				
Block	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Barcaldine	6.07	4.07	11.07	6.72	9.03	9.83	7.58	10.05	7.83	12.30	9.2	16.24	8.54	8.25	7.49	5.52	3.86	5.90	11.33	8.51
Blackall	3.99	3.29	4.55	3.78	6.45	7.24	4.70	12.37	14.17	17.47	10.35	11.58	9.69	8.52	7.89	8.78	5.63	5.93	5.58	3.66
Bollon	4.13	8.87		8.35		11.16	9.90		7.78		7.27	9.83		8.87		7.18		6.68	5.02	8.98
Boulia																			4.23	6.17
Charleville	4.55	5.48	7.36	9.57	7.58	8.47	6.46	14.69	5.53	7.03	4.97	5.06	6.32	3.75	4.06	3.72	1.44	3.68	1.79	1.58
Charters		0.02		0.05		0.00	0.70		0.24		0.21	0.62		0.59		0.28		0.20	0.00	0.53
Cloncurry	2.14		4.18		6.17		3.01	3.34		5.91		4.06	3.45		2.97			2.86	7.82	6.35
Cunnamulla	3.54		4.59		9.02		10.65	18.27		28.76		27.29	16.54		6.94	5.56	5.75	7.01	9.34	
Emerald		0.00		0.00		0.00	0.02		0.05		0.00	0.00		0.00		0.00		0.00	0.00	0.00
Hughenden	1.97	1.59		1.59		1.29	0.92		2.22		2.67	1.52		2.62		3.54		3.92	4.79	3.79
Hungerford	1.04	2.57		3.90		4.41	2.60		7.01		8.75	9.7		9.83		0.65		2.94	3.74	6.19
Inglewood		0.00		0.00		0.00	0.50		0.00		0.00	0.00		0.00		0.00		0.00	0.00	0.00
Julia Creek	4.08	5.13	4.91		5.39		3.16	3.30		8.10		5.6	4.58		5.54			1.73	2.34	2.26
Longreach	9.53	11.86		11.33		14.71	12.24		14.43		19.26	4.79		15.90		25.72		25.75	35.21	32.54
Mt Isa																			6.21	4.12
Quilpie	2.19		1.39		5.13		2.06	4.70		9.80		9.51	12.27		7.87	2.41	1.76	2.25	4.37	
Roma	2.19	1.62	2.54	2.66		2.37	2.26		3.47		5.02	2.83		2.96		4.96		2.98	4.29	5.87
Taroom	0.02	0.37		0.00		0.00	0.00		0.00		0.00	0.00		0.00		0.00		0.00	0.00	0
Westmar	0.97		0.59		0.55		1.14	1.49		1.14		2.28	4.69		3.27		4.42	2.48	1.24	
Windorah	4.42	4.52	7.32	4.48	9.85	12.62	6.67	10.47	10.77	11.84	8.11	12.29	12.16	16.95	11.80	3.22	2.41	2.80	4.32	3.85
Winton	3.69	5.02	5.62		6.05		3.32	4.44		9.73		16.98	8.57		10.86		8.00	9.72	6.62	



Common wallaroo																				
Block	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Barcaldine	6.59	12.3	8.63	16.4	19.9	16.2	5.52	8.30	5.53	9.02	4.69	6.79	4.89	3.57	3.57	0.87	1.63	1.90	2.09	2.27
Blackall	18.0	21.1	22.1	34.9	39.1	49.0	23.8	21.5	20.2	54.4	28.5	24.8	11.2	9.32	6.89	3.44	1.60	0.78	1.04	0.87
Bollon	4.72	2.64		1.55		1.67	0.36		2.44		0.7	0.31		2.38		1.01		1.42	0.60	0.73
Boulia																			0	1.07
Charleville	7.21	6.20	5.79	4.66	4.70	5.36	11.8	13.4	10.6	5.09	4.47	4.07	3.81	1.24	0.60	0.60	0.64	1.44	0.82	0.86
Charters		0.30		2.84		0.61	1.07		0.51		1.03	0.22		0.23		0.63		0.41	1.35	0.41
Cloncurry	0.00		0.30		0.64		0.51	0.26		0.14		0.02	0.21		1.32			0.73	2.93	0.97
Cunnamulla	1.68		0.45		0.64		1.95	0.61		0.70		2.53	2.60		2.10	0.99	0.87	1.08	1.09	
Emerald		0.02		0.00		0.78	0.02		0.33		0.19	0.32		0.25		0.25		0.32	0.15	0.31
Hughenden	1.65	1.28		2.28		0.24	0.41		0.94		0.93	0.22		1.59		0.55		1.21	1.65	0.72
Hungerford	1.19	0.36		0.24		0.48	0.25		0.47		1.27	1.93		2.33		0.08		0.28	0.24	0.66
Inglewood		3.08		4.03		0.34	1.01		1.22		3.18	3.42		11.1		11.6		4.47	3.12	4.37
Julia Creek	2.74	0.00	0.04		0.11		0.01	0.00		0.00		0.00	0.03		0.00			0.00		0
Longreach	17.9	21.5		18.5		12.6	9.18		17.7		15.6	8.84		4.17		6.05		8.40	7.89	6.78
Mt Isa																			0	0
Quilpie	5.41		0.78		3.36		2.69	3.00		5.58		7.51	3.42		3.76	0.45	0.87	1.17	0.64	
Roma	1.35	3.74	2.49	2.08		1.16	3.45		0.87		1.01	0.75		1.45		1.15		0.45	0.66	0.72
Taroom	0.22	2.04		0.17		1.05	0.25		0.02		0.38	0.18		0.35		0.20		0.10	0.17	0.17
Westmar	0.74		0.02		0.13		0.30	0.00		0.01		0.00	0.28		0.54		0.38	0.75	0.21	
Windorah	2.14	2.30	1.81	2.72	3.03	3.07	2.42	3.18	3.32	5.29	2.82	1.46	4.86	4.12	2.47	0.46	0.20	0.02	0.18	0.22
Winton	1.73	1.78	1.70		3.14		0.96	4.19		6.35		0.76	1.14		1.30		0.26	0.82	1.82	