
2019 Quota Report

for Commercial Kangaroo Harvest in South
Australia



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and Water

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1 SCOPE AND CONTEXT

All kangaroo species in South Australia are protected under the *National Parks and Wildlife Act 1972* (NPW Act), have value in ecosystem processes, and contribute to biodiversity. The NPW Act (section 60I) allows for the sustainable harvest of three common and secure species of kangaroo, the Red Kangaroo (*Macropus rufus*), the Western Grey Kangaroo (*M. fuliginosus*), and the Euro (*M. robustus*). The wildlife trade provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) regulate the export of kangaroo products from Australia. The harvest and export of these protected species requires a management plan endorsed under the NPW Act and a wildlife trade management plan endorsed under the EPBC Act. The South Australian Commercial Kangaroo Management Plan 2018-2022 (the Management Plan) meets the requirements of a management plan and wildlife trade management plan under South Australian and Commonwealth legislation, respectively. The Management Plan is valid from 1 January 2018 to 31 December 2022.

In accordance with the Management Plan, harvest quotas are set annually for each species of harvested kangaroo. Quotas are detailed in annual reports endorsed by the Director of National Parks and Wildlife and forwarded to the Commonwealth Department of Environment for information. Where quotas are set outside the standard quota parameters detailed in the Management Plan, quotas must be endorsed in writing by the Commonwealth Department of Environment prior to implementation.

This quota report has been developed in accordance with the quota report provisions of the Management Plan. The quota report provides the necessary detail on quota-setting procedures and the harvest quota for three kangaroo species for 2019, including population estimates and other information used to set the quotas. The report lists Regional Harvest Quotas and Special Land Management Quota for 2019. Also included is a summary of harvest statistics for the incomplete year of 2018 (January-August).

2 SUMMARY OF POPULATION ESTIMATES AND INFORMATION USED TO SET QUOTAS

In accordance with the provisions of the Management Plan, annual harvest quotas are based on the results of direct monitoring of kangaroo populations. Monitoring takes place in accordance with the standard survey techniques detailed in the Management Plan.

2.1 Harvest Regions used for Quota Setting

Four harvest regions have been defined in the Management Plan: Western Pastoral, Eastern Pastoral, Western Agricultural, and Eastern Agricultural.

The harvest regions contain sub-regions (detailed in Table 1 and Figure 1) primarily based on the administrative boundaries of the former Soil Conservation Board districts (or an amalgamation thereof). Population estimates and commercial quotas for 2019 are derived and set at the harvest sub-region level. Sub-region quotas can be re-distributed within, but not between, each harvest region in response to spatial and temporal changes in kangaroo distribution.

Table 1: Kangaroo Harvest Regions (and sub-regions) of South Australia.

Harvest Region	Harvest sub-regions
Eastern Pastoral	North East Pastoral, North Flinders, Eastern Districts, Murray Mallee
Western Pastoral	Marla-Oodnadatta, Marree (inside dog fence), Marree (outside dog fence), Kingoonya, Gawler Ranges
Eastern Agricultural	South Flinders, Mid North
Western Agricultural	Eyre East, Eyre West

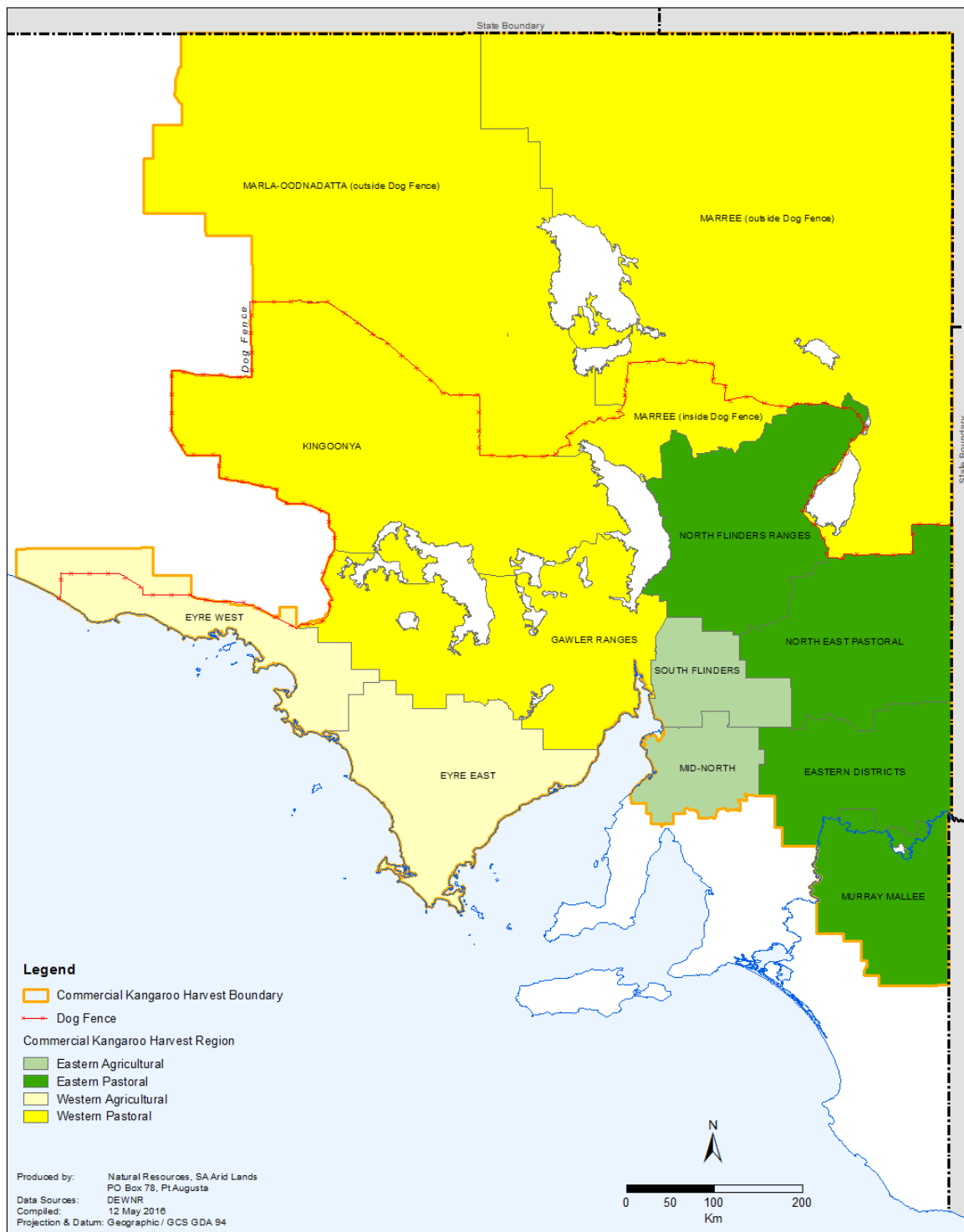


Figure 1: Map of harvest regions and sub-regions of South Australia.

2.2 2018 Red Kangaroo and Western Grey Kangaroo Monitoring

Population estimates used to set the 2019 quota for Red Kangaroos and Western Grey Kangaroos were derived from aerial surveys undertaken in June and July 2018. Surveys were conducted using standard fixed-strip width transect methodology with a fixed-wing aircraft (see Grigg et al. 1999 for further detail). Raw counts are converted to density estimates for each harvest region by the application of correction factors specific to each species. Surveys have been conducted annually since 1978.

Regions flown during 2018 include:

- Eastern Pastoral harvest region (North Flinders, Eastern Districts and North East Pastoral)
- Western Pastoral harvest region (Gawler Ranges, Kingoonya, Marree Inside Dog Fence, Marree Outside Dog Fence)
- Eastern Agricultural harvest region (South Flinders and Mid North)

Note: Wind towers including turbines and monitoring equipment are present across some areas of Mid North harvest sub-region. Flight survey lines are excluded in these areas for the safety of personnel involved in conducting the aerial surveys.

In accordance with the Management Plan, sub-regions that have least one annual harvest equal to or greater than 50% of the quota during the preceding five years may be surveyed every three years (Action 9, The Management Plan). In some sub-regions, the current harvesting rates for Red Kangaroos and/or Western Grey Kangaroos falls below this level, and as such, surveys are undertaken once every three years. Where sub-regions are not monitored annually, quotas are allocated at lower levels to account for the lower monitoring frequency (refer to Quota Setting Procedures 2019 for further detail).

The estimated size of the Red Kangaroo population across the commercial harvest area is 2,550,094, a decrease of 8% from the previous year total of 2,758,663, but 62% higher than the long-term average of 1,569,617 (1998 -2017). Densities for the 2018 survey were below the long-term average in the Marla-Oodnadatta, Marree (Outside Dog Fence), Eastern Districts and Mid North sub-regions (Figure 2).

The estimated size of the Western Grey Kangaroo population across the commercial harvest area is 1,241,347, a decrease of 23% from the previous year total of 1,613,880 and 45% above the long-term average of 855,817 (1998 -2017). Although a decline in population was detected, densities for the 2018 survey were still above the long-term average for all sub-regions (Figure 3).

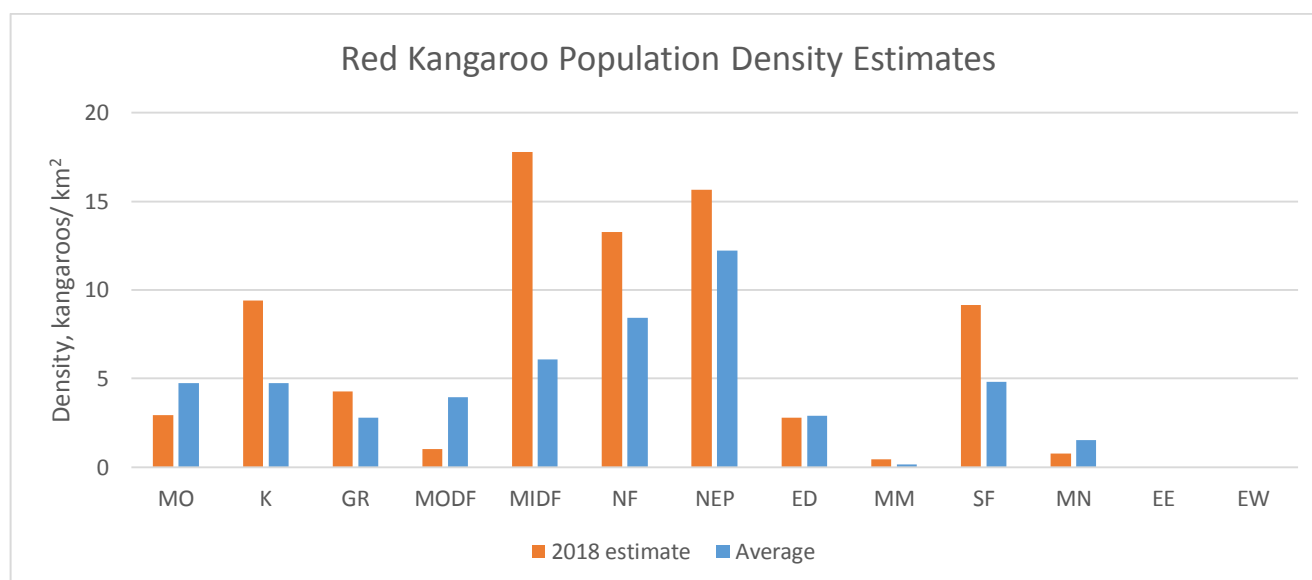


Figure 2: Red Kangaroo 2018 population density estimate for each sub-region compared to the long-term average population density estimate (1978-2017). MO = Marla-Oodnadatta, K = Kingoonya, GR = Gawler Ranges, MODF = Marree (outside dog fence), MIDF = Marree (inside dog fence), NF = North Flinders, NEP = North East Pastoral, ED = Eastern Districts, MM = Murray Mallee, SF = South Flinders, MN = Mid North, EE = Eyre East, EW = Eyre West.

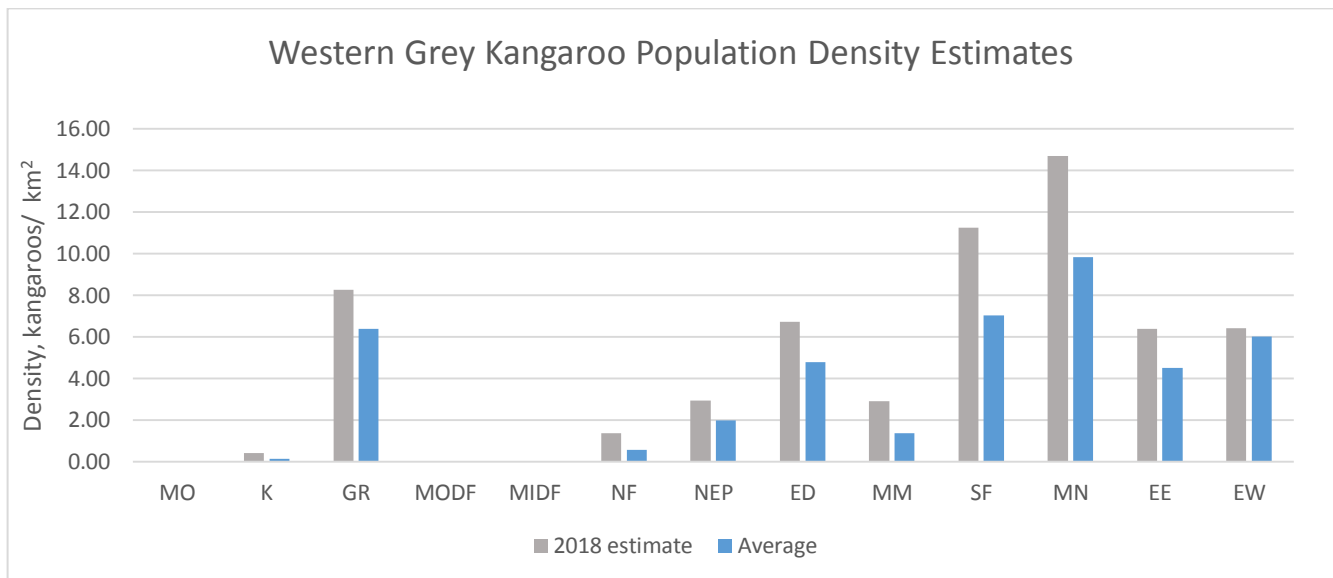


Figure 3: Western Grey Kangaroo 2018 population density estimate for each sub-region compared to the long-term average population density estimate (1978-2017). MO = Marla-Oodnadatta, K = Kingoonya, GR = Gawler Ranges, MODF = Marree (outside dog fence), MIDF = Marree (inside dog fence), NF = North Flinders, NEP = North East Pastoral, ED = Eastern Districts, MM = Murray Mallee, SF = South Flinders, MN = Mid North, EE = Eyre East, EW = Eyre West.

2.3 2018 Euro Monitoring

Euros are difficult to count from a fixed-wing aircraft due to the undulating, rocky terrain they inhabit, therefore walking surveys were conducted using the line transect methodology (Buckland et al. 2001). The technique aims to assess Euro densities in targeted areas of suitable habitat within harvest regions. Typically, a small sample area is surveyed in each harvest sub-region. These localised densities are used to develop regional densities for Euros, by multiplying obtained survey densities by the amount of suitable Euro habitat in each region. The design of ground surveys is based around obtaining sufficient data for line transect analysis to typically return results with a coefficient of variance between 10% and 25%. Data were analysed using line transect distance sampling techniques (Miller 2016).

In accordance with the Management Plan, sub-regions that are not heavily harvested (that is, at least one annual harvest equal to or greater than 50% of the quota during the preceding five years, Action 9, The Management Plan) will be surveyed triennially. The current harvesting rates for Euros fall well below this level, and as such, surveys for Euros within a region are undertaken once every three years, and quotas are allocated at lower levels (refer to Quota Setting Procedures 2019 for further detail). The population estimates derived from surveys undertaken in 2016-2018 for Euros in commercially harvested areas have been used to set quota for 2019.

The estimated size of the Euro population across the commercial harvest area is 615,675, a decrease of 7% from the 2018 estimate of 662,134 and 32% greater than the long-term average of 465,049 (1998 -2017). Densities for the 2018 survey were slightly below the long-term average for Marree (Inside Dog Fence) and North East Pastoral sub-regions and above average in the other sub-regions (Figure 4).

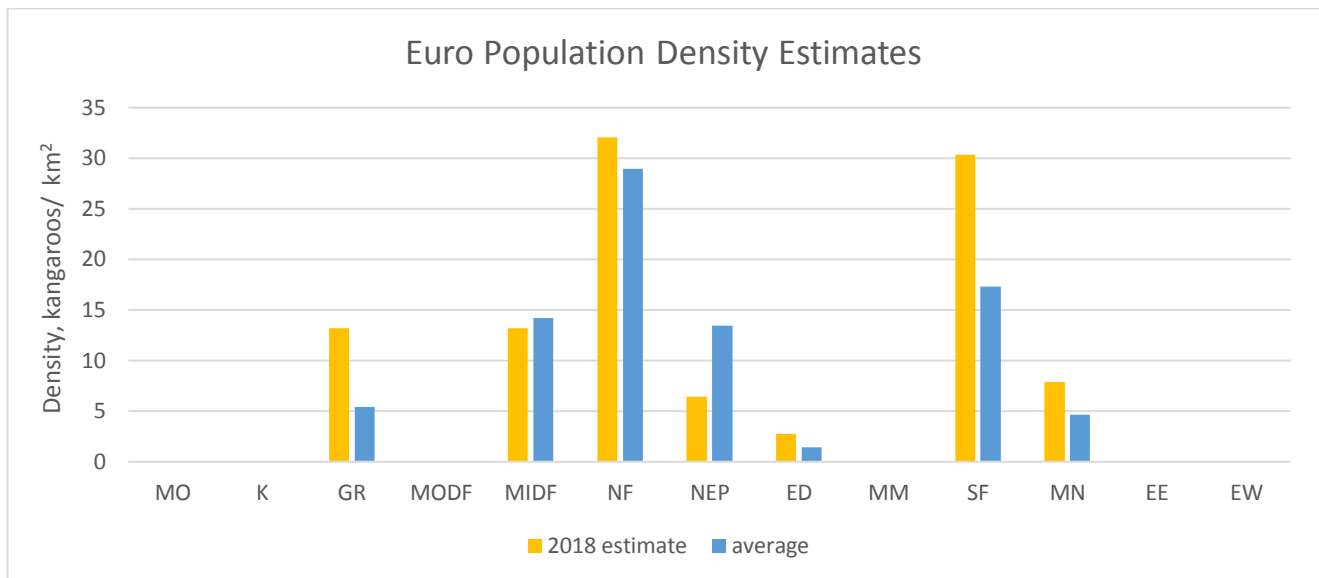


Figure 4: Euro 2018 population density estimate for each sub-region compared to the long-term average population density estimate (1997-2017). MO = Marla-Oodnadatta, K = Kingoonya, GR = Gawler Ranges, MODF = Marree (outside dog fence), MIDF = Marree (inside dog fence), NF = North Flinders, NEP = North East Pastoral, ED = Eastern Districts, MM = Murray Mallee, SF = South Flinders, MN = Mid North, EE = Eyre East, EW = Eyre West.

2.4 Proposed Monitoring Program for 2019

The following monitoring program is proposed to determine kangaroo population densities in South Australia in 2019:

- Conduct a broad-scale aerial survey of the South Australian pastoral zone and some agricultural areas to estimate regional densities of Red Kangaroos and Western Grey Kangaroos.
- Conduct ground-based Euro monitoring to achieve triennial Euro survey data.
- If opportunities arise, conduct more frequent ground-based Euro monitoring (otherwise rely on most recent data obtained between 2016 and 2018).
- Commence review of aerial and ground survey methods.
- Investigate opportunities of using fixed camera grids to obtain Euro data (carried over from 2017 Quota Report).
- Conduct additional ground or aerial surveys (for any of the three harvested species) on selected properties when considered necessary for quota distribution purposes, due to localised or widespread seasonal conditions, or high pressure on available quota for a particular harvest region.

3 HUMANE HARVESTING PRACTICES

Both the NPW Act and the EPBC Act require kangaroo harvesting to be carried out using humane destruction techniques. Only licensed field processors who are accredited in marksmanship and game field-processing are able to shoot kangaroos commercially. All kangaroos taken commercially must comply with the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Commercial Purposes: First Edition 2008 (the Code) (or any subsequent editions once endorsed).

Animal welfare is an important consideration for DEW. A reporting protocol has been developed for suspected non head-shot carcasses and DEW adopts a zero-tolerance approach to such incidences. Staff conduct random inspections of and investigate complaints relating to processing works, transport vehicles, chillers, and monitor compliance with the Code.

The Commercial Kangaroo Harvest Report for South Australia, prepared in March each year, reports on the preceding year's harvest and contains information on compliance activity for that year.

Further information on the compliance and enforcement program is detailed in the Management Plan.

4 HARVEST STATISTICS SUMMARY 2017

In 2017, the commercial kangaroo harvest in South Australia was 103,929 (data from 2017 Commercial Kangaroo Harvest Report for South Australia). This figure represents 13% of the approved quota of 789,500 (*including* Special Land Management Quota) (Table 2).

Table 2: Harvest summary calculated for 2017 from Meat Processor returns. Note that no Special Land Management Quota was released in 2017.

Species	Quota	Harvest	% Quota Harvested
Red Kangaroo	517,200	73,426	14
Western Grey Kangaroo	202,200	22,385	11
Euro	70,100	8,118	12
Total	789,500	103,929	13

Of the four harvest regions in the South Australian commercial harvest area, the Eastern Agricultural and Eastern Pastoral harvest regions had the greatest percentage of quota harvested for Red Kangaroos. The Eastern Pastoral harvest region had the greatest percentage of quota harvested for Western Grey Kangaroos. The Eastern Agricultural harvest region had the greatest percentage of quota harvested for Euros. The extent of harvest for each harvest region and species is shown in Table 3.

Table 3: Harvest statistics for 2017 from Field Processor returns.

Harvest region	Red Kangaroo		Western Grey		Euro	
	Quota*	Harvest	Quota*	Harvest	Quota*	Harvest
Western Pastoral	191,600	21,335	52,400	4,904	18,100	1,576
Eastern Pastoral	291,600	42,641	69,700	9,827	44,700	5,755
Western Agricultural	0	0	19,800	1,236	0	0
Eastern Agricultural	20,800	9,169	52,900	6,636	4,500	1,483
Total	504,000	73,145	194,800	22,603	67,300	8,814

* excludes Special Land Management Quota.

5 HARVEST STATISTICS SUMMARY TO AUGUST 2018

A total of 71,536 kangaroos were harvested by field processors during the first eight months of 2018 (1 January 2018 – 31 August 2018; Table 4). This represents 9% of the combined kangaroo harvesting quota for the year. Based on current harvest rates, the projected harvest for 2018 for all species is 107,304. This will represent 14% of the combined quotas.

Table 4: Harvest statistics for 2018 from Field Processor returns.

Species	Quota*	Actual (1 Jan - 31 Aug)		Projected (1 Jan - 31 Dec)	
		Harvest	Harvest as % of quota	Projected harvest	Harvest as % of quota
Red Kangaroo	485,100	46,988	10	70,482	15
Western Grey Kangaroo	197,400	19,451	10	29,177	15
Euro	78,300	5,097	6	7,645	10
Total	760,800	71,536	9	107,304	14

* excludes Special Land Management Quota.

A harvest summary for each species in each harvest region for the 2018 year-to-date (1 January – 31 August) is shown in Table 5. The harvest projection for 2018 represents a small increase to the 2017 harvest of 104,562 (calculated from field processor returns).

Table 5: 2018 harvest region harvest summary calculated from Field Processor returns for 1 Jan – 31 Aug.

Harvest region	Red Kangaroo		Western Grey Kangaroo		Euro	
	Quota*	Harvest	Quota*	Harvest	Quota*	Harvest
Western Pastoral	169,000	14,301	57,400	2,307	23,000	811
Eastern Pastoral	278,900	23,432	55,700	8,248	45,200	2,511
Western Agricultural	0	0	29,100	0	0	0
Eastern Agricultural	37,200	9,255	55,200	8,896	10,100	1,775
Total	485,100	46,988	197,400	19,451	78,300	5,097

* excludes Special Land Management Quota.

Between 1997-2017, the combined harvest of all three macropod species in South Australia has ranged between 98,500 and 326,600, representing a 14 – 52% utilisation of the annual kangaroo harvesting quota. Harvest of kangaroos in South Australia peaked in 1995 at approximately 360,000. Since this time, the combined State harvest has declined significantly, while quotas have fluctuated between 328,000 and 938,000. Trends of annual harvest and quota for all species are shown in Figure 5 (section 8 of this report).

6 QUOTA SETTING PROCEDURES 2019

6.1 Legislation

The preparation of the commercial harvest quotas for Red Kangaroo, Western Grey Kangaroo and Euro in South Australia is directed by the Management Plan. All quotas issued for 2019 have been issued in accordance with the standard quota parameters detailed in this plan, which is endorsed under the NPW Act and the EPBC Act.

6.2 Criteria Used in Setting Commercial Harvest Quotas

Quotas for 2019 are set at the harvest region level and then further broken down into harvest sub-regions, with boundaries primarily based on the administrative boundaries of the former Soil Conservation Board districts (or amalgamations thereof). For management purposes, the quota allocated for each harvest sub-region can be re-distributed within, but not between, harvest regions. This will occur when quota in a particular sub-region has been fully issued, allowing management for spatial and temporal changes in kangaroo populations. The scale of management at the harvest region level (i.e. four harvest regions in South Australia) is considered to be sustainable for kangaroo populations. The derivation of population estimates and quotas at the sub-region level provides added detail to allow for more accurate allocation of quota at the start of the harvest year. Quotas for each sub-region are rounded down to the nearest hundred.

6.3 Regional Harvest Quotas

Quotas outlined in this report represent a constant proportional harvest strategy for kangaroos in South Australia. Regional quota percentages have been limited to a maximum of 20% of the estimated population size for Red Kangaroos and 15% of the estimated population sizes for Western Grey Kangaroos and Euros. More conservative quota percentages have been applied to sub-regions that are not surveyed on an annual basis, which are typically subject to low harvest pressure (quotas reduced to 10% as per Action 10 of The Management Plan). Population estimates for some sub-regions in 2018 are associated with coefficients of variation greater than 25%. Some of these variances can be explained by low overall numbers of kangaroos counted. High coefficients of variation, e.g. on the Eyre Peninsula, are related to the patchy nature of the landscape surveyed, having areas of kangaroo habitat interwoven with large cropping areas. In areas where the kangaroo population estimate is

associated with greater uncertainty due to coefficient of variations greater than 25%, the total quota issued has been reduced by three percent, as a more conservative approach (as per Action 10 of The Management Plan). The coefficient of variation is calculated as the standard error of the density estimates across all transects for each harvest sub-region using the ratio estimate (Caughley 1977). The standard error is then divided by the mean density of kangaroos for the harvest sub-region to give the coefficient of variation, which is expressed as a percentage (the lower the percentage, the more reliable the density estimate).

6.4 Trigger Points

In accordance with the Management Plan, trigger points based on long-term average populations are calculated for each harvest sub-region. If aerial survey results indicate a population has fallen below 1.5 standard deviations (SD) or 2 SD of the long-term average density for that species in that harvest sub-region, the commercial quota will be reduced or suspended for the following calendar year, respectively. This will remain in place until surveys indicate populations have increased.

No harvest sub-regions for any of the three species have reached a trigger point during 2018.

6.5 Special Land Management Quota

Special Land Management Quota component is set annually at up to 1.5% of the estimated population size of each species, and is to account for land management issues that might arise due to localised and/or widespread seasonal conditions. This quota component is only for the harvest of kangaroos that would otherwise be culled under Permits to Destroy Wildlife, and is designed to minimise the number of kangaroos destroyed under these permits and not utilised.

Special Land Management Quota will only be released when the commercial harvest quota for a harvest region has been fully issued on tags and is likely to be harvested, and land management issues remain. This quota is allocated at the State level, and will be distributed between harvest regions where necessary. Release of this quota may warrant property or regional inspections of kangaroo density and/or potential impact(s).

7 ADAPTIVE MANAGEMENT EXPERIMENTS

No adaptive management experiments were undertaken in 2018.

8 2019 QUOTAS

The 2019 commercial kangaroo harvesting quotas for South Australia are shown in Table 10. The 2019 harvest region quotas for each species are shown in Tables 11, 12 and 13. Harvest quotas and annual harvests since 1975 for all species combined are shown in Figure 5. The highest recorded annual quotas are 555,000 for Red Kangaroos (1997), 280,000 for Western Grey Kangaroos (1997), and 103,000 for Euros (1997).

Table 10: Commercial kangaroo harvesting quotas for South Australia in 2019, and comparison with the 2018 quota and 5 year average (2014-2018 Quota Reports). Note that the total quota comparisons do not include Special Land Management Quota (SLMQ).

Species	Quota			Change (%) 2018 - 2019
	5 year average	2018	2019	
Red Kangaroo	408,540	485,100	488,500	+1%
Western Grey Kangaroo	176,520	197,400	164,700	-17%
Euro	63,640	78,300	77,000	-2%
Total	648,700	760,800	730,200	-4%

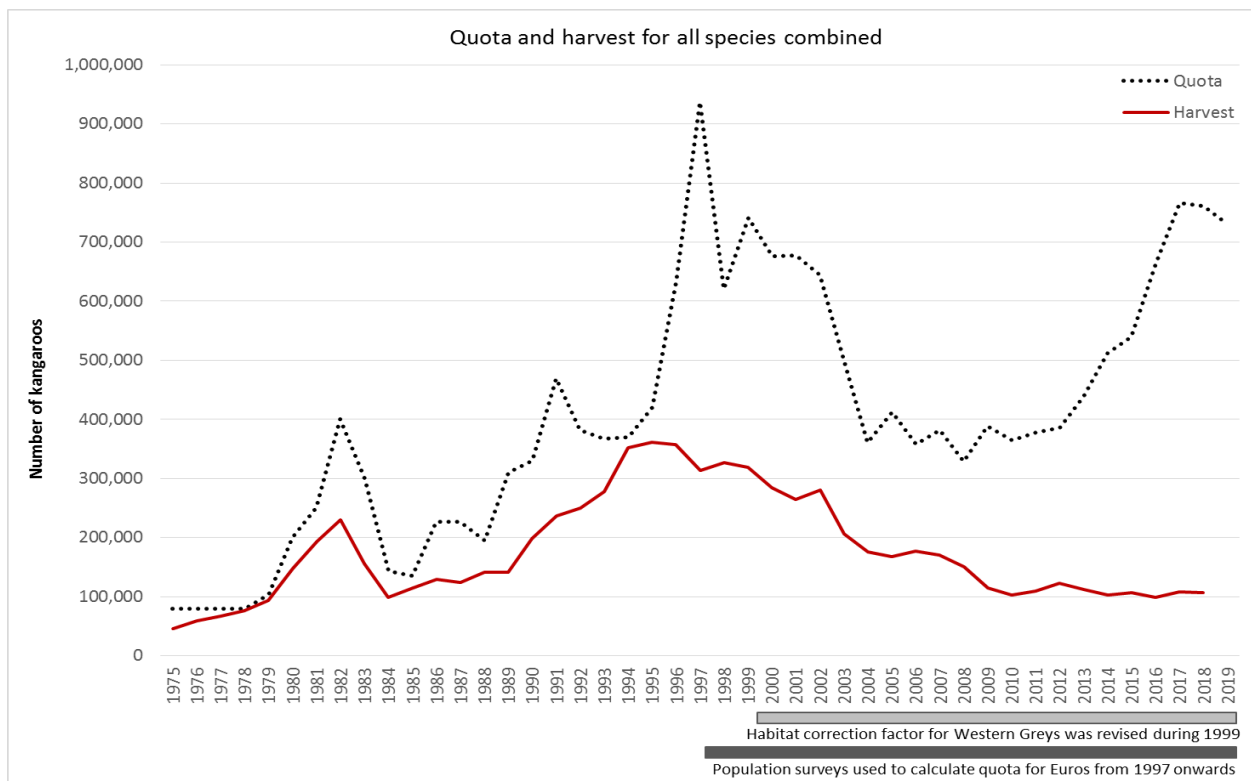


Figure 5: Kangaroo (all species combined) total quota and harvest for South Australia between 1975 and 2019. Population surveys for Euros commenced during 1997 and population estimates were used to calculate quotas from 1997 onwards. Prior to 1997, conservative quotas were set for Euros and harvest was very low. The habitat correction factor for Western Grey Kangaroos was revised during 1999.

9 REGIONAL HARVEST QUOTAS FOR 2019

Table 11: Proposed Red Kangaroo harvesting quotas for 2019.

Harvest region ¹	Area – km ²	% Suitable	Density	Estimated numbers	% harvest	Quota
Western Pastoral						262,000
Marla - Oodnadatta	128,908	45	2.95	171,125	10	17,100
Kingoonya	73,392	100	9.42	691,353	20	138,200
Gawler Ranges	45,811	100	4.28	196,071	20	39,200
Marree (inside dog fence)	14,680	100	17.78	261,010	20	52,200
Marree (outside dog fence)	177,517	50	1.02	90,534	17	15,300
Eastern Pastoral						203,800
North Flinders	34,622	100	13.27	459,434	20	91,800
North-east Pastoral	31,448	100	15.66	492,476	20	98,400
Eastern Districts	22,920	100	2.79	63,947	20	12,700
Murray Mallee	19,715	100	0.46	9,069	10	900
Eastern Agricultural						22,700
South Flinders	11,883	100	9.16	108,848	20	21,700
Mid North	10,925	75	0.76	6,227	17	1,000
Western Agricultural						0
Eyre West	22,459	0	0	0	0	0
Eyre East	31,164	0	0	0	0	0
Total	625,444			2,550,094		488,500
Special Land Management Quota²						12,700
Total quota available for 2019						501,200

¹ The Marree (outside dog fence), Eyre East, Eyre West, Murray Mallee and Marla-Oodnadatta sub-regions are not monitored on an annual basis, but are monitored once every three years. Conservative harvest rates have been applied to these sub-regions to account for this lower frequency of monitoring. These rates have been reduced further where coefficients of variation are greater than 25%.

² Special Land Management Quota will only be released when the entire quota for a harvest region has been fully issued with tags and is expected to be harvested. This quota will allow for the commercial utilisation of animals that would otherwise be culled on Permits to Destroy Wildlife. The SLMQ has been set at 0.5% of the total population estimate for the commercial harvest area.

Table 12: Proposed Western Grey Kangaroo harvesting quotas for 2019.

Harvest region ¹	Area – km ²	% Suitable	Density	Estimated numbers	% harvest	Quota
Western Pastoral						60,400
Marla - Oodnadatta	128,908	0	0.00	0	0	0
Kingoonya	73,392	100	0.41	30,091	12	3,600
Gawler Ranges	45,811	100	8.27	378,857	15	56,800
Marree (inside dog fence)	14,680	0	0.00	0	0	0
Marree (outside dog fence)	177,517	0	0.00	0	0	0
Eastern Pastoral						47,600
North Flinders	34,622	100	1.38	47,778	12	5,700
North-east Pastoral	31,448	100	2.92	91,828	15	13,700
Eastern Districts	22,920	100	6.72	154,022	15	23,100
Murray Mallee ²	19,715	100	2.91	57,371	9	5,100
Eastern Agricultural						32,500
South Flinders	11,883	100	11.24	133,565	15	20,000
Mid North	10,925	65	14.71	104,459	12	12,500
Western Agricultural						24,200
Eyre West ³	22,459	100	6.41	143,962	10	14,300
Eyre East ³	31,164	50	6.38	99,413	10	9,900
Total	625,444			1,241,347		164,700
Special Land Management Quota⁴						6,200
Total quota available for 2019						170,900

¹ The Marree (outside dog fence), Eyre East, Eyre West, Murray Mallee and Marla-Oodnadatta sub-regions are not monitored on an annual basis, but are monitored once every three years. Conservative harvest rates have been applied to these sub-regions to account for this lower frequency of monitoring. These rates have been reduced further where coefficients of variation are greater than 25%.

² Murray Mallee sub-region was surveyed during 2016 and under the 2013-2017 Management Plan the quota was reduced from 12% (due to triennial surveys) to 9%, due to a coefficient of variation greater than 25%. This will remain at 9% until the sub-region is re-surveyed.

³ Eyre West and Eyre East sub-regions were surveyed during 2017 and under the 2013-2017 Management Plan quotas were reduced to 12% due to triennial surveys. Under the new Management Plan 2018-2022, all sub-regions that are surveyed triennially will have harvest reduced to 10% (Action 10).

⁴ Special Land Management Quota will only be released when the entire quota for a harvest region has been fully issued with tags and is expected to be harvested. This quota will allow for the commercial utilisation of animals that would otherwise be culled on Permits to Destroy Wildlife. The SLMQ has been set at 0.5% of the total population estimate for the commercial harvest area.

Table 13: Proposed Euro harvesting quotas for 2019.

Harvest region ¹	Area – km ²	% Suitable	Density	Estimated numbers	% harvest	Quota
Western Pastoral						22,200
Marla - Oodnadatta	128,908	0	0.00	0	0	0
Kingoonya	73,392	0	0.00	0	0	0
Gawler Ranges	45,811	25	13.17	150,833	9	13,500
Marree (inside dog fence) ²	14,680	15	26.50	58,353	15	8,700
Marree (outside dog fence)	177,517	0	0.00	0	0	0
Eastern Pastoral						46,900
North Flinders ²	34,622	25	32.05	277,409	15	41,600
North-east Pastoral ²	31,448	15	6.40	30,190	15	4,500
Eastern Districts	22,920	15	2.77	9,523	9	800
Murray Mallee	19,715	0	0.00	0	0	0
Eastern Agricultural						7,900
South Flinders	11,883	20	30.34	72,106	9	6,400
Mid North	10,925	20	7.90	17,262	9	1,500
Western Agricultural						0
Eyre West	22,459	0	0.00	0	0	0
Eyre East	31,164	0	0.00	0	0	0
Total	625,444			615,675		77,000
Special Land Management Quota³						3,000
Total quota available for 2019						80,000

¹ Euro populations are not monitored on an annual basis due to lower harvest rates, but are monitored once every three years. Conservative harvest rates have been applied to account for this lower frequency of survey.

² Data collected during 2018. Data used for other sub-regions have been collected during previous years (2016 and 2017).

³ Special Land Management Quota will only be released when the entire quota for a harvest region has been fully issued with tags and is expected to be harvested. This quota will allow for the commercial utilisation of animals that would otherwise be culled on Permits to Destroy Wildlife. The SLMQ has been set at 0.5% of the total population estimate for the commercial harvest area.

10 QUOTA ALLOCATION PROCEDURES

The quotas detailed in this report will be allocated as detailed in the Management Plan. The quota in a harvest sub-region will be allocated as required, until the entire quota allocated to the harvest sub-region has been issued. If further quota is requested beyond this, un-allocated quota may be issued from another sub-region within the same harvest region. If the entire quota in a harvest region has been issued with tags and is likely to be harvested, the Special Land Management Quota may be released.

11 REFERENCES

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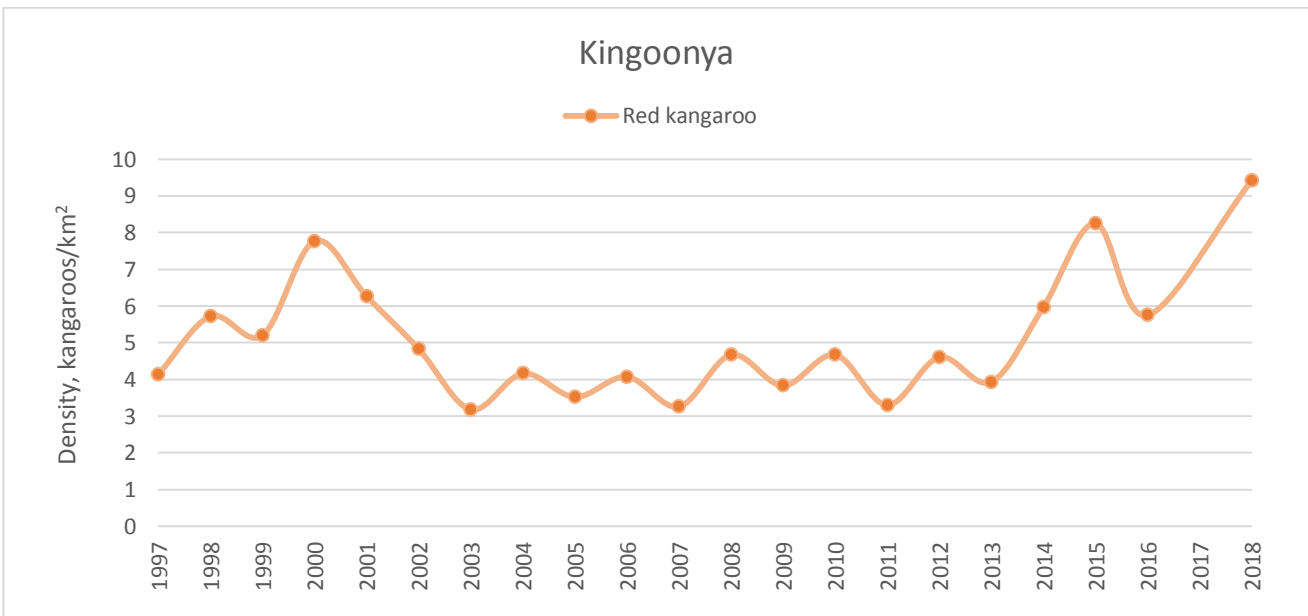
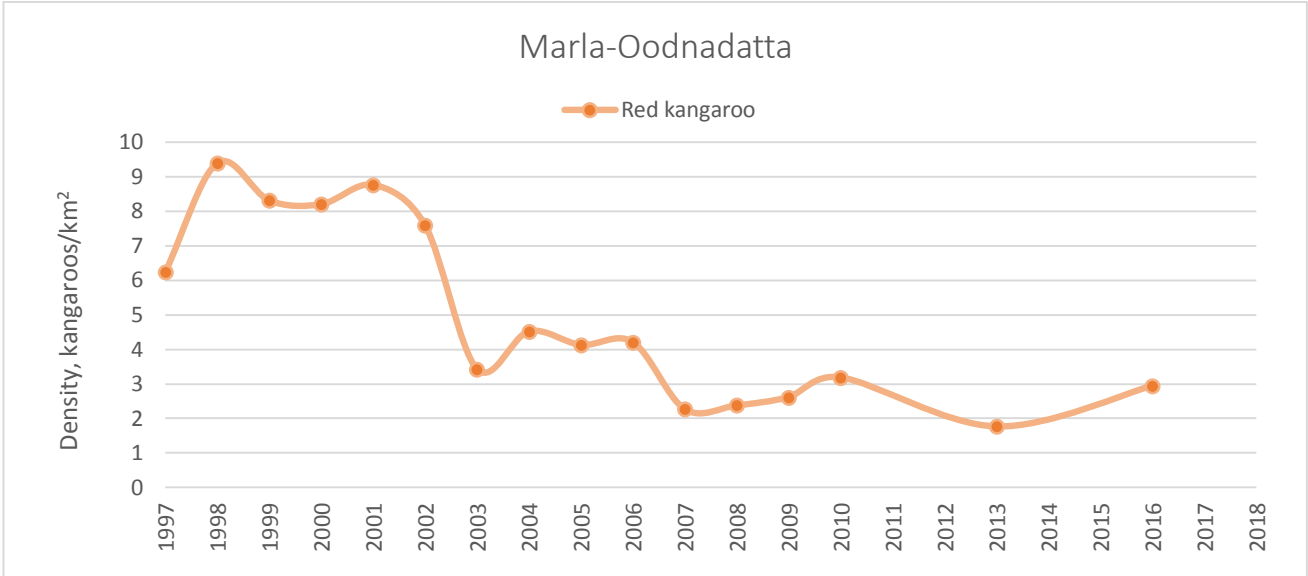
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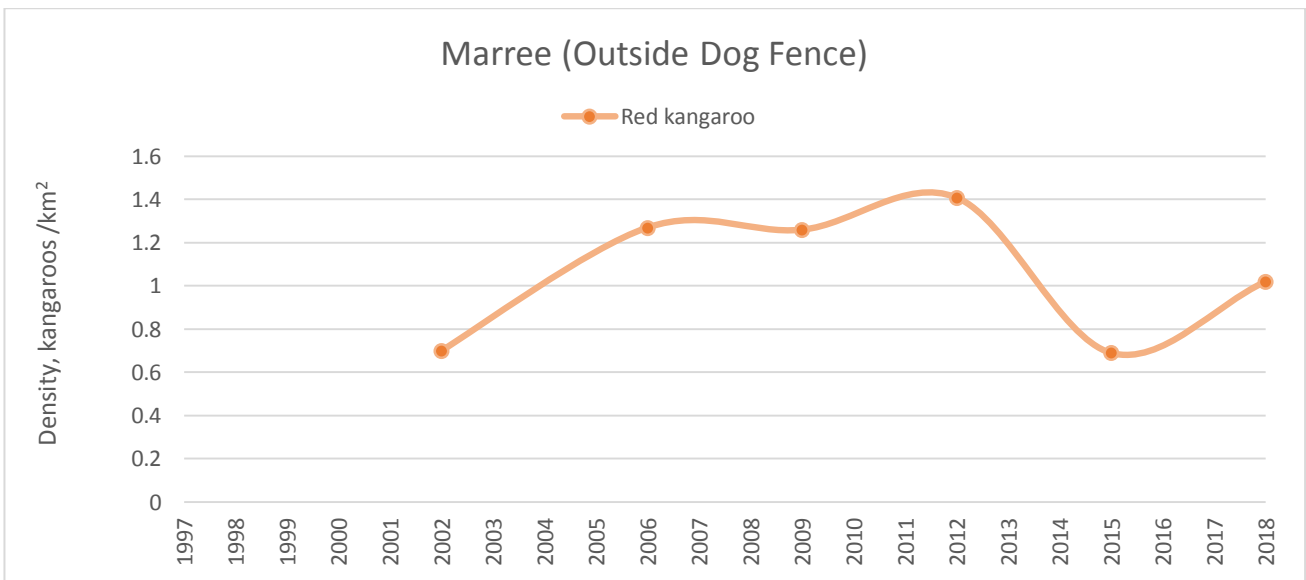
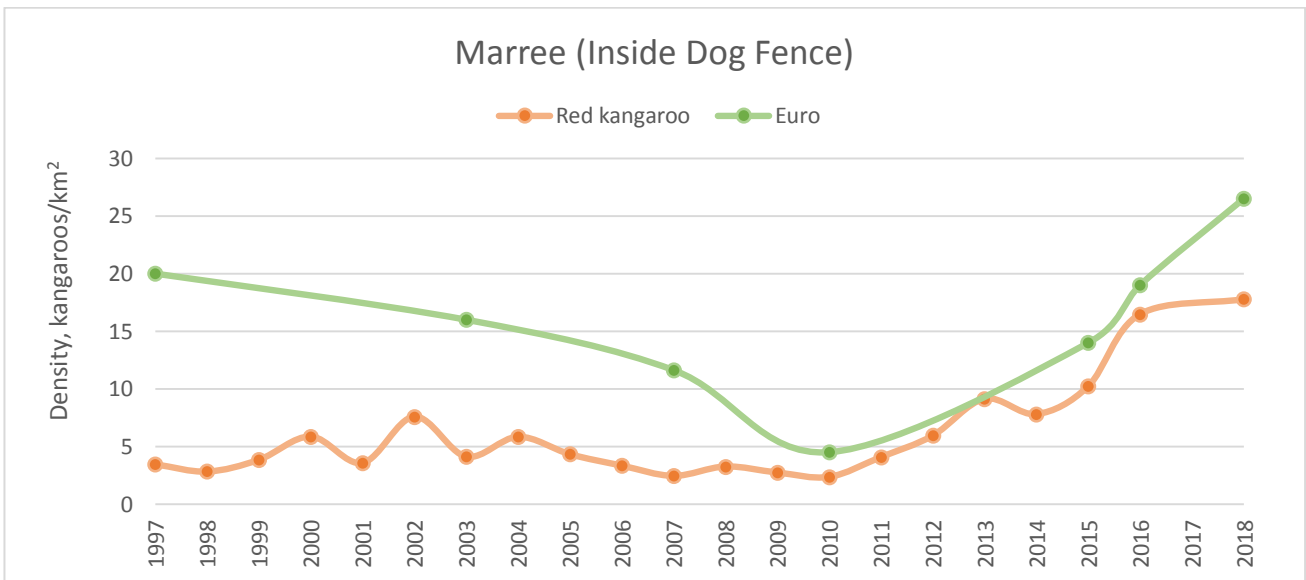
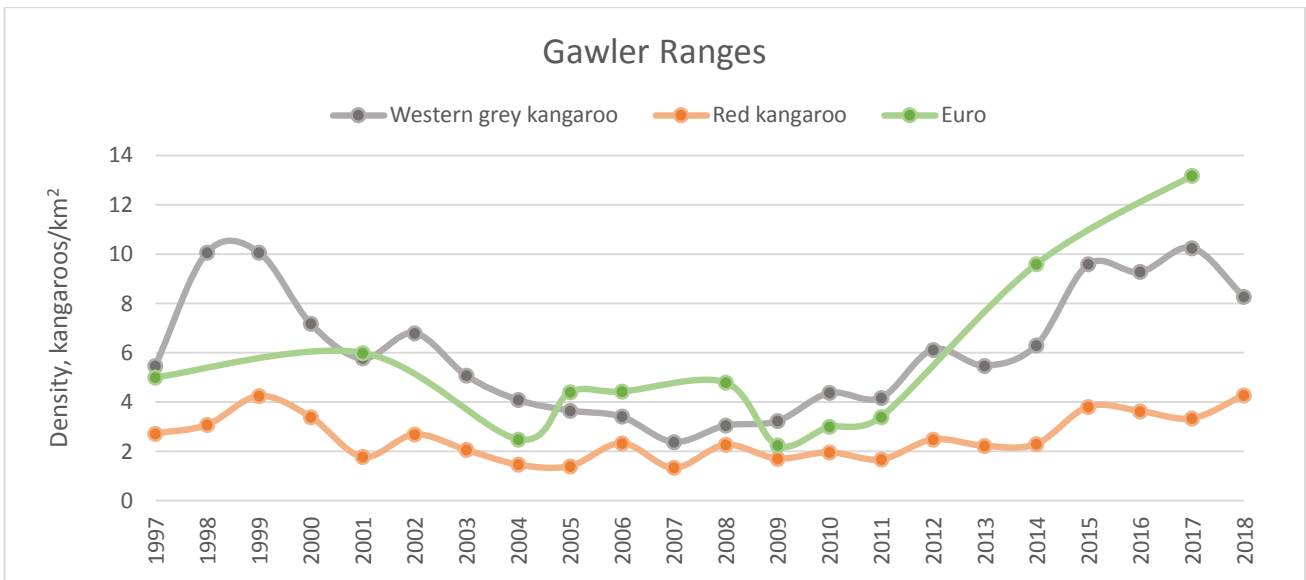
Grigg, G.C., Beard, L.A., Alexander, P., Pople, A.R., and Cairns, S.C. 1999. Aerial survey of kangaroos in South Australia 1978 – 1998: A brief report focusing on methodology. *Australian Zoologist* 31: 292 – 300.

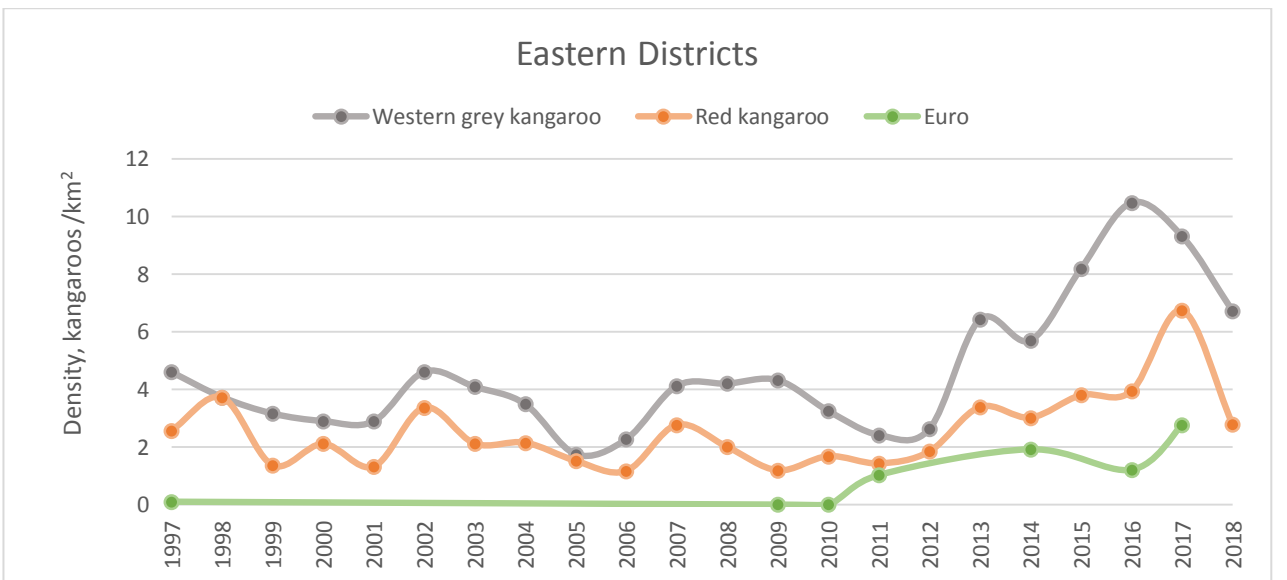
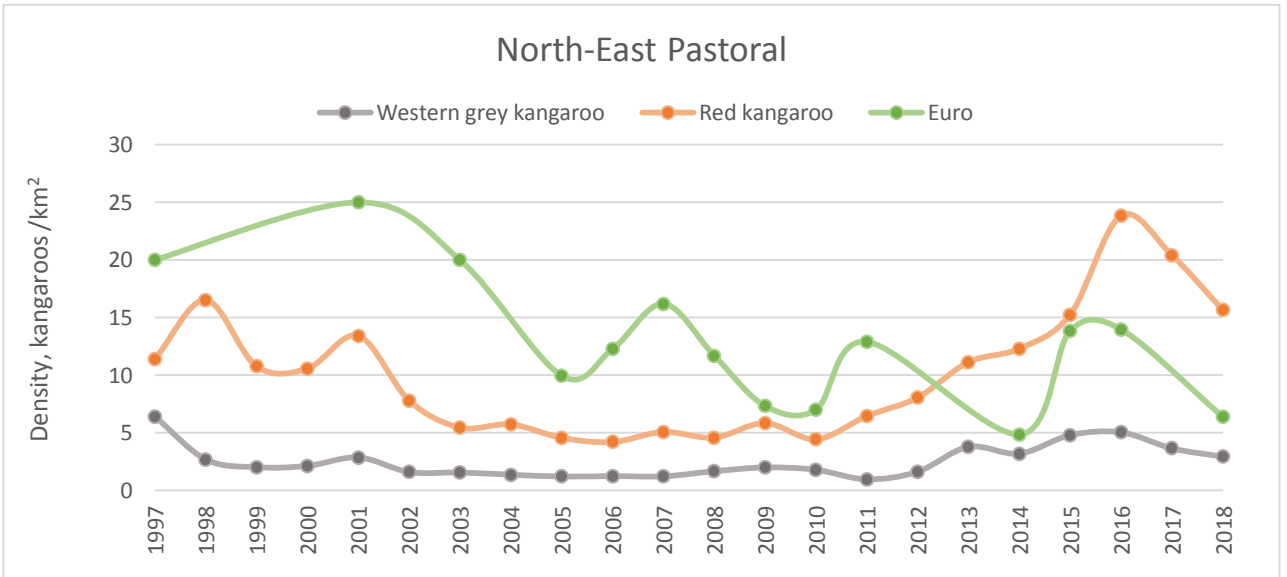
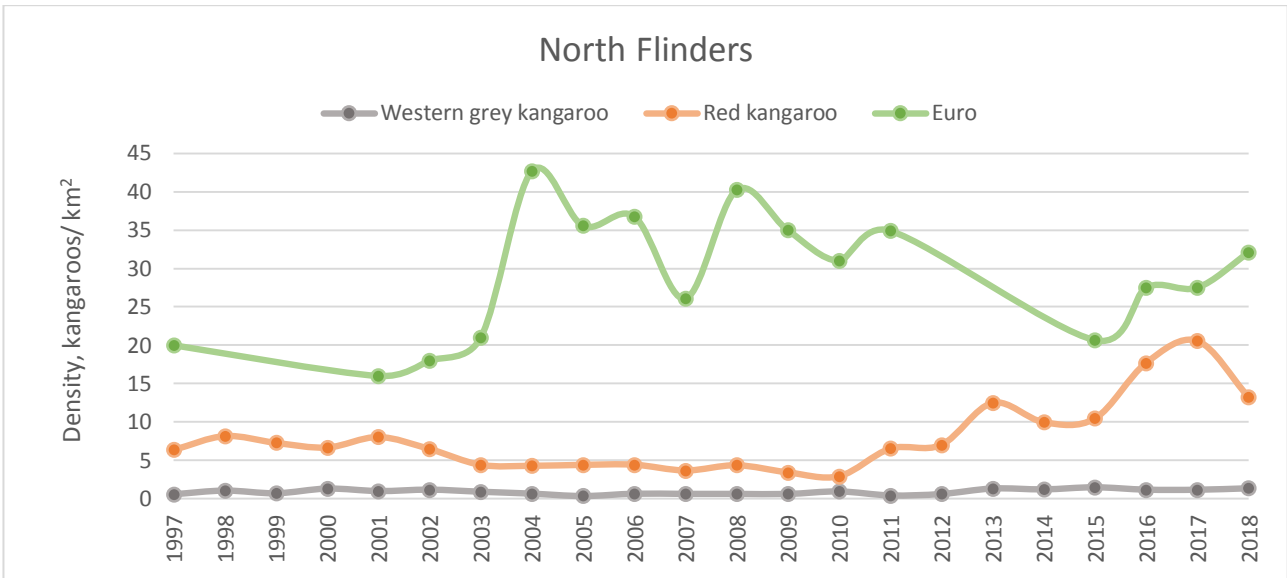
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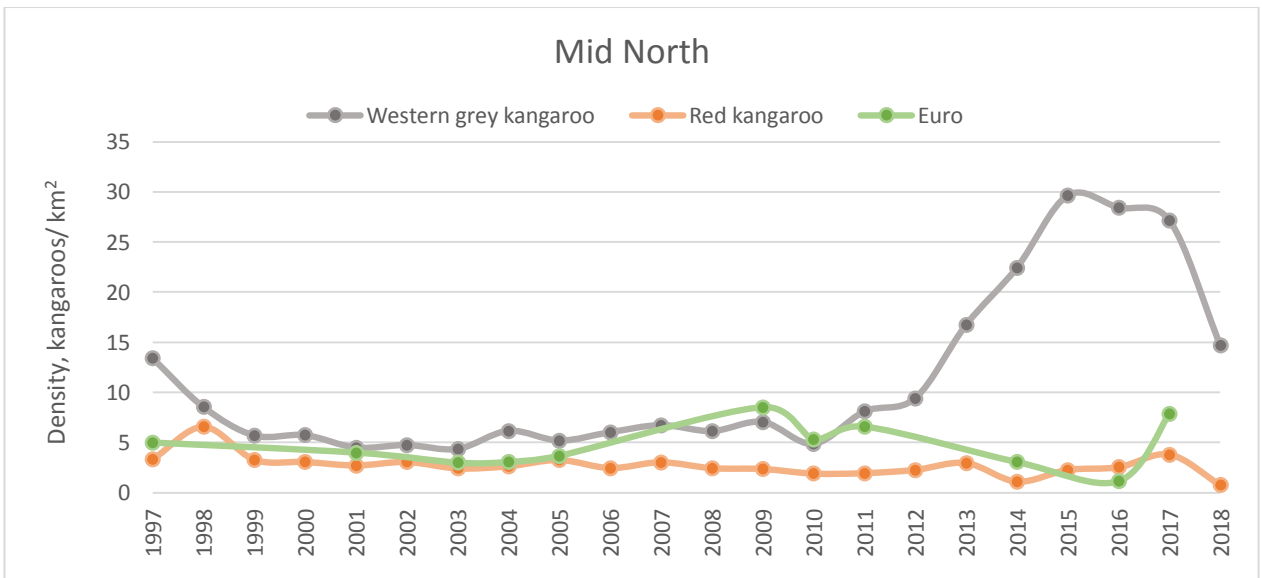
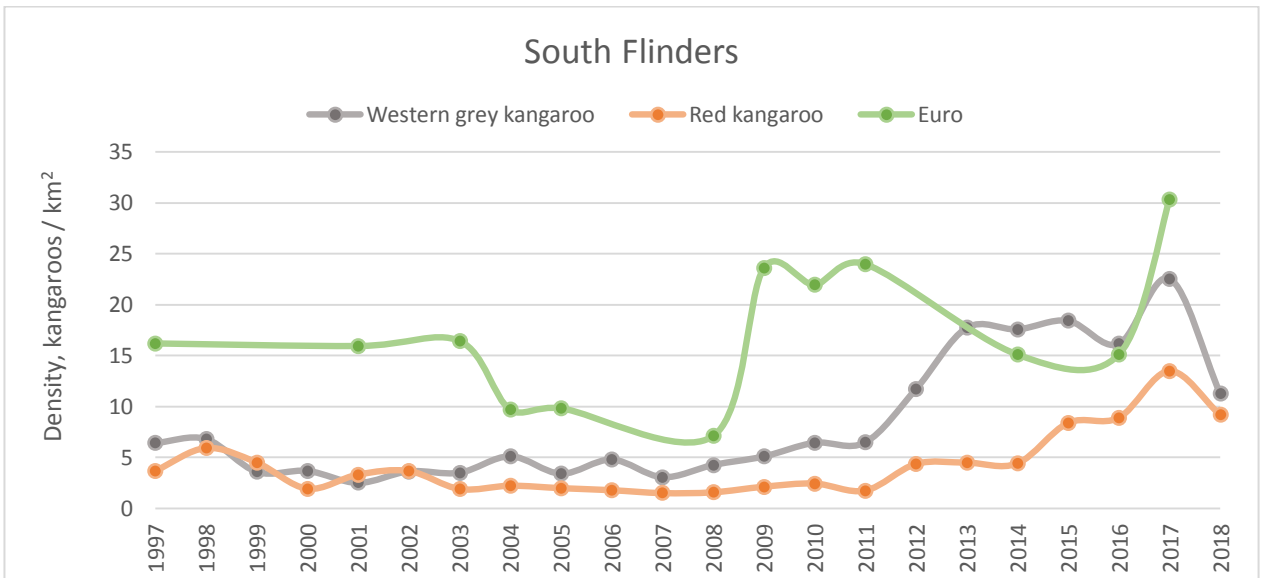
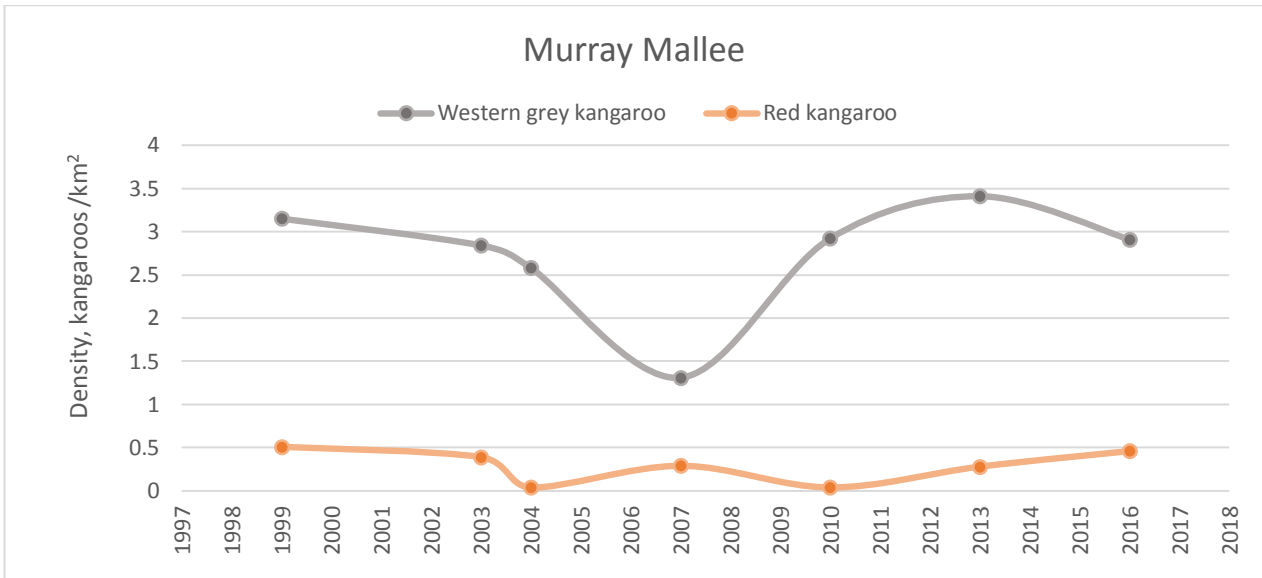
12 SUB-REGIONAL KANGAROO DENSITY CHARTS

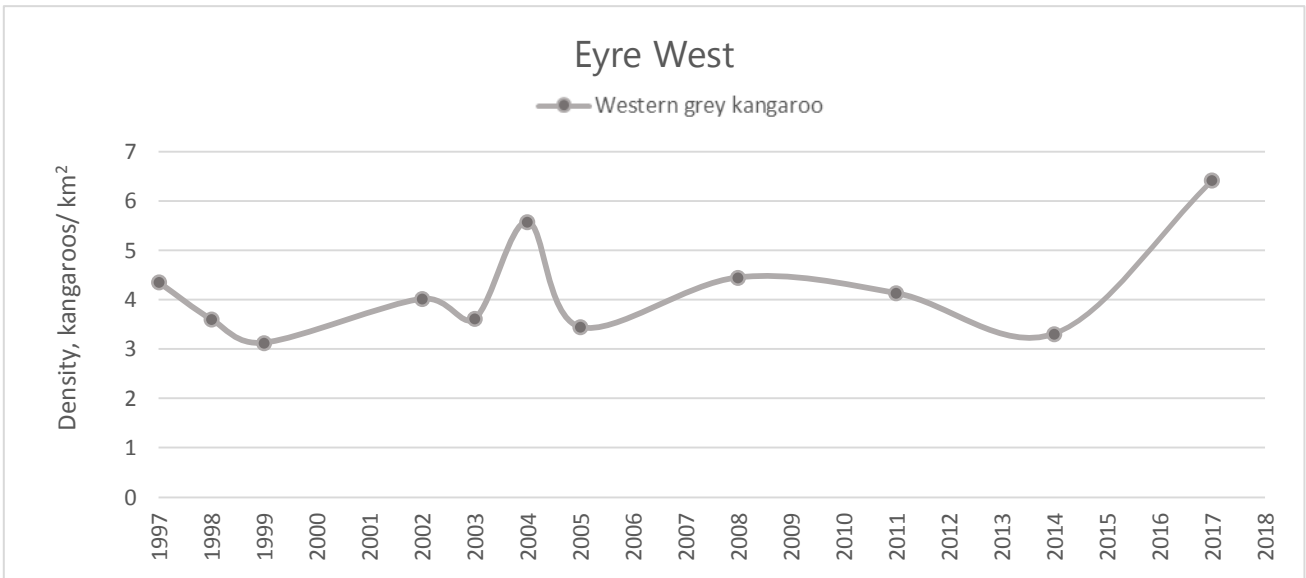
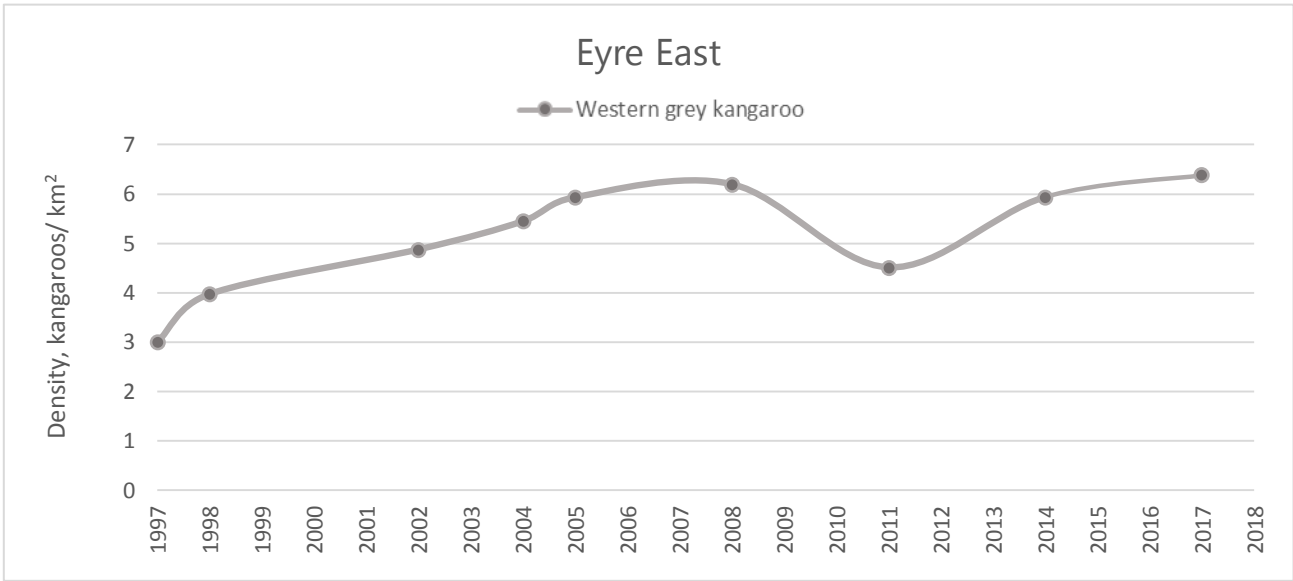
A summary of kangaroo density trends in each harvest sub-region is provided in the following charts.













Government of South Australia
Department for Environment
and Water