



Monitoring kangaroo populations in New South Wales

NSW Commercial Kangaroo Management Program

The main goal of kangaroo management in New South Wales is conservation. Kangaroos are protected by legislation, with exemption for managing overabundant populations and the commercial harvesting of kangaroos, through the granting of licences.

To ensure kangaroo populations remain ecologically viable, only a certain number of kangaroos can be commercially harvested each year. Kangaroo populations are regularly monitored. The 4 commercially harvested species of kangaroo in New South Wales (wallaroos, eastern grey, western grey and red kangaroos) have been regularly surveyed since 1975.

Estimating kangaroo populations

Estimating kangaroo numbers in Australia is challenging due to the large areas over which population sizes are estimated, their lack of contrast with the landscape, the diverse country in which they are distributed, the vehicles available for sampling, and resource limitations.

Surveys from aircraft are currently the most efficient way of estimating kangaroo populations on a large scale. During a population survey, aircraft fly at a specified speed and height over the land along a straight line (transect). Trained observers record the number of kangaroos they see and the distance they are from the transect on each side of the aircraft. This method is known as distance sampling, or line transect sampling.



Four species of kangaroo are commercially harvested in NSW:

1. Wallaroos, 2. Eastern grey kangaroos, 3. Western grey kangaroos, 4. Red kangaroos.

Distance sampling is a well-established method that has been improved and refined over the past 30 years by Australian and international researchers.

Light, wind and vegetation cover affect visibility and accuracy of detecting kangaroos from aerial surveys. The mark-recapture method for counting wildlife helps to address these limitations. Mark-recapture uses estimates taken from two observers independently counting animals along the same transect on the same side of an aircraft. This method accounts for the differences in detection between observers and surveys, across species, group size, vegetation, and other factors that may influence whether or not a kangaroo is counted.

The combination of mark-recapture and distance sampling (MRDS) combines the strengths of both methods and reduces the influence of potential limitations.

Kangaroo population surveys

In New South Wales, there are 15 commercial kangaroo management zones that collectively cover 688,000 km², or 86% of the state. Nine of these zones are on the Western Plains and 6 are on the Tablelands. Survey methods vary slightly to account for differences in terrain and habitats.

On the Western Plains, surveys are undertaken each year using fixed-wing aircraft, with four observers (2 on each side of the plane). Helicopters, with two observers, are used to survey the Tablelands every 3 years. In arid and semi-arid regions (such as the Western Plains), kangaroo numbers can change rapidly over a short time, particularly in response to unfavourable climatic conditions such as drought. In these cases, annual surveys are preferred. However, research shows that in environments with more balanced water availability (such as the Tablelands), these processes occur at a slower pace than in the arid

and semi-arid regions. Therefore, triennial surveys in these regions are considered ecologically accurate and cost-effective in detecting changes in population numbers.

From survey sample to population estimate

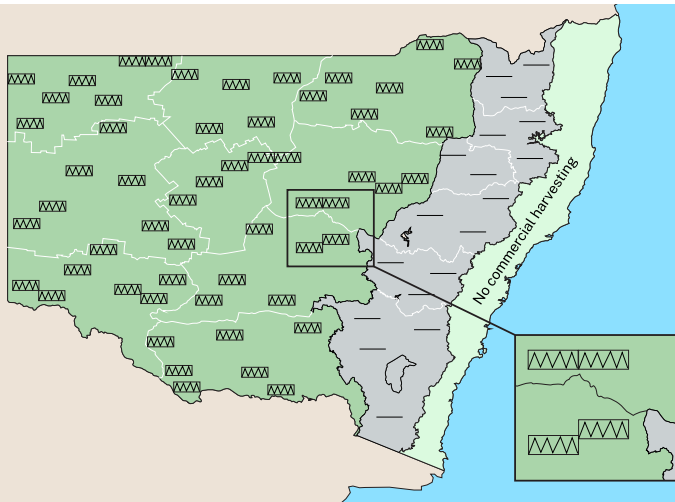
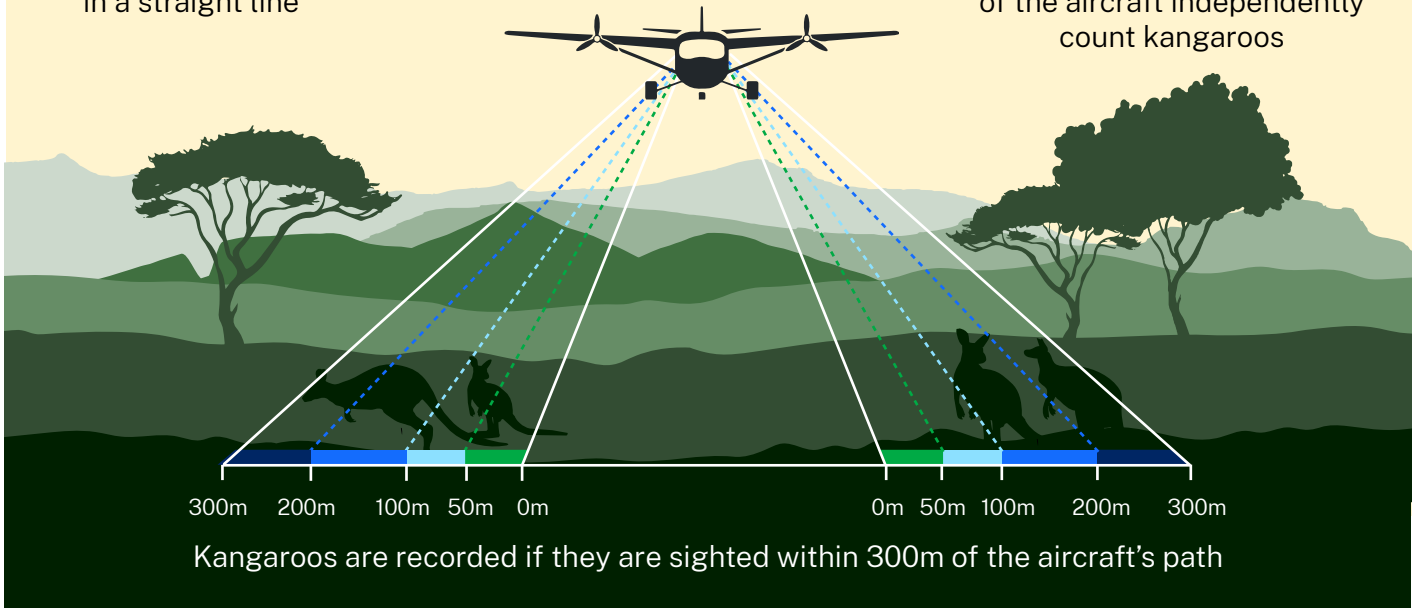
Aerial surveys in New South Wales provide estimated populations for each of the 4 commercially harvested species of kangaroo across the 15 commercial kangaroo management zones.

On the Western Plains, observers record the number of kangaroos they see and the distance the kangaroos are from the transect as they fly by light aircraft along pre-determined zigzag transects (160 km long), recording kangaroos within 56 randomly allocated blocks (20 km x 50 km each). These counts are used to estimate the density of kangaroos within representative sample areas and are then used to predict the total number of kangaroos in each zone.



Aircraft travels
in a straight line

Two observers on each side
of the aircraft independently
count kangaroos



There are **15** commercial kangaroo management zones in NSW

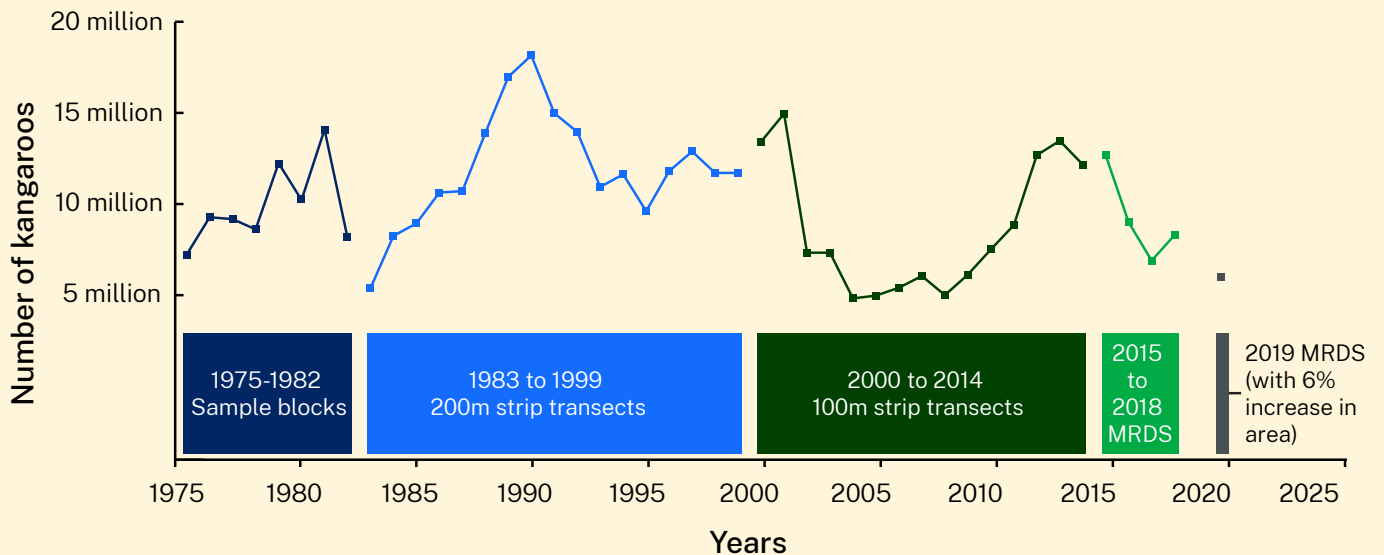
10,000 km
is flown in 4–6 weeks

Each sample area is 20 km × 50 km

Aerial surveys follow a
160 km zigzag transect

Monitoring methods to assess Western Plains kangaroo populations

Scientifically proven methods have been developed to ensure surveys are able to robustly estimate changing kangaroo populations.



On the Tablelands, observers record the number of kangaroos they see and the distance they are from the transect as they fly by helicopter along transects that are selected to give a representative and unbiased coverage of the landscape. The survey is not flown in areas with a low likelihood of kangaroos being present, which includes intensive cropping country and steep timbered country with rocky outcrops. The estimated kangaroo densities within the representative sampling areas are then used to predict the number of kangaroos in each zone.

The population estimates are then used to calculate annual harvest quotas for each commercially harvested kangaroo species in each of the 15 harvest zones in New South Wales. Regular population surveys, combined with monitoring the number of kangaroos harvested, support a sustainable kangaroo management program.

During the 45 years of regulating the commercial harvest of kangaroos in New South Wales, there has been no overall decline in kangaroo abundance in areas where kangaroos are harvested.

Advances in monitoring technology

Kangaroo monitoring methods have undergone several refinements since their inception. Each aims to increase certainty around the accuracy of the surveys and therefore the population estimates to provide the most accurate harvesting quota.

The first aerial surveys to estimate kangaroo populations were conducted in 1974. Prior to this, population estimates were not widely performed. Between 1975 and 2000, annual aerial surveys increased from six randomly selected blocks in the inland plains to 15 fixed-wing transect surveys across the breadth of western New South Wales. Since 2016, trained observers have used the MRDS method throughout the Western Plains.

The department keeps track of technological advances that could help monitor and estimate kangaroo populations. New technology to refine monitoring methods is adopted where appropriate. For example, upgrading to the larger Cessna 208 Caravan aircraft enabled additional wildlife observers (4 observers are now used) and the adoption of the MRDS method. Tablets, game controllers and GPS units have increased the accuracy of real-time observations and records.

Photographic, drone and satellite imagery are not yet at the stage where they can be efficiently and cost-effectively used for kangaroo sampling in New South Wales. Human counters outperform thermal or other cameras, particularly when surveying

multiple species. Thermal imaging drones are suitable for some small-scale surveys of wildlife, but limitations, such as their restricted range, make them unfeasible for broad-scale surveys. There is some momentum behind developing artificial intelligence to automate detection using imagery captured from drones. This may provide new and useful tools in the future but is not yet at the stage where it can be used for estimating kangaroo populations on an operational scale.

Strong and complementary partnerships between government agencies and researchers are important to the success of long-term wildlife monitoring programs. The NSW Government uses the most applicable and scientifically rigorous methods available, and estimates are regularly reviewed and publicly available.

Estimates of kangaroo populations across New South Wales are available on the department's website (see www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/kangaroo-management/kangaroo-population-monitoring-and-reporting).

How can I find out more?



Online:

www.environment.nsw.gov.au/topics/animals-and-plants/wildlife-management/kangaroo-management

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