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SUMMARY REPORT 2016

# SURVIVAL OF QUOKKAS IN THE 2015 NORTHCLIFFE BUSHFIRE

**In 2015, an intense bushfire burnt through a 98,000 ha area near Northcliffe in southwest Western Australia – an area that was known to support more than 500 quokkas. Post the fires, WWF-Australia in-conjunction with the WA Department of Parks and Wildlife conducted a survey to discover the impact of this event on the quokka population.**

## SUMMARY

Since European settlement, the quokka has been lost from more than 50% of its former range on the mainland of Western Australia. The southern forest now supports the most extensive remaining quokka population on the mainland, and the most genetically diverse population of the species. In 2015, an intense bushfire burnt through a 98,000 ha area near Northcliffe which supported more than 500 quokkas.

In-conjunction with the WA Department of Parks and Wildlife, post fire surveys for quokkas were undertaken across the area. In all, transects covering 252 kms were walked in search of fresh quokka scats. The fire resulted in a loss of approximately 500 animals from within the fire area. Only 39 quokkas are known to remain across the 98,000 ha area in pockets that were not so severely burnt. In the unburnt area surrounding the fire, the density of quokkas was unexpectedly high, with an estimate for one site of 36 quokkas per hectare. It is thought that additional animals have survived the fire by fleeing.

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Quokkas are occupying post fire habitats where there is a complex vegetation structure with a sedge dominated understorey, low feral pig damage, and proximity to unburnt canopy. These findings can be linked to thermoregulatory requirements and predator avoidance behaviours that have previously been documented for this species.

It is crucial to protect quokkas remaining in and adjoining the fire area in order to support post fire recolonisation of the area. DPaW are targeting predator control around these refuge areas that still support quokkas. Monitoring quokka survivorship and their movements will be done using radio collars and remote sensor cameras.

Intensely burnt forest, showing complete loss of vegetation structure. Western Australia. © KARLENE BAIN / WWF-AUS

Quokka joey (Setonix brachyurus) taking refuge in an unburnt pocket within a midly burnt area, Western Australia.
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## BACKGROUND

The quokka (*Sentonix brachyurus*), one of the smaller macropod species, is endemic to Southwest Australia[1]. While once widespread and abundant, there has been a dramatic decline in their numbers since European settlement and they are now restricted to small areas of the Southwest and two offshore islands. Their area of occupancy is thought to have been reduced by 50% over the past century[2]. The decline of quokkas is mostly attributed to the introduction of predators (red fox and cat) and land clearing. They are listed as Vulnerable by the Australian Government and by the IUCN (2015).

Quokkas on the mainland have recently been further threatened by a large fire which occurred across a significant area of their range in February 2015. The Northcliffe fire burnt an area of 98,000ha making it the biggest fire Western Australia (WA) has experienced since 1960[3].

## SURVEYS

Urgent surveys have been undertaken for quokkas in the Northcliffe fire area to assess what animals remain and what immediate threats need to be addressed. Several groups of animals have been found well within the fire area, surviving in areas that burnt under milder conditions than the surrounding landscape. Other animals have been found around the fire edge and these animals are critical for future re-colonisation of the fire-affected area, as the habitat recovers.

A total of 126 sites were selected to survey, based on areas occupied prior to the fire and areas adjacent to the fire with quokka habitat. Each site was surveyed for presence or absence of quokkas during a single summer-autumn period between February and June 2016. Presence was determined by walking a 2 km transect at each site and recording the occurrence of fresh faecal pellets within 2 m of the transect. A series of habitat attributes were recorded every 200 m along each transect.

[1] Kitchener, D. J. (1995). Quokka (*Setonix brachyurus*). In: 'The Mammals of Australia, Second Edition.' (Ed R. Strahan.) pp 401–403. (Australian Museum and Reed New Holland: Sydney.)

[2] Woinarski, J., Burbidge, A., Harrison, P. (2014). 'The Action Plan for Australian Mammals 2012.' (CSIRO Publishing: Victoria.)

[3] Department of Fire and Emergency Services (2015) Major Incident Review of the Lower Hotham and O'Sullivan fires. Government of Western Australia, Perth.

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## RESULTS

Of the 43 burnt sites known to be occupied by quokkas prior to the fire, only 10 of these (23%) were occupied post fire and seven of these were immediately adjacent to the fire edge, adjoining unburnt vegetation. It is estimated that these 43 sites supported more than 500 quokkas and the survey found that only approximately 39 quokkas remain. However some quokkas may have survived the fire by fleeing to unburnt areas. One site in unburnt forest near the fire edge supports 36 quokkas per hectare which is an extremely high density, not previously recorded.

The probability of habitat being occupied by quokkas in the fire area is dependent on the structure of the vegetation and, in particular, the number of vegetation layers. Of the sites that were occupied, 100% contained habitat with three vegetation layers or more (maximum 7 layers), while habitats with two or fewer vegetation layers were never occupied. Vegetation structure is a habitat feature that has previously been found to be important for quokkas in this region[4].

## DISCUSSION

Intense fire behaviour was recorded for the Northcliffe fire and this was associated with loss of much of the vegetation across the 98,000 ha. The fire resulted in the loss of 33 known sites where quokkas were previously recorded (77 %) and all quokka activity within the burnt area is now restricted to the edge of the fire or a small number of internal sites. In these internal sites quokkas are now isolated and existing in marginal, and in some cases, unsuitable habitat.

These internal sites are likely to be critical for the recolonisation of core areas of the fire, however the refuge patches are in most cases smaller than 0.5 ha and surrounded by intensely burnt ecotypes. This makes animals surviving here highly vulnerable to factors such as feral predators with an increased risk that they may not survive to recolonise areas further afield.

[4] Bain, K., Halley, M., Barton, B., Wayne, A., McGilvray, A., Wilson, I., and Wayne, J. (2016). Survival of quokkas in Northcliffe bushfire of 2015: understanding the impact of intense and broad scale fire on an important population of quokkas in the southern forest. (unpublished).

It is unknown how these small isolated groups of quokkas will survive and behave in comparison to the larger, less constrained groups outside of the fire area. In some ways the current situation in the Northcliffe fire area is similar to the population structure of quokkas occurring in the northern jarrah forest, where the metapopulation is no longer considered functional. In the northern jarrah, quokkas have more constrained movement patterns that are seemingly highly governed by introduced predators[5]. It is possible that the quokkas isolated in these now fragmented refuge patches within the Northcliffe fire area may exhibit a similar modification to their spatial use patterns in response to resource availability, refuge and predator pressures, until the burnt area can recover.

Australian fauna is adapted to fire, but the scale and intensity of fire is important and has implications for the long term suitability and connectivity of habitat to maintain species. Large scale and homogenising bushfires are becoming more frequent as a result of drying climate, drier and more combustible vegetation, a higher prevalence of summer lightning strikes and increasing human populations in the rural-urban interface[6]. This creates challenges for the protection of habitats that are important for threatened species and the maintenance of landscape level habitat connectivity.

We currently have limited knowledge of the factors limiting recolonisation and survival of quokkas in the Northcliffe fire area. These factors are expected to include:

- the impact of feral predators on the survivorship and mortality of quokkas in the fire area;
- the impact of feral pigs on vegetation structure and habitat quality;
- the spatial use, movement patterns and behaviours of quokkas that have been isolated in refuge patches within the fire and how this affects survival and recolonisation;
- the carrying capacity of habitat and how this is affected by an influx of individuals following a fire of this scale; and effects of the fire on sympatric species.
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Conservation actions and additional research will be undertaken in partnership with the Department of Parks and Wildlife so that these questions can be answered.

[5] Hayward, M. W., de Tores, P. J., Dillon, M. J., and Banks, P. B. (2007). Predicting the occurrence of the quokka, *Setonix brachyurus* (Macropodidae: Marsupialia), in Western Australia's northern jarrah forest. *Wildlife Research* **34**, 194-199.

[6] Department of Fire and Emergency Services (2015) Major Incident Review of the Lower Hotham and O'Sullivan fires. Government of Western Australia, Perth.