

Supplementary Material

Effectiveness and costs of helicopter-based shooting of deer

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Appendix S1. Descriptions of the sites at which we conducted our study

Queensland sites

Our three sites containing chital deer were all in the Einasleigh Uplands bioregion of the North Queensland Dry Tropics. The area consists of Open Tropical Savannah Woodland (Fig. 2a), characterised by *Eucalyptus* spp. and *Corymbia* spp. interspersed with patches of Tussock Grassland and *Acacia* and *Melaleuca* thickets (Forsyth *et al.* 2019; Fig. 2b). The climate is semi-arid tropical with summer-dominant, but variable, rainfall (Watter *et al.* 2019). All three sites were in severe drought during our study.

New South Wales sites

Fallow deer were the dominant species at all four NSW sites, but red deer were observed in the aerial surveys (and shot in the subsequent shooting operations) at the WT site. Other deer species were occasionally seen in aerial surveys (or shot) at some other sites, but were <0.1% of observations or kills and are not reported here.

The WT site consists of steep to undulating grazing country and black-soil plains used for cropping (cotton, maize, sorghum, canola, wheat and barley). The site is surrounded in the east by the western side of the Great Dividing Range and by the Liverpool Ranges in the south. The vegetation on the steeper and higher-elevation lands is dominated by modified native grasslands used for livestock (cattle and sheep) grazing, rising up into native Grassy Woodlands, with patches of Northern Warm Temperate Rainforest near the divide and occasional Sclerophyll Woodlands in the drier west (Office of Environment and Heritage 2017). This site was in severe drought during our study (N. Davis *et al.*, unpublished data).

The GI site (New England Tablelands) is pastoral hill country, with cattle and sheep being the dominant livestock. Valley bottoms are typically Open Grasslands, with Riverine Forest along the larger creeks. Slopes and ridges are dominated by Grassy Woodlands and Dry Sclerophyll Forests (Office of Environment and Heritage 2017). This site was in severe drought during our study.

The MDG (Fig. 2b) and PB sites are rolling hill country, with livestock grazing (cattle and sheep) being the dominant land uses. The MDG site has an area of Dry Sclerophyll Forest, but otherwise consists of Grassy Woodlands and Grasslands (NSW Office of Environment and Heritage 2017). In the south, this site adjoins

vineyards and a thoroughbred training property. The MDG site was in severe drought during our study.

The PB site contains areas of improved pasture and cropping (lucerne and oats) in the lower, fertile valley bottoms. Slopes and ridges are dominated by Grassy Woodlands and Dry Sclerophyll Forests (NSW Office of Environment and Heritage 2017). For further information on vegetation types in the NSW sites, see NSW Office of Environment and Heritage (2017).

ACT site

The ACT site contains native grasslands, *Pinus radiata* plantations, and areas of native woodland [primarily Red Stringybark (*Eucalyptus macrorhyncha*) – Scribbly Gum (*Eucalyptus haemastoma*) – Red-anthered Wallaby Grass (*Rytidosperma pallidum*) Tall Grass–Shrub Dry Sclerophyll Open Forest on the loamy ridges, and Grassy Woodland (Armstrong *et al.* 2013; ACT Government GeoHub 2018)]. There are also relatively open areas of improved pasture grazed by cattle and sheep.

South Australia site

Gum Lagoon Conservation Park is characterised by broad plains with discontinuous sand dunes and Shallow Ephemeral Wetlands. The vegetation is dominated by *Banksia ornata* shrubland, *Melaleuca brevifolia* low-shrubland, *Eucalyptus arenacea* Open Woodland, and Open Mallee (*Eucalyptus diversifolia*). For further details on this study area, see Department for Environment and Heritage (SA) (2005).

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Figure S1. Ivlev functional response curves fitted to aerial shooting operations targeting fallow and chital deer in eastern Australia. The orange function was estimated using the combined dataset of fallow deer and chital deer operations whereas the blue function was estimated using fallow deer operations only. Shaded polygons show the 95% credible interval for each function.

