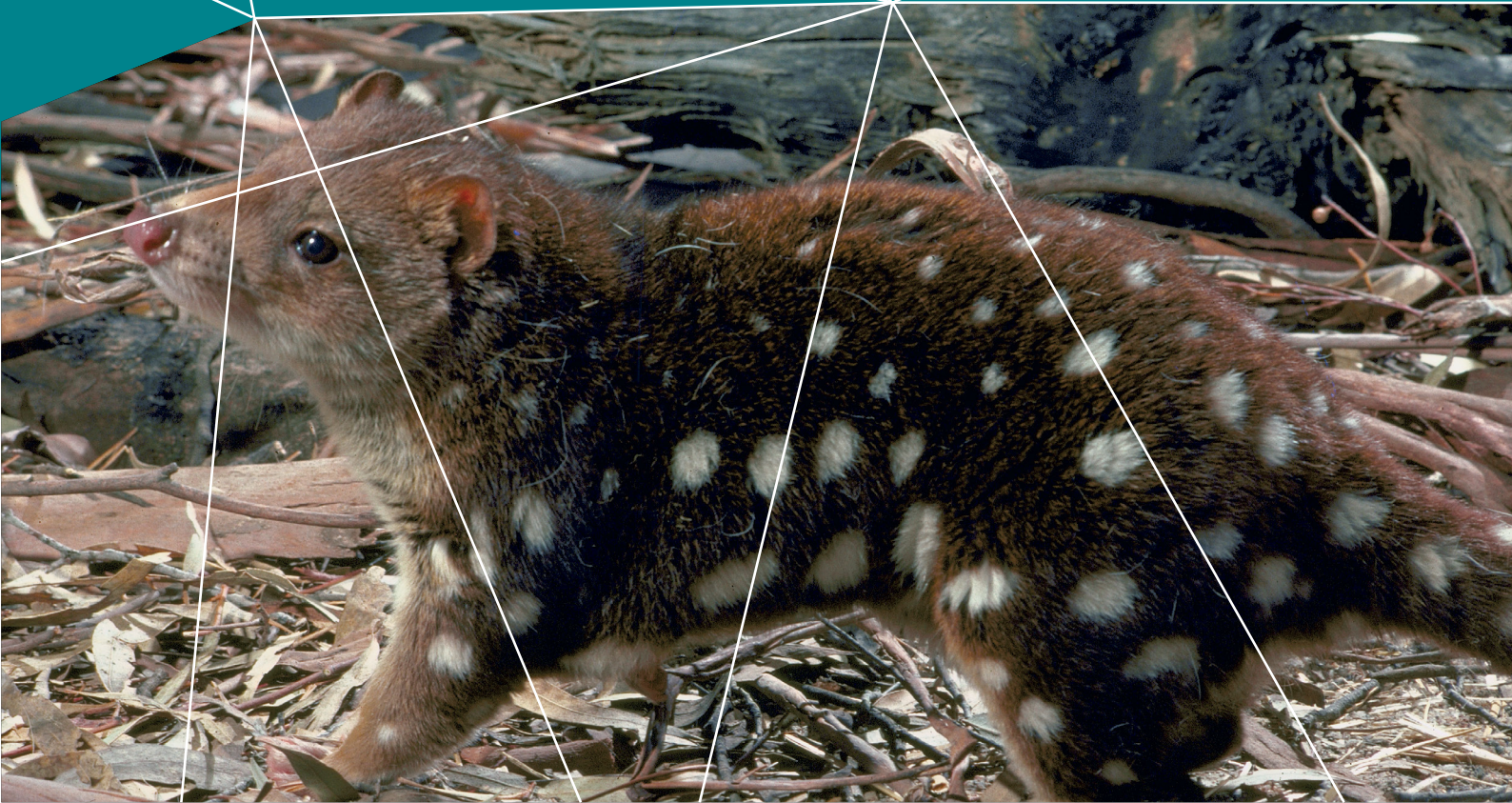


ACTION PLAN

SPOTTED-TAILED QUOLL *DASYURUS MACULATUS MACULATUS*



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PREAMBLE

The Spotted-tailed Quoll (*Dasyurus maculatus*, Kerr, 1792) was declared a Vulnerable species in the ACT on 4 September 2003 (Instrument No. 265 of 2003 under the [Nature Conservation Act 1980](#)). Under section 101 of the Nature Conservation Act 2014, the Conservator of Flora and Fauna is responsible for preparing a draft action plan for listed species. The first action plan for this species was prepared in 2005 (ACT Government 2005). This revised edition supersedes the earlier edition.

An action plan outlines conservation and protection proposals for the species or community concerned or proposals to minimise the effect of threatening processes. The primary objective is to maintain for the long term, viable, wild populations of each species (or samples of the ecological community) as components of the indigenous biological resources of the ACT.

This revised action plan incorporates information underpinning the National Recovery Plan for this species that was subsequently published in 2016 (DELWP 2016) and other recent research findings. While the legal authority of this action plan is confined to the Australian Capital Territory, management considerations are addressed in a regional context.

CONSERVATION STATUS

There are two described subspecies of the Spotted-tailed Quoll (*Dasyurus maculatus*). The subspecies that occurs in the ACT and is the subject of this action plan is *D. maculatus maculatus*, while *D. maculatus gracilis* is restricted to north-eastern Queensland. Hereafter references to *D. maculatus* or Spotted-tailed Quoll in this action plan pertain to *D. maculatus maculatus* which is variously also known as Spot-tailed Quoll, Tiger Quoll, Tiger Cat and Spotted-tailed Native Cat.

Dasyurus maculatus is listed internationally as Near Threatened on the IUCN Red List 2017-3 (previously Vulnerable 1996). Nationally it is listed as Endangered under the [Environment Protection and Biodiversity Conservation Act 1999](#) and as threatened in every state and territory in which it occurs:

Australian Capital Territory: Vulnerable - [Nature Conservation Act 2014](#).

New South Wales: Vulnerable - [Biodiversity Conservation Act 2016](#).

Victoria: Threatened - [Flora and Fauna Guarantee Act 1988](#) and is considered Endangered on the Advisory List of Threatened Fauna 2013 (DSE 2013).

Queensland: Vulnerable - [Nature Conservation Act 1992](#).

Tasmania: Rare - [Threatened Species Protection Act 1995](#).

South Australia: Endangered - [National Parks and Wildlife Act 1972](#), but is considered to be extinct in that state (DEH 2004a).

SPECIES DESCRIPTION AND ECOLOGY

DESCRIPTION

Dasyurus maculatus is a marsupial carnivore endemic to eastern Australia. Male *D. maculatus* have a head and body length of 380–760 mm, a tail length of 370–550 mm and weigh up to 7 kg (average 3 kg). Females have a head and body length of 350–450 mm, a tail length of 340–420 mm and weigh up to 4 kg (average 2 kg). The fur ranges from rich rufous brown to dark above while pale below. The large size and conspicuous white spots of varying size over the body and tail distinguish it from other quoll species (Edgar and Belcher 1995) (Figure 1).

Figure 1. Spotted-tailed quoll (*Dasyurus maculatus*)



DISTRIBUTION

Dasyurus maculatus maculatus occurs from southern Queensland through to south-western Victoria and Tasmania (Figure 2) but it has declined across its former range in both distribution and abundance since European settlement. Populations have become fragmented and isolated and estimates of the decline range from 50 – 90% (Jones *et al.* 2001) for the mainland generally and 25 - 50% for the population in NSW (Lunney *et al.* 2000).

Within the ACT both *D. maculatus* and *D. viverrinus* (Eastern Quoll) were present up until the mid-1800s and quolls were regularly seen in the Tidbinbilla Valley. One historical reference from 1892 refers to a carpet python that was caught “with a tiger cat inside it” (Higgins 2009).

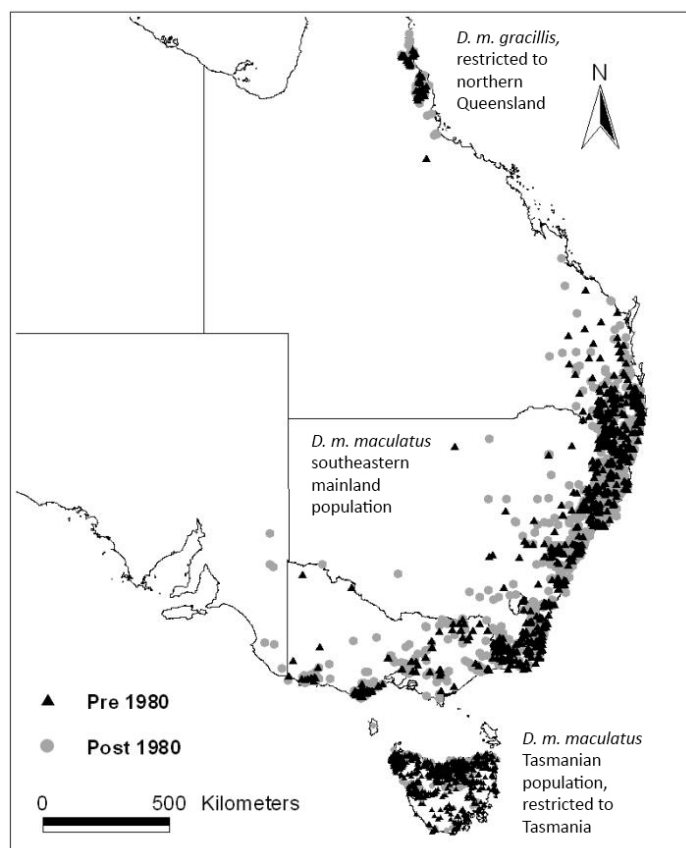
The introduction of strychnine to the Canberra district in 1861 is believed to have led to quolls being widely poisoned (Allan Fox and Associates 1987). By 1971, *D. viverrinus* was considered to be extinct in the district (National Parks Association of the ACT 1971) and on the mainland as a whole (Maxwell *et al.* 1996). At this time, *D. maculatus* was recorded as occurring mostly in the timbered ranges of the ACT, including Tidbinbilla Nature Reserve.

A survey conducted in 1999 and 2000 by Environment ACT failed to record the species in the ACT (Nelson *et al.* 2001). *Dasyurus maculatus* scats were collected in May 2002, as part of a regional survey in Kosciuszko National Park, on the NSW-ACT border at Sentry Box Mountain at the southern end of Namadgi National Park (ACT Wildlife Atlas). In 2003 and 2004 during a search for quoll latrine sites, scats of the species were collected in the Gudgenby and Orroral Valleys in Namadgi National Park (ACT Wildlife Atlas). The most recent record of a scat collection is from 2006 in the Scabby Range area (ACT Wildlife Atlas).

Occasional sightings of *D. maculatus* continue to occur across the ACT and surrounding region and there have been 29 confirmed sighting records (live or dead) and a further 32 records (hair, scats or DNA) of *D. maculatus* in the ACT since the 1950s (ACT Wildlife Atlas) (Figure 3).

More recently there has been an average of one incidental animal sighting per year since 2005 but no confirmed scats have been recorded since 2006. This low detection rate is despite several return surveys in the Scabby Range area (T Stubbs pers. com.) as well as an intensive scat survey paired with wildlife cameras placed on potential latrine sites in the Gudgenby area in 2013 (ACT Government unpublished report).

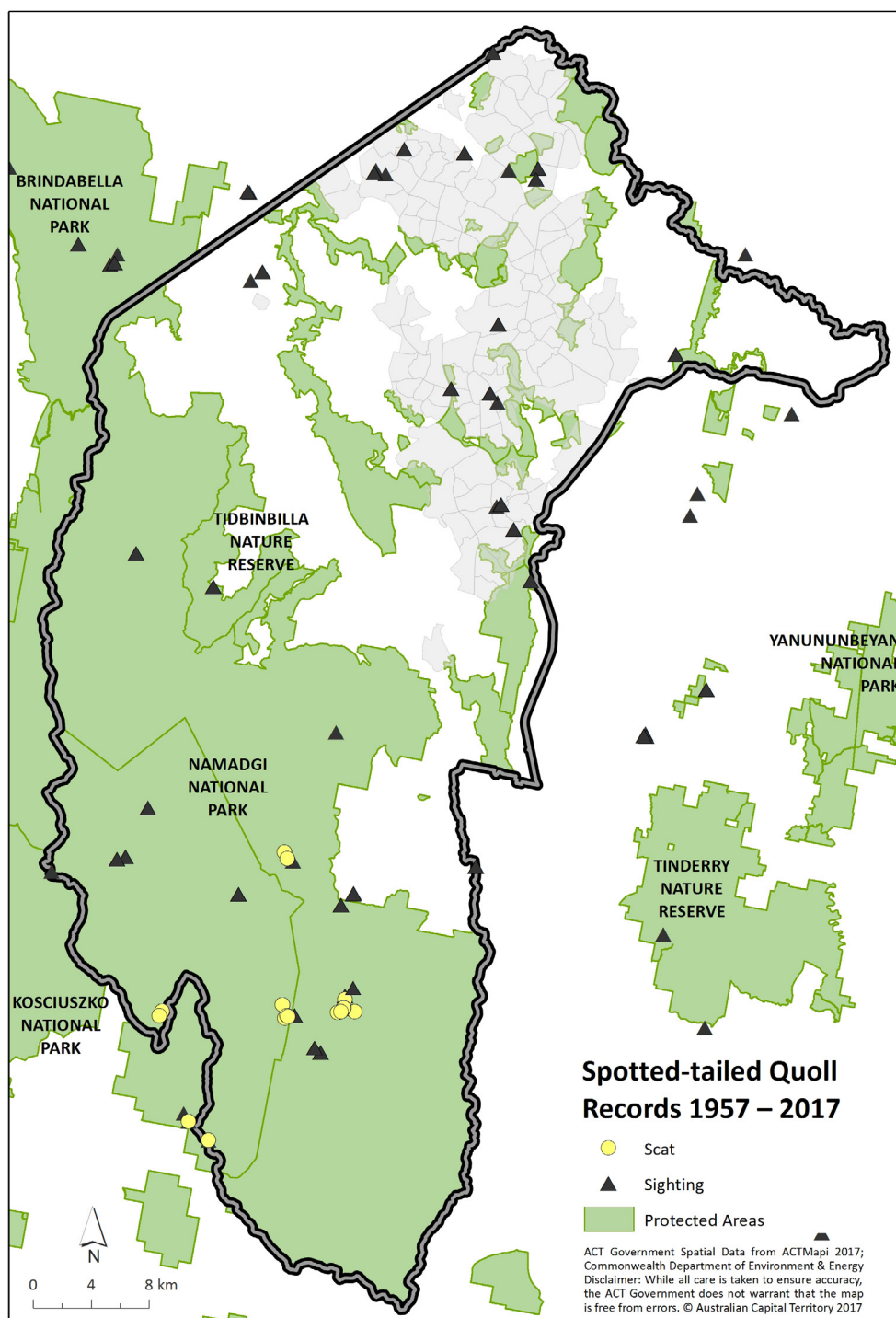
Figure 2. Distribution of the Spotted-tailed Quoll (DELWP 2016).



While *D. maculatus* populations in and around the ACT have declined, strongholds of the species remain in the adjoining Kosciuszko National Park (KNP) in NSW. An annual survey has been conducted since 2002 in the Lower Snowy and Byadbo areas of KNP and the adjoining Merriangaah area further to the east. In just one walked transect of 3 km during the most recent survey in 2017, some 60 latrines were found with several containing more than 30 scats (NPWS unpublished data).

Dasyurus maculatus sightings in the ACT since 2005 and recorded in the ACT Wildlife Atlas have largely been during May to August and are usually young males. It is likely that these are individuals dispersing across the landscape from nearby areas rather than evidence of an endemic ACT population. Andrew (2005) showed that the species is capable of covering large distances in a short period of time, with animals recorded moving at least 8 km in a day and 19 km in a week.

Figure 3. Records for Spotted-tailed Quoll in the ACT region 1957 – 2017. Data from ACT Wildlife Atlas (ACT Government) and NSW BioNet (NSW Office of Environment and Heritage).



HABITAT AND ECOLOGY

Dasyurus maculatus occupies a broad range of habitat types throughout its geographic distribution. This includes rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas (Green and Scarborough 1990; Belcher 2000; Jones and Barmuta 2000; Andrew 2005).

The home ranges of *D. maculatus* vary in size from several hundred to several thousand hectares with female home ranges smaller and generally not overlapping. *Dasyurus maculatus* use multiple dens (possibly in excess of 20) and regularly move between them (DELWP 2016). Recorded den sites include rock crevices, hollow logs, hollow tree buttresses, tree hollows, windrows, clumps of vegetation, caves and boulder tumbles, under buildings and underground burrows, including those of rabbits and wombats (DELWP 2016). Female *D. maculatus* will dig burrows when a suitable substrate is available (Andrew 2005).

Dasyurus maculatus is primarily a carnivore that preys on medium-sized mammals including possums, gliders and rabbits. Other prey includes small mammals, birds, reptiles and invertebrates (Belcher 1995). It is also known to prey on domestic poultry and to scavenge on carrion (Edgar and Belcher 1995).

THREATS

Aspects of the biology and ecology of *D. maculatus* render them especially susceptible to threatening processes. They are obligate carnivores, they typically occur at low densities, the adults are solitary and they occupy large home ranges. They have a relatively short lifespan and a low overall reproductive output, with some females breeding only once or twice during their lives (DELWP 2016).

The National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016) lists the major threats to the species as modification, fragmentation and loss of habitat, timber harvesting, poison baiting, competition and predation from introduced carnivores, deliberate killing, road mortality, bushfire and prescribed burning, poisoning by Cane Toads, and climate change.

Competition from introduced carnivores and inappropriate fire-regimes pose the biggest threats to sustaining a viable population of *D. maculatus* in the ACT.

Control of foxes and careful management of fire will be the focus of management programs aimed at this goal.

In regard to the impact of 1080 baiting on *D. maculatus* populations, the National Recovery Plan notes that the results of several studies (Körtner *et al.* 2003; Körtner and Watson 2005; NRW 2006; Claridge and Mills 2007; Körtner 2007) indicate that under field conditions *D. maculatus* are probably not as susceptible to fatal poisoning as predicted by laboratory measurements of their sensitivity to 1080 (McIlroy 1981) and trials conducted using non-toxic baits (Belcher 2000; Murray and Poore 2004; Claridge *et al.* 2006). This is supported by the persistence of apparently robust populations of *D. maculatus* in areas with a history of regular aerial and/or ground baiting (Körtner *et al.* 2003; Körtner & Watson 2005). However, it is also clear that some individual *D. maculatus* are poisoned during control operations (Belcher 2003; Körtner and Watson 2005; NRW 2006) and in areas where *D. maculatus* populations are small, fragmented or declining, even small elevated mortality rates may affect the viability of populations. Other factors such as the history, seasonal timing, frequency or intensity of baiting, or the type of bait used, may also alter the susceptibility of populations, although these factors remain largely untested (Körtner *et al.* 2003; Körtner and Watson 2005; Claridge and Mills 2007).

No single threat or habitat preference can be advanced to explain why there is no longer an endemic *D. maculatus* population in the ACT, particularly since the use of strychnine was prohibited. Elsewhere relatively high densities of *D. maculatus* have been recorded over a range of both wet and dry forest habitats. Aerial baiting programs have not been conducted in the ACT and ground baiting using buried (not mound) baits is highly targeted. Doing this reduces uptake by *D. maculatus* since they are less inclined to dig for food than are introduced canids (Glen and Dickman 2003). Canid Pest Ejectors (CPE), containing the same amount of 1080 poison as a single meat bait, are also used in some areas of the ACT for targeted fox and dog control programs. While *D. maculatus* are capable of triggering CPEs, in a small trial in Kosciuszko National Park, *D. maculatus* were observed investigating CPEs but no activations by the species were recorded (Hunt 2010).

Major habitat disturbance caused by the 2003 wildfires in NSW and the ACT did not diminish *D. maculatus* populations beyond the very short term at Byadbo in southern NSW where about 30% of individuals were known to survive the immediate impact of a severe bushfire (Dawson 2005) and the population recovered quickly.

However, a short return interval for fire (either planned or unplanned) may negatively impact on *D. maculatus* if it results in fewer hollows, which are a key resource for *D. maculatus* and also for their prey, especially in areas where rock den sites are rare or absent.

Research has shown that habitat critical to the survival of the *D. maculatus* includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (Belcher 2000; Belcher and Darrant 2006; Glen and Dickman 2006a, b). While the former exists within the 110,000 hectares of Namadgi National Park in the ACT, it is possible that the levels of competition for prey, particularly by foxes, could be a major contributing factor to low *D. maculatus* population levels (DELWP 2016).

CONNECTIVITY

The substantial area of forested habitat in Namadgi National Park connects with other protected forested areas within the ACT such as Tidbinbilla Nature Reserve and the river corridors. Namadgi National Park also adjoins Kosciuszko National Park to the west and south, and there are connections to Tinderry National Park and escarpment parks in the east. In total about 19% of the region covering south east NSW and the ACT is in protected (and mostly well connected) areas of forested habitat. The continuing annual sightings of *D. maculatus* are an indication that they are moving through the landscape, although the tendency of female *D. maculatus* to exhibit philopatry (Firestone *et al.* 1999; Belcher 2003; Andrew 2005) may limit establishment of new populations.

CHANGING CLIMATE

The predicted changes in climate in the next 50 years are likely to see the ACT become warmer and drier, with increases in extreme weather events and bushfire risk (ACT Government 2016). Species that tolerate such conditions will have an advantage over those species more sensitive to change. The direct effects on *D. maculatus* are not known but higher frequency of both planned and unplanned fire (shorter intervals since fire) could result in a loss of habitat diversity or an advantage to another species competing for prey. Determining the likely impact of climate change on *D. maculatus* is an objective of the National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016).

MAJOR CONSERVATION OBJECTIVES

The overall conservation objective of this plan is to maintain in the long-term, suitable habitat conditions that will support an endemic population of *D. maculatus* in the ACT and contribute to regional and national conservation of the species.

Specific objectives of the action plan (Table 1) are to:

- Maintain habitat diversity within the ACT and connectivity with suitable adjoining habitat to the east and south of the ACT.
- Minimise adverse impacts of management actions on *D. maculatus* by ensuring that pest predator baiting programs and planned fires comply with best practice procedures for the species and its key habitat features.

The National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016) contains objectives and actions that aim to reduce the rate of decline of the species nationally. The objectives of this plan align with the national objectives that are relevant to the ACT. As a member of the National Recovery Team, the ACT will contribute to the implementation of the other national objectives where possible.

CONSERVATION ISSUES AND INTENDED MANAGEMENT ACTIONS

PROTECTION

Dasyurus maculatus fills a key ecological role as the largest marsupial carnivore endemic to mainland Australia. Population strongholds exist in adjoining areas of south east NSW, though an endemic population does not appear to exist in the ACT and the species is listed as Vulnerable in both jurisdictions. Despite a long history of infrequent sightings in the ACT, a resident population remains a goal rather than a reality.

In a paper titled “Why are there so many Spotted-tailed Quolls in parts of north-eastern New South Wales?” (Glen and Dickman 2011) the authors explore the question of why *D. maculatus* remains abundant in parts of north-eastern New South Wales, while populations in many other areas have declined or disappeared.

They conclude that the major contributing factors to the abundance of *D. maculatus* in their study area were:

- High densities of hollow-bearing trees which help to support prey populations.
- Maintaining an abundance of fallen timber which provides shelter and movement pathways for *D. maculatus*.
- Low density of foxes in the study area.

The National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016) concludes that it is currently not possible to define (or map) habitat critical to their survival and that given the threatened status of *D. maculatus*, all habitats within its current distribution (Figure 2) that are known to be occupied are considered important. The plan concludes that there is currently insufficient information to identify potential habitat that the species may recolonise or to which it could be reintroduced.

SURVEY, MONITORING AND RESEARCH

The status of *D. maculatus* as Vulnerable in the ACT (Endangered nationally) and their role as a 'top order' predator will attract a priority in survey, monitoring and research programs.

To date there has been no regular structured monitoring program for *D. maculatus* in the ACT and monitoring has relied instead on opportunistic sightings usually related to road kills or occasional sightings in suburban backyards. A simple monitoring technique used elsewhere relies on annual inspection for scats at the distinctive rock formations likely to be used as latrine sites. This requires minimal resources of at most, several days per year during early Spring at the most likely sites which are those where there are existing records of scats e.g. the Gudgenby area and the Scabby Range. This could be undertaken concurrently with other monitoring programs or could be a project for volunteers in the Citizen Science program. Larger, more comprehensive surveys in potential *D. maculatus* habitat will be conducted approximately every 10 years in an effort to detect populations of the species in the ACT.

Cooperation will be encouraged with regional and national networks to ensure coordination of research, survey and monitoring programs.

MANAGEMENT

Consistent with the findings of Glen and Dickman (2011) above, management programs will aim to maintain a high density of hollow-bearing trees which help to support prey populations and an abundance of fallen timber which provides shelter and movement pathways for *D. maculatus*. Long term fox control programs are vital to reduce competition for prey.

COMMUNITY ENGAGEMENT AND AWARENESS

The solitary and elusive nature of *D. maculatus* means that the community can supplement any formal monitoring effort. Increasing public awareness of the species and its important ecological role is likely to assist in detection of the species and the public will be encouraged to report sightings.

IMPLEMENTATION

Implementation of this action plan will require:

- Land planning and land management sections of the ACT Government to take into account the conservation of threatened species as part of all their activities.
- Allocation of adequate resources to undertake the actions specified in this action plan.
- Collaboration with researchers to facilitate and undertake required research and monitoring.
- Engagement with the community, where relevant, to assist with monitoring and other on-ground actions, and to help raise community awareness of conservation issues.

OBJECTIVES, ACTIONS AND INDICATORS

Table 1 Objectives, Actions and Indicators

(NRP Obj # = corresponding Objective in the National Recovery Plan for the Spotted-tailed Quoll [DELWP 2016])

Objective	Action	Indicator
1. Protect habitat features required to support a viable wild population of <i>D. maculatus</i> in the ACT. (NRP Obj 1)	Maintain habitat complexity particularly close to suitable denning features such as complex rock outcrops – see Glen and Dickman (2014).	Habitat complexity is maintained.
	Maintain forested links with adjoining protected areas containing <i>D. maculatus</i> to the east and south of the ACT.	Connectivity is maintained with protected areas adjoining the ACT.
2. Manage potential threats to <i>D. maculatus</i> and monitor the occurrence of the species in the ACT. (NRP Obj 1, 5 & 6)	Undertake pest predator control activities using best practice prescriptions to minimise the risks of baiting programs on <i>D. maculatus</i> .	Pest predator control activities comply with best practice prescriptions.
	Consider the possible benefit to <i>D. maculatus</i> of control programs targeted at pest predators, particularly foxes.	The benefit to <i>D. maculatus</i> of pest predator control programs is considered.
	Implement fire management prescriptions that protect key habitat features for <i>D. maculatus</i> such as rocky outcrops and hollow bearing trees.	The frequency and severity of planned fires in likely <i>D. maculatus</i> habitat are compatible with an appropriate fire regime for the species.
	Undertake surveys for <i>D. maculatus</i> in the ACT. This could involve scat searches at historic latrine sites with more widespread, comprehensive surveys approximately every 10 years.	Surveys for <i>D. maculatus</i> are undertaken and reported.
	Record and collate all evidence of the species in a suitable database. Follow up reliable evidence by undertaking site visits and surveys of likely extant populations.	All evidence of <i>D. maculatus</i> is recorded in a suitable database and reliable recent sightings are followed up.
3. Improved understanding of the species' ecology, habitat and threats. (NRP Obj 2)	Undertake or facilitate research on habitat requirements, techniques to manage habitat, and aspects of ecology directly relevant to conservation of the species.	Research undertaken and reported and where appropriate applied to the conservation management of the species.
4. Improve coordination with regional and national networks to ensure coordination of research, survey and monitoring programs. (NRP Obj all)	Ensure policies and management programs are consistent with the National Recovery Plan for the Spotted-tailed Quoll.	Consistency with National Recovery Plan.
	Maintain links with networks and participate in joint programs.	Participation with networks and consistency with contemporary survey and monitoring protocols.
5. Promote awareness of and strengthen community engagement in the conservation of the species. (NRP Obj 11)	Undertake community awareness activities particularly aimed at encouraging reporting of sightings.	Awareness and interest in <i>D. maculatus</i> amongst the community results in continuing feedback of reliable records.
		Platforms designed to collect community data are maintained (e.g. Canberra Nature Map).

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