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Report on the environmental impacts of the Tarran Valley rezoning

Expertise and context
I am a Postdoctoral Research Fellow at the University of Melbourne within the School of BioSciences, in a research group which forms part of the broader National Environmental Science Program's Threatened Species Hub and Centre of Excellence for Environmental Decisions. We are funded by the Australian Department of the Environment and Australian Research Council to carry out research that supports transparent and robust conservation decisions, particularly in relation to threatened species. This group hosts some of the world's premier researchers in the fields of population and distribution modelling, optimal monitoring and environmental decision making. As part of my role I carry out research into conservation in highly modified 'marginal' habitats in urban and agricultural landscapes. I employ both empirical approaches and modern quantitative modelling tools and elements of decision theory to answer questions relating to population dynamics, habitat associations, and connectivity conservation.

I hold a Bachelor of Science (Ecology Honours) from Monash University (2007), and a PhD in Landscape Ecology from the Australian National University (2012). I carried out my PhD within the Conservation and Landscape Ecology group, and focussed on the conservation value of roadside reserves and farmland in the central west New South Wales wheat-sheep belt. As part of this work I carried out extensive field surveys of box-gum-grassy-woodland vegetation and the associated woodland bird, microbat, and native bee communities. I have supervised a Masters student whose research explored the population viability of brush-tailed phascogales and sugar gliders in a region of north-central Victoria which includes the Tarran Valley site, and have myself completed a project on prioritising conservation actions on private land in the area for woodland birds with the Connecting Country group. I visited the site for approximately an hour on the 1st November 2015 to get a sense of the vegetation condition and structure and the habitat features represented, but did not conduct a formal survey of any kind.

Throughout my PhD and postdoctoral research I have worked closely with experts on the impacts of housing developments on wildlife (Dr. Karen Ikin), the value of scattered trees in rural landscapes (Prof. Joern Fischer), conservation offsets (Assoc. Prof. Brendan Wintle, Assoc. Prof. Philip Gibbons and Dr. Martine Maron), the ecology of swift parrots (Dr. Dejan Stojanovic) and box-ironbark forests (Prof. Andrew Bennett), the impacts of noisy miners (Dr. Martine Maron), and species distribution modelling (Dr. Jane Elith and Assoc. Prof. Brendan Wintle) whose work I am very familiar with and will draw on in my report. I have also been provided with and read the following material:

- Gary Cheers, September 2003: Flora and fauna assessment, proposed development site, Castlemaine-Maldon Road, Maldon.
- Ern Perkins, November 23 2008, Proposed Maldon Subdivision plant list
- Tim Read, undated: Statement of concern regarding the proposed Tarran Valley development and subdivision proposal 2008.

- Gary Cheers, March 2014: Updated Ecological Assessment of Tarran Valley Development Area Castlemaine-Maldon Road.
- Lincoln Kearn (Practical Ecology), 30 April 2014: Expert witness report to the Bushfire Management Overlay Standing Committee – Amendment C36 Mount Alexander Planning Scheme.
- DEPI, 7 May 2014: Submission to the Bushfire Management Overlay Consultation 2013 Standing Advisory Committee – Mount Alexander Planning Scheme Amendment C36.
- DTPLI, 12 June 2014: Amendment C36 to the Mount Alexander Planning Scheme Panel Report (section 7, "biodiversity and native vegetation impacts" only).
- DELWP, 2015, Submission to the Tarran Valley Rezoning Advisory Committee.
- Coliban Water, 10 September 2015: Letter to Con Tsotsoros regarding Tarran Valley Rezoning Advisory Committee.
- Sweett (Australia), 14 September 2015: Initial submission to the Rezoning Advisory Committee, Amendment C36 Tarran Valley.
- Mount Alexander Shire Council, 14 September 2015: Initial submission to the Rezoning Advisory Committee, Amendment C36 Tarran Valley.
- DPCD, 29 October 2015, Mount Alexander Planning Scheme.
- Debra Worland, undated: Advice on the significance of land at Tarran Valley, Maldon-Castlemaine Road, Maldon as habitat for Swift Parrots.
- Joint Statement (DEPI, Council, CFA, Proponent), undated: Joint statement regarding draft development plan, Tarran Valley, Maldon (Mount Alexander PS Amendment C36).

I perceive five key environmental issues relating to the Tarran Valley rezoning based on my reading of the above background material and my expertise, which I discuss in detail below. These are i) DELWP have stated that 'no net loss' is not achievable for Tarran Valley, ii) DELWP modelling is based on biased data and estimates an unknown value, iii) The environmental impacts of housing developments are not limited to vegetation clearing, iv) The habitat features that the site provides should not be underestimated, and v) Rezoning will have impacts on critically endangered Swift parrot habitat.

I) DELWP have stated that 'no net loss' is not achievable for Tarran Valley

Biodiversity offsetting is a contentious conservation tool that aims to counterbalance losses of biodiversity in one place by generating equivalent 'like-for-like' biodiversity benefits elsewhere. Although offsetting in principle as a concept appears straightforward, in practice it is fraught with issues associated with time lags, compliance (Gibbons and Lindenmayer, 2007), and calculation of perceived benefit (Maron et al., 2013b). Irrespective of how stringent a policy is with regards to like-for-like offsetting of biodiversity, in the deepest biological sense fulfilling this requirement is an approximation (Walker et al., 2009). This issue becomes particularly concerning when it is threatened species habitat that we are trading. We are generally certain that we will lose habitat from clearing, but the uncertainty of the future of the offset site is high – studies that have attempted to account for this uncertainty have found that offsets multipliers need to be set 10s to 100s times higher (i.e. 10-100 ha of offset for every 1 ha lost) to ensure there is actually 'no net loss' over time (Moilanen et al., 2009).

The current 'Permitted Clearing of Native Vegetation - Biodiversity Assessment Guidelines' (September 2013) specify that offsetting is required to achieve at a minimum no net loss of native vegetation. In addition, specific offsets are required for species where the proportional impact for a threatened species will be >0.005%. This proportional impact is calculated as:

"site (condition X area of habitat mapped X importance score of the mapped habitat) /
whole of state (condition X area of habitat mapped X importance score of the mapped habitat)"

Given the issues with the modelling used to calculate ‘importance’ scores (see next point below), we cannot interpret what this value of 0.005 actually represents. What is clear, however, is that for the four species that the DELWP mapping system have deemed require a specific offset, there is not enough additional habitat available in the landscape to offset the losses that the Tarran Valley development will incur (DELWP 2015). Hence, the Tarran Valley case represents an alarming situation where offsetting the impacts of clearing is actually inappropriate and/or unachievable.

The following list of such situations (truncated here) was compiled from the research literature (Business and Biodiversity Offsets Programme (BBOP), 2012; Maron et al., 2012; Pilgrim et al., 2013) by Dr. Yung En Chee at the University of Melbourne. Points iii is relevant to the case of Tarran Valley, as well as point i if the Swift parrot is considered (see below):

i. the impacted entity (e.g. species/community/ecosystem) is critically endangered, and any further loss will increase its risk of extinction;
ii. the impacted entity is unique and irreplaceable;
iii. the impacted entity has a highly restricted distribution, occurring only at a few sites or populations and is effectively irreplaceable because there are no or too few viable offset sites outside the area affected by the project;
iv. the impacted entity is in good to excellent condition and there are few, if any opportunities to make gains at available offset sites via enhancement;
v. the background rates of loss for the impacted entity are low and there are few, if any opportunities to obtain gains at available offset sites through averted loss.

In light of the fact that an offset cannot be identified even under modest expectations about what is acceptable, this rezoning cannot proceed and remain in line with current Victorian government policy.

II) The DELWP modelling is based on biased data and estimates an unknown value

Since the 2013 changes to policy relating to native vegetation in Victoria, clearing approval decisions have been predominantly based on data and mapping products produced by the Department of Environment, Land, Water, and Planning, including those relating to risk, strategic biodiversity priorities, and vegetation condition. The maps which underpin these products are species distribution models, or predictions of where a species occurs in the landscape.

‘Species distribution modelling’ is a huge and rapidly evolving field of research which involves building statistical models based on presence-absence survey data (Guisan et al., 2013). Recent methodological developments mean that these models can now also be built from what is known as ‘presence only’ data – we know where a species was observed, but not where someone surveyed but did not see it (Elith et al., 2006). These are the type of data contained within the Victorian Biodiversity Atlas and which form the basis of the models in the DELWP NaturePrint system. These models are also associated with a series of well-recognised problems – namely, bias in the location of records (Phillips et al., 2009). People tend to go out and

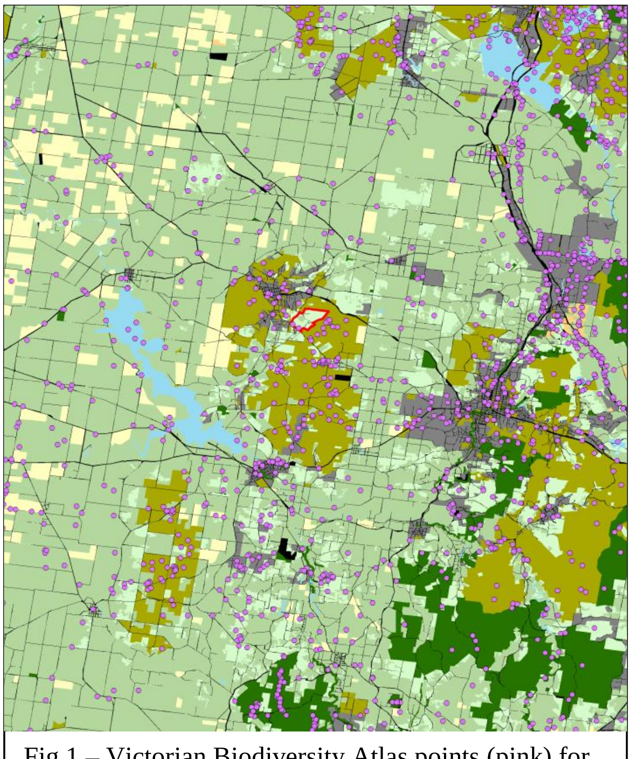

Fig 1 – Victorian Biodiversity Atlas points (pink) for the area around the Tarran Valley site (in red). Points are clustered in urban areas (grey), along roads (black lines) and in protected areas (dark green) and public forests (khaki).Few points fall within farmland (pale green and yellow) record species in easily-accessible areas close to roads, or in towns and nature reserves, and not on private land (see Figure 1 for an example of this in the area around Tarran Valley). In turn, the models tend to produce predictions that the best habitat for a species is close to roads, and in reserves and towns – some of my own research has demonstrated that this can lead to the systematic undervaluing of marginal habitats in agricultural areas (Lentini and Wintle, 2015). My direct supervisor Assoc. Prof. Brendan Wintle recently carried out a technical review of the DELWP habitat models and has confirmed that, in spite of the best attempts of DELWP researchers to correct these problems using best-practice approaches, scant and biased data are still a large problem for many of the species being modelled. As is the case for many areas of ecological modelling 'rubbish in, rubbish out'.

Because the models are based on presence-only data they cannot tell us what the probability of a species occupying an area are, as presence-absence models can. Instead they yield 'relative likelihoods'. In real-world terms, this means that instead of being able to say a site with a model score of 0.5 has a 50% chance of being occupied by a phascogale (Figure 2), all we can say is that it has twice the likelihood of being occupied as a site with a score of 0.25. Worse still, when the data that inform these models are biased, as they are in this case, the values of the models are no longer even relative, but ranks. So a site scored as 0.5 is better than 0.25, but how much better we can't say (Guillera-Arroita et al., 2015). Hence, using these values to indicate how much of a species' habitat remains is illogical, and comparison between species models is impossible: a site can score 0.5 for both a phascogale and a frog, but that can mean completely different things.

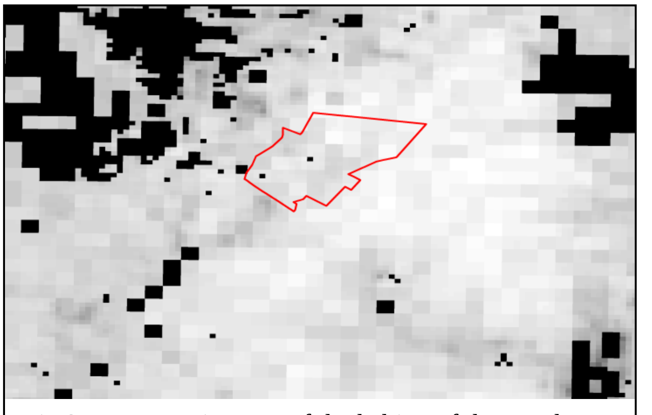

Fig 2 – NaturePrint map of the habitat of the Brush-tailed phascogale *Phascogale tapoatafa* around the Tarran Valley site, showing the range of modelled values (whiter colours indicate better habitat).

One means of accounting for some of these issues is the incorporation of uncertainty into decision-making (Guisan et al., 2013). The maps being used at the moment are essentially the best-guesses of the model, but there will also be maps which show the highest possible and lowest possible values based on a certain level of confidence. Where a site has a high level of uncertainty, we need to be extremely careful in accepting the model prediction as the 'truth', but at the moment this is exactly what is being done even though we are have no sense of how much error sits behind the predictions. Another means of knowing how much faith we can put into the models are evaluation techniques (Liu et al., 2011) which provide some measure of the ability of the model to discriminate 'good' and 'bad' sites, and test just how good its predictions are. Even though DELWP researchers have carried out this evaluation step (Liu et al., 2013), as far as I'm aware no models have been discarded from the system on the basis of poor performance.

As the saying goes: all models are wrong, some are useful. In this case, the models produced by DELWP may be useful in helping to determine the species one could hope to find at a site and the importance of it compared to others, but should not be the final determining factor when deciding how much habitat needs to be offset for a given species. The models will also not tell you what the effects of habitat clearing will be on the area immediately surrounding the site, as I discuss next.

III) The environmental impacts of housing developments are not limited to vegetation clearing

From my reading of the supporting material, it appears that the consideration of environmental impacts of the Tarran Valley development is limited to the clearing of native vegetation which forms habitat for threatened species on the site. However, recent research has indicated that the impacts of housing developments stretch well beyond the immediate area of clearing. These factors must be borne in mind given that the site sits directly adjacent to a public forest.

What first struck me during my visit to the site was the diversity of woodland bird species present. These communities have been shown to have declined rapidly in Victoria due to clearing of woodlands for agriculture, the impacts of which have been exacerbated by drought (Mac Nally et al., 2009). In addition, it was exceptional that Noisy miners (*Manorina melanocephala*), a hyper-aggressive species of native honeyeater that have been shown to supress communities of small-bodies woodland birds (Howes et al., 2014; Mac Nally et al., 2012; Maron et al., 2013a), were not present. This is in spite of the fact that Noisy miners are associated with forest edges, Eucalypts and particularly Yellow gums, and areas with low rainfall (Oldland et al., 2009; Thomson et al., 2015). In theory, the site should have been perfect for Noisy miners, but instead the bird community is dominated by declining species such as robins, honeyeaters, treecreepers and whistlers, which stands testament to its habitat value.

This habitat value is likely to be compromised by the rezoning and development beyond just the area that is cleared. In their paper "Key lessons for achieving biodiversity-sensitive cities and towns" Ikin et al. (2015) emphasize as Lesson 1 that "*The effects of urbanization on wildlife extend into adjacent habitats. We recommend retaining large, undisturbed areas of habitat away from development, avoiding intensive development adjacent to important conservation areas, prioritizing areas of ecological and social significance, screening light and noise pollution at the urban fringe and around large nature reserves, and planting appropriately provenanced locally native species for public streetscapes, parks and gardens*". Studies from Canberra have demonstrated that communities of small, migratory and woodland-dependent bird species become more depauperate with increased proximity housing (Rayner et al., 2015), and that the effects of suburban areas can penetrate at least 250m into adjacent reserves (Ikin et al., 2014, Figure 3). Additional factors that have not been considered in the case of the Tarran Valley site include the direct mortality that domestic pets and especially cats will cause for wildlife occupying the forest, and sensory pollution caused by increased noise and light (Patricelli and Blickley, 2006). In essence, to suggest that accounting for vegetation loss alone will offset the impact that the development will have on the Maldon-Muckleford environment is to ignore best available scientific advice and evidence.

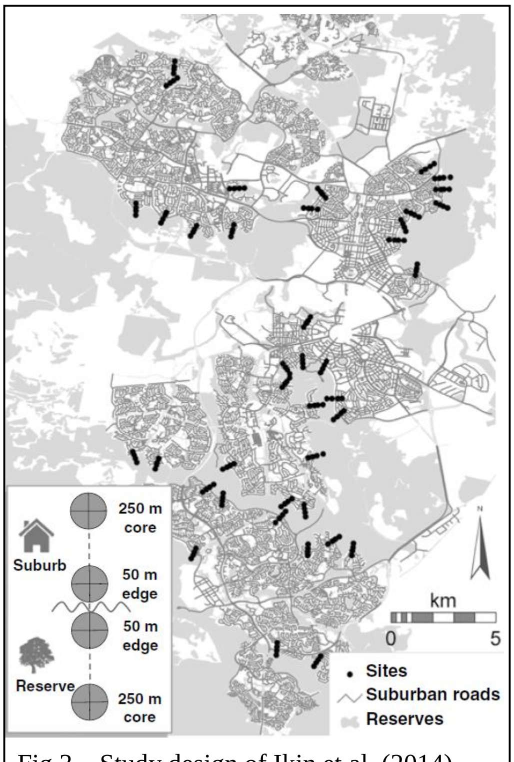

Fig 3 – Study design of Ikin et al. (2014)

IV) The habitat features that the site provides should not be underestimated

There are a number of features of the site which are currently being downplayed in the environmental assessments.

Firstly, streamlines run to the north-west and south-east of the site, and remain relatively well vegetated. Gullies and associated small ephemeral streams such as these can influence the resistance, resilience and stability of faunal communities to drought (Haslem et al., in press), and need to remain a conservation priority free from the impacts of nearby development. Nimmo et al. (in press) suggest that by protecting native vegetation in productive areas of landscapes along stream systems, we can enhance the resistance of biota to climatic extremes. The streams within the site are likely to be making an important contribution in supporting the diversity of fauna recorded, as well as increasing the incidence of Eucalypt flowering events.

The DELWP risk-based pathways approach deems that the clearing of individual paddock trees (Figure 4) or smaller patches, which actually constitute the majority of clearing applications, are "low risk" for biodiversity. However, research in the past decade has demonstrated that these elements are actually of great importance to fauna in rural landscapes. Scattered trees and small patches have been shown to not only provide habitat for a range of bird, mammal and invertebrate species (Fischer and Lindenmayer, 2002; Haslem and Bennett, 2008; Law et al., 2000; Lentini et al., 2011), including threatened species such as the Superb parrots (Manning et al., 2004), but they also increase the permeability or connectivity of the landscape by acting as "stepping stones" (Fischer and Lindenmayer, 2002). These elements actually provide disproportionate value given the area they occupy (Fischer et al., 2010a), and are key habitat elements in semi-natural open areas (Hanspach et al., 2011). Individual scattered trees are also in rapid decline across agricultural regions, through both legal and illegal clearing and a lack of regeneration, and thus form elements of the landscape which are greatly at risk (Fischer et al., 2010b; Gibbons et al., 2008). It has been noted that the site to be cleared at Tarran Valley supports medium-aged scattered Eucalypts as well as regeneration, a phenomenon which is absent from sites which have been subject to excessive inputs or grazing pressure and are 'too far gone' to recover naturally (Fischer et al., 2009) – this shows it has the capacity and resilience to bounce back from past land uses. These trees will become the large, old, scattered trees of the future and replace the current generation which is in rapid decline only if they are allowed to remain standing.

Fig 4 – A large old Yellow Gum on site flowering in spite of the dry condition during my visit in early November

V) Rezoning will have impacts on critically endangered Swift parrot habitat

Swift parrots *Lathamus discolor* were observed foraging at the site during Gary Cheers' 2003 surveys, and a statement made by local expert Debra Worland states that she believes that it contains important habitat for this species, yet no specific offset is because the proportional impact is deemed to be <0.005%. This is deeply concerning for a number of reasons.

The Swift parrot is one of Australia's most endangered birds. It has undergone severe population declines since European settlement and as of October 2015 its status has been upgraded to Critically Endangered on the IUCN Red List (the world's foremost conservation authority), which is the final category before a species is declared extinct. Recent modelling has indicated that the population is likely to decline by a further 87% over the next three generations (12-18 years, Figure 5). The reasons for this decline are twofold: the ongoing loss of both nesting and foraging habitat, and nest predation by sugar gliders introduced to Tasmania (Stojanovic et al., 2014). I shall focus on the former.

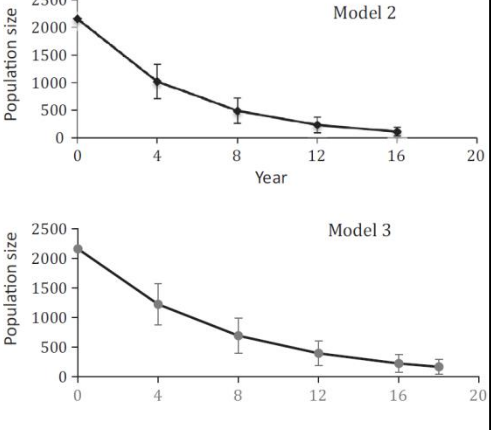

Fig 5 – Predictions of population decline for the Swift parrot in coming years. Source: Heinsohn et al (2015)

Part of the difficulty in conserving the Swift parrot is that it is nomadic: it breeds in Tasmania, then crosses to the mainland over winter to feed. Where exactly its feeds and breeds year to year is variable and unpredictable, because the birds respond to patterns of flowering of Eucalypts (Saunders and Heinsohn, 2008) which are renowned for being irregular and unpredictable (Law et al., 2000). Because of this, over the course of 10 years the Swift parrot can cover an enormous range (Figure 6), even if it occupies only a tiny proportion of this in any given year. By assuming the parrot is occupying its entire range all the time the Department of the Environment is taking a conservative approach, in that developments occurring anywhere in this area could trigger assessment under the EPBC Act (1999). The same is the case for the Victorian Department of Environment, Land, Water, and Planning. However, this also has the effect that any loss of habitat is perceived to be relatively minor when assessed against the entire distribution – a huge area would need to be cleared to trigger the need for a specific offset, which is obviously undesirable when we are considering the loss of habitat for an internationally recognised, critically endangered species.

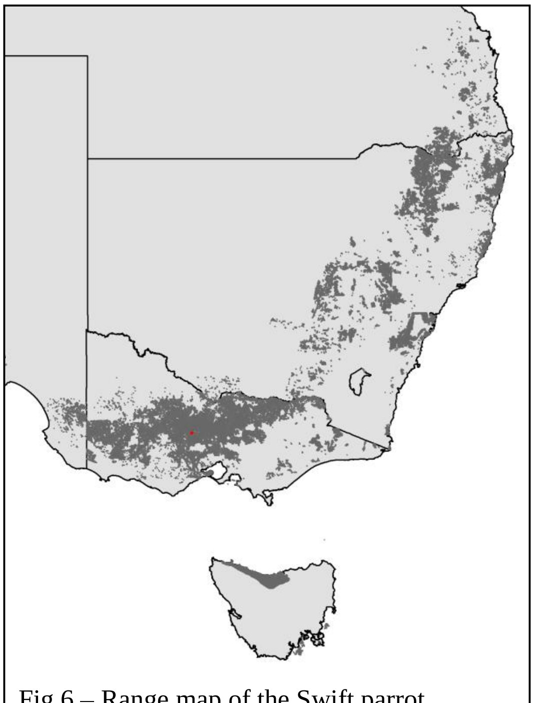

Fig 6 – Range map of the Swift parrot *Lathamus discolor* across Australia. Source: Environment Resource Information Network, Department of the Environment.

The case of the Swift parrot mimics the challenge of conservation for many other nomadic and highly-mobile species (Runge et al., 2014), in that no one area is seen as irreplaceable, so they are set on a course of 'death by a thousand cuts' – this problem has already been recognised for this species in the scientific literature (Allchin et al., 2013). In many cases sites are falsely deemed to be unoccupied during surveys because only limited amounts of time and effort are dedicated to these, which means species go undetected (Wintle et al. 2005). This is especially problematic when the site contains important resources during only part of the year or following particular environmental phenomena such as drought, and has been attributed to the Swift parrot's ongoing decline (Saunders et al. 2007). Webb et al. (2014) have shown that habitat models for the Swift parrot which do not account for imperfect detection and spatial auto-correlation (a statistical phenomenon which stems from the spatial clustering of flowering events) will yield unreliable predictions, which is what is occurring here.

Finally, recent research has demonstrated that Swift parrots have evolved to be nomadic in order to exploit widely dispersed flowering resources as this is closely linked to their fitness and survival (Stojanovic et al., 2015). By continuing to clear habitat that is perceived to be unoccupied or relatively unimportant we are seriously limiting this species' ability to find food across the landscape and across years, which has implications for their ongoing survival. The cumulative impacts of what may seem to be small decisions such as these will be substantial in the long run.

I am happy to provide electronic copies of any of the reference material cited throughout this statement. I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Yours sincerely,

Dr. Pia E. Lentini

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