



Eastern bristlebird *Dasyornis brachypterus monoides*

A summary of recovery effort and future direction for the Eastern Bristlebird

(Dasyornis brachypterus monoides)

July 2018

Prepared by: Threatened Species Program, Conservation Operations, Department of Environment and Science

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Executive summary

The eastern bristlebird (*Dasyornis brachypterus*) is an endangered species that occurs discontinuously in coastal and sub-coastal eastern Australia. Although probably never common since European settlement, the species has declined greatly in the past 30 to 40 years. This population decline has resulted in the fragmentation and contraction of the species distribution to three widely geographically separated populations, generally known as the northern, central and southern populations.

It is estimated that the northern population of this species, which occurs in northern NSW and south-east Queensland (SEQ), has declined by approximately 80% during the past 30 to 40 years.

The largest known population of eastern bristlebirds in SEQ is estimated to consist of 6 individuals (located with the use of a detector dog trained specifically to detect eastern bristlebirds in 2015) on a private property adjacent to Lamington National Park. Unless more populations are discovered recovery of this species will require the reintroduction of captive bred birds into sites with suitable habitat adequately managed to promote their long-term survival.

In SEQ, the eastern bristlebird is threatened by the combined impacts of inappropriate fire regimes and feral predators on a critically small population, and without intervention it is likely the rapid decline will continue. Management actions on sites within national park will be undertaken by QPWS. Healthy Waterways and Catchments (HWC) (formerly known as SEQ Catchments) has previously obtained funding to assist landholders with implementing fire and pest management plans in eastern bristlebird habitat on private property, and it is anticipated that this assistance will continue.

The main objectives of the Department of Environment and Science (DES) Threatened Species Program (TSP) eastern bristlebird project is to recover the northern population of this species to approximately 150 birds in the wild. Actions to achieve this include supporting and facilitating:

1. Population monitoring
2. Breeding birds in captivity for release to supplement wild populations
3. Mitigating threats and enhance habitat

TSP will provide advice to key management stakeholders including QPWS, HWS, local NRM groups and management committees for the Gondwana Forests of Australia World Heritage Area.

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1 Introduction

The eastern bristlebird, *Dasyornis brachypterus*, is listed as endangered in Queensland (*Nature Conservation Act 1992*) and nationally (*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*). The species is restricted to three geographically separate areas along eastern Australia, with the smallest and most northern occurrence in south-east Queensland (SEQ) and adjacent parts of north-east New South Wales (NSW). The population lives in moist areas of mountain ranges within about 100 km of the coast. Most sightings in SEQ have been within localised pockets of relatively open eucalypt forest in close proximity to denser vegetation along creek lines and rainforest.

Without intervention it is likely the rapid decline in this species in Queensland will continue. Staff within the Threatened Species Program (TSP) have been involved with the recovery effort for the eastern bristlebird in SEQ since 1996 (then the Queensland National Parks and Wildlife Service) by conducting surveys, providing expert advice and continuing to coordinate the Eastern Bristlebird Northern Working Group. The over-arching aim of the TSP eastern bristlebird program is to recover the northern population to approximately 150 birds in the wild.

It is estimated that the northern population of this species, which occurs in northern NSW and south-east Queensland (SEQ), has declined by approximately 80% during the past 30 to 40 years. This decline instigated recovery efforts including:

1. Monitoring eastern bristlebird populations in NSW (1999 – present) and Queensland (1996 – 2015)
2. Researching habitat requirements
3. Establishing a captive breeding program (2004)
4. Reintroducing captive bred birds into SEQ (2008)
5. Managing threats

1.1 Background

Although the eastern bristlebird has probably never been abundant in either northern New South Wales or SEQ, the northern population has undergone both a dramatic population decline and range contraction (Holmes 1989, 1997 and 1998; Rohweder 2000, 2005, 2006, 2007, 2008 and 2012; Charley 2015). It is estimated that the northern population of this species has declined by approximately 80% during the past 30 to 40 years (Garnett *et al.* 2011).

Genetic studies undertaken by the University of Wollongong indicated that the northern population form a discrete genetic cluster from the central and southern populations (Martin Elphinstone, pers. comm. ~ 2006). This form is now widely accepted as the northern ultrataxa of the eastern bristlebird, *Dasyornis brachypterus monoides* (Schodde and Mason 1999) and a recognised subspecies in the IOC (International Ornithological Congress) World list by Gill and Donsker (2018).

Population estimates prior to 1988 are not available, however, it is known that several populations have become extinct including at Cunningham's Gap and Mount Cordeaux both in Main Range National Park, Queensland, the "Big Scrub" in the Northern Rivers region of New South Wales and on the Dorrigo Plateau in New South Wales. Since 1988 and particularly since the mid-1900's a number of significant sub-populations have disappeared or declined sharply. In NSW, a significant proportion of the Richmond Gap population on the Lamington Plateau has been lost to changing habitat quality brought about by a lack of regular fire to maintain these habitats (D. Charley, pers. comm., 2015). Populations have also been lost on Mount Gipps adjacent to the border fence, at Cougal, Green Pigeon, The Pinnacle and Bald Knob. The only exception to this decline is near Cougal where recent surveys have relocated one pair thought to be have been extinct and the discovery of two new pairs (D. Charley, pers. comm., 2015).

The largest number of eastern bristlebirds known to have occurred in northern NSW and SEQ was 154 birds found by Holmes at Spicers Gap at Main Range National Park during surveys conducted in 1988 (Holmes 1989). In the subsequent 10-20 years this population decreased to less than 50 individuals (Homes 1997; Rohweder 2005, 2007 and 2008).

In South East Queensland the eastern bristlebird is threatened by the combined impacts of inappropriate fire regimes and feral predators on a critically small population. Various levels of management effort have been implemented over the years. When there were wild birds at Spicers Gap (prior to 2008) in the Main Range National Park QPWS managed the site for fire and pests, but no targeted management has occurred since the birds became locally extinct there. Very little targeted management has occurred at Conondale National Park and the population on Lamington Plateau now only occurs on private property. Because this property is adjacent to Lamington National Park, QPWS do occasionally assist with burning. There has not been any assistance with feral animal control.

In 1996 the Threatened Species Program commenced eastern bristlebird surveys in response to growing public concern over the decline of this species.

1.2 Habitat requirements

The broad habitat requirements of the eastern bristlebirds are largely known, being open forest with most of the territories occurring in Regional Ecosystem 12.8.14 or a mixed 12.8.14 with another similar Regional Ecosystem. Regional Ecosystem 12.8.14 is described as a *Eucalyptus eugenioides*, *E. biturbinata*, *E. melliodora* +/- *E. tereticornis*, *Corymbia intermedia*, *E. crebra* woodland. *Allocasuarina torulosa* is a common understorey species. Localised occurrences of *E. laevopinea* and *E. banksii* may occur. It occurs on Cainozoic igneous rocks, especially basalt. Vegetation communities in this regional ecosystem include: 12.8.14a: *E. moluccana* open forest +/- *E. tereticornis*, *E. siderophloia* or *E. crebra*. Understorey is generally sparse but can become shrubby in absence of fire. It occurs on Cainozoic igneous rocks. Woodland of *E. eugenioides*, *E. biturbinata/longirostrata*, *E. crebra*, and *Corymbia trachyphloia*. It occurs on Cainozoic and Mesozoic sediments. Populations have also known to occur in mallee heath *E. approximans*, shrubs, *Gleichenia* spp. and *Gahnia* spp. at Mount Barney (Holmes 1989).

The northern population of the eastern bristlebird is dependent upon the maintenance of grassy Eucalypt forests and woodlands. These forests are highly productive, occur on basaltic ridges and slopes in a region that receives a relatively high and very seasonal annual rainfall. Generally these forests are dominated by a Eucalypt canopy with a diverse grassy ground cover and scattered small shrubs, vine thickets and ferns. It is in this grassy groundcover that the eastern bristlebird forages and builds its nest. Recent successful detection and location of a number of nests indicate that these nests are always constructed in the crowns of tussock grasses such as *Poa* sp., native sorghum and foxtail grass.

1.3 Threats

Habitat loss or fragmentation has been identified as the main reason for the decline of the eastern bristlebird (OEH 2012). The remaining habitat continues to be threatened by invasive weeds such as lantana, crofton weedⁱ, Christmas wattle, foxtail and native shrubs that outcompete and shade out grass tussocks and the grassy ground layer the bristlebirds depend on.

Feral predators can also threaten this species, particularly after fire (OEH 2012). Disturbance from cattle and feral pigs are also likely to affect bristlebird habitat. An integrated and long-term approach is necessary as these threats are intimately linked to the management of fire in these habitats.

Bell Miner associated forest dieback is affecting extensive tracts of forest in northern NSW and southeast Queensland and has been identified as a significant threat to the long-term survival of the open grassy forests of this region. This has the potential to adversely impact eastern bristlebird habitat.

1.4 Strategies for conservation action

The actions in the National Recovery Plan focus on:

1. Improving habitat and threats (manage fire, reduce fragmentation, control feral predators and exotic herbivores, overgrazing and weeds)
2. Improving knowledge of populations
3. Enhancing/augmenting northern populations
4. Researching ecological knowledge gaps, and
5. Increasing community awareness.

In order to restore the eastern bristlebird population in SEQ, numerous conservation actions are required. Most recently the Eastern Bristlebird Northern Working Group outlined the following recovery actions in their 2016 Business Plan (Charley 2015):

- Implement an on-going bi-annual population monitoring and survey program of all territories in Queensland.
- Locate new populations in the wild using specifically trained conservation detector dogs.
- Implement sustainable habitat management.
- Re-assess suitability of available release sites prior to release of captive-bred birds.
- Undertake habitat management (control and removal of invasive weed species) in eastern bristlebird habitats at Mount Gipps, Stretcher Track and Lamington National Park, Queensland.
- Conduct habitat management burns in previously occupied territories at Mount Gipps, Spicer's Gap, Lamington National Park and Main Range National Park in SEQ.
- Implement feral animal control.
- Re-introduce captive-bred birds into suitable habitat and conduct post-release monitoring programs.

1.5 Objectives

The main objectives of the current eastern bristlebird project is to recover the northern population of this species to approximately 150 birds in the wild. Actions to achieve this include supporting and facilitating:

1. Population monitoring
2. Breeding birds in captivity for release to supplement wild populations
3. Mitigating threats and enhance habitat

The long-term benefit from of these actions is the eventual down listing of the endangered eastern bristlebird.

2 Methods

2.1 Population monitoring

The purpose of the population monitoring is to monitor population trends, assess the distribution of this species and locate previously unknown population.

Population monitoring of these cryptic birds is not easy. Several methods are utilised including the use of call playback and a trained sniffer dog.

Call playback involves playing an eastern bristlebird call through a small hand-held speaker for 1-2 minutes then waiting 5 minutes for a response from a bristlebird; this is usually repeated once or maybe twice (if the habitat appears suitable for bristlebird) or twice, before moving to the next locality. Eastern bristlebird call playback is usually done near the known bristlebird territory to provoke a response, near old territories to find if birds have moved back into a territory, or in an area that appears suitable for bristlebirds.

An English springer spaniel conservation detection dog (Penny, Figure 1.) has been trained to locate both eastern bristlebirds and bristlebird nests. The dog can detect both the scent of eastern bristlebirds within suitable habitat and active eastern bristlebird nests during the breeding season. To minimise disturbance to the birds, Penny has been trained not touch or go close to any eastern bristlebird scent sources, but rather to show a passive response when in the area if a scent is detected.

Prior to any nest searches any selected pairs are passively monitored by an experienced eastern bristlebird specialist to determine breeding activity and the stage of breeding. Once this is determined the potential nest area will be searched using the detector dog.

Eastern bristlebirds have been monitored annually in NSW since 1999 by Wildsearch Environmental Services. Queensland areas were monitored between 1996 and 2015 by David Stewart (1 survey area on the Main Range, 1 survey area at Conondale Range, 1 survey area at Mount Barney, 6 survey areas on the Lamington Plateau).



Figure 1. Penny, the trained eastern bristlebird detector dog, with working harness and GPS attached.

2.2 Captive breeding and reintroduction program

Captive breeding: 2002 – 2008/9

After discussions during a 2002 Eastern Bristlebird Northern Working Group meeting it was decided to investigate the feasibility of captive breeding eastern bristlebirds in Queensland. Two reports were prepared by the Threatened Species Program for the Eastern Bristlebird Northern Working Group and Queensland Environmental Protection Agency (EPA):

- Stewart, D. 2001a. Northern population of the Eastern bristlebird (*Dasyornis brachypterus monoides*) Captive breeding Report. A report for the Northern Working Group of the Eastern Bristlebird National Recovery Team and Environment Australia.
- Stewart, D. 2001b. Northern population of the Eastern bristlebird (*Dasyornis brachypterus monoides*). Translocation Report. A report for the Northern Working Group of the Eastern Bristlebird National Recovery Team and Environment Australia.

In 2004, after consideration of these reports, the Queensland EPA decided to establish a small eastern bristlebird captive breeding colony at the David Fleay Wildlife Park. Two sibling nestlings were taken from the wild in NSW and hand-raised by staff at David Fleay Wildlife Park.

In 2008/9 a decision was made by DES to separate all of the resulting pairs and cease breeding.

Pilot reintroduction program: 2008

In 2008 a pilot reintroduction program was commenced by the staff from Department of Environment and Resource Management (David Fleay Wildlife Park and the Threatened Species Unit) and the NSW Department of Environment and Heritage with eight of the captive-bred birds being released into the wild at two locations that previously supported wild populations. Four of these birds were released into Queensland at a site at Spicers Gap. These birds were constantly monitored over four weeks.

Resumption of captive breeding: 2014 -present

In 2014 a Letter of Agreement between the NSW Office of Environment and Heritage (OEH) and Currumbin Wildlife Sanctuary was signed, enabling the re-establishment of an eastern bristlebird captive-breeding program. The remaining six eastern bristlebirds at David Fleay Wildlife Park were considered an essential but aging resource for any on-going captive breeding program. These remaining captive bristlebirds were transferred from David Fleay Wildlife Park to purpose built aviaries at Currumbin Wildlife Sanctuary in 2014. Over a two year period one pair of wild adults and a pair of chicks from NSW were added to the Currumbin Wildlife Sanctuary population.

2.3 Mitigating threats and habitat enhancement

Establishing the habitat requirements of the eastern bristlebird is also an important component of restoring eastern bristlebird populations in SEQ. Although the broad details of these are known, the more specific information relating to the habitat requirements will be better understood when Zoe Stone finalises her PhD and it is published in March or April 2018 from the University of Queensland.

The minimisation of habitat threats through the control of invasive weed species, invasive native shrub regrowth, establishment of appropriate fire regimes and pest animal control provides a strong basis upon which to maintain eastern bristlebird habitat.

The TSP and the Eastern Bristlebird Northern Working Group collaborated to develop a fire management plan and pest management plan (i.e. weed and feral animal) appropriate for eastern bristlebird habitat in both the Conondale Range and on Lamington Plateau (Stewart 2007a and 2007b).

3 Results

3.1 Population monitoring

In Queensland, the most recent surveys in 2015 indicate that the Queensland population consists of approximately 6 birds at Mount Gipps on the Lamington Plateau and potentially another pair at Spicers Gap at Main Range National Park (Table 1).

The last surveys conducted by TSP in Queensland in 2015 failed to detect any eastern bristlebirds on national parks. However one pair was found at Mount Gipps on a private property on the Lamington Plateau (Table 1). Later in 2015 Penny located 2 male bristlebirds (in addition to a known pair) on the same private property at Mount Gipps on the Lamington Plateau. However there has not been a follow up confirmation by calling or sighting by a Recovery Team member. It is likely that this small sub-population comprised three pairs (Charley 2015).

In 2015 Penny also detected the presence of eastern bristlebird at Spicers Gap at the reintroduction site.

A number of nest searches in NSW by Penny in the 2014 – 2015 breeding season located a total of five nests. In NSW, Penny located a pair thought to have either relocated or died out and rediscovered a pair not recorded since 2003 (D. Charley, pers. comm., 2014). There is thought to be 18 birds in the NSW side of the northern population.

No eastern bristlebirds have been detected on national parks in SEQ for 10 years. The last known sightings of wild eastern bristlebirds on national parks in SEQ were in 2001 (Mount Barney National Park), 2002 (Conondale National Park and Lamington National Park) and 2007 (Main Range National Park). Sightings at Main Range National Park in 2015 are thought to be birds released there in 2008. A map of these main areas is provided in Appendix 1. Results from surveys undertaken by the TSP as well as DES Wildnet records for years from 1943-2010 can be found in Appendix 2.

Table 1. Summary of eastern bristlebird observations by the Threatened Species Program and the detector dog in south-east Queensland in the most recent detections in 2015.

Area	Site name	Tenure	Results	Notes
Lamington Plateau	Mt Gipps	Private property	One pair found by TSP staff. Penny (the dog) detected 2 extra males (assumed to be 2 pairs).	
Main Range	Spicers Gap	Main Range National Park	Penny detected up to 2 birds in 2015.	4 birds reintroduced in 2008. At least 1 known to be alive in 2009.

3.2 Captive breeding and reintroduction program

Captive breeding: 2002 – 2008/9

The two sibling nestlings that were taken from the wild and hand-raised by staff at David Fleay Wildlife Park readily bred in captivity and produced 38 eggs from 22 clutches over five years. Sixteen chicks were hatched with fourteen successfully fledged by these founder birds.

No breeding occurred between 2008/9 – 2014.

Pilot reintroduction program: 2008

The monitoring of the 4 released birds into Queensland indicates one bird was taken by a fox and the other 3 were alive during post-release surveys (approximately a month). A bird was detected in this area in 2009.

Monitoring of the 4 birds released in NSW indicate at least one was killed by a cat.

Resumption of captive breeding: 2014 -present

Initially, two breeding pairs were housed in suitable aviaries at Currumbin Wildlife Sanctuary and within six months one pair had started breeding. All of the progeny from these breeding attempts were subsequently hand-raised. However, due to various health issues none of these chicks survived to maturity. The early cause of these deaths has remained unknown and the problem has largely resolved itself through trialling different husbandry techniques with parent bristlebirds subsequently raising chicks by themselves.

In 2017 Currumbin Wildlife Sanctuary had a captive breeding colony of approximately 15 birds. The facilities are currently at carrying capacity. Prior to reintroduction the genetic viability of the captive bred birds needs to be increased from the addition of wild birds to the captive population (from central NSW or SEQ).

3.3 Mitigating threats and habitat enhancement

Zoe Stone, a PhD candidate from the University of Queensland will be providing the Eastern Bristlebird Northern Working Group with an assessment of northern eastern bristlebird requirements for habitat structure. Her first paper has been published:

- Stone, Z, Tasker, E. and M. Maron. 2018. Grassy patch size and structure are important for the northern eastern bristlebird persistence in a dynamic ecosystem, *Emu – Austral Ornithology*.

Analysis in this paper found that eastern bristlebirds are most likely to occur in larger patches of grassy habitat with tall, dense grass. This study emphasised the importance of the size of the grassy habitats.

Final publication of the thesis is expected mid-2018.

Long-term exclusion of fires from extensive areas of eastern bristlebird habitat has resulted in the invasion of these areas by introduced weed species and the proliferation of a shrubby understorey. These developments result in the shading-out and exclusion of the grassy ground cover and a rapid decline in the eastern bristlebird habitat values.

Large areas of formerly occupied habitat are now dominated by shrubs and the grassy ground-cover has become fragmented and significantly less dense. A series of targeted programs to remove areas of dense Acacia and other shrub regrowth have been undertaken by QPWS and OEH with considerable success. In areas where shrub removal has occurred grass cover is recovering. These programs have targeted priority sites where there has been a high likelihood of successfully restoring the grassy groundcover.

Appropriate threat management actions have been outlined in the fire, pest and weed management plans developed for the eastern bristlebird areas on the Lamington Plateau and Conondale Range (Stewart 2007a and 2007b; Charley 2017).

In summary these reports suggest (see Table 1 and Table 2 in Appendix 3):

- **Fire Management** – 4-5 year fire frequency. This should address the threats associated with too frequent fire (that can impact the survival of the individuals and the recruitment of important grass resources) or too infrequent fire (that can lead to weed and shrub invasion which shade out the grassy ground cover and large sorghum tussocks). This fire frequency is broadly consistent with the 3-6 years suggested by Tasker et al. (2016) to maintain a grassy understorey.
- **Pest Management** – Control where possible feral pigs and cattle, and target release sites for feral animal control.
- **Weed management** – Control through a combination of spraying and fire.

4 Discussion and recommendations

4.1 Population monitoring

In Queensland the largest known sub-population comprises only three pairs (D. Charley, pers. comm., 2015). Surveys are needed to determine the population extent at these known occurrences and if there are other populations extant where they once occurred.

Penny the detector dog has proved an effective tool in detecting potential breeding sites, eastern bristlebirds in areas they were known to occur, and unknown pairs/populations. However unfortunately she has now retired. The survey effort will now need to be conducted by an eastern bristlebird expert in TSP. Each survey would require two TSP staff, including one staff member highly experienced in surveying bristlebirds. The TSP surveys would take approximately one week spread throughout the August-October period.

Recommendation 1: Survey the extent of known populations and for additional populations of eastern bristlebird dividing sites.

4.2 Captive breeding and reintroduction program

Improving the genetic diversity of the captive population at Currumbin Wildlife Sanctuary and ultimately supplementing the critically small wild population in Queensland with captive-bred birds remain priorities for the recovery of this species.

4.2.1 Captive breeding

The initial success of the captive breeding program provided strong evidence that under a well-managed captive-breeding program a founder population of between 6 and 12 pairs could generate between 120 and 300 releasable progeny over a five-year period. A captive breeding program could readily supplement the wild population and assist in maintaining a wild population in excess of 150 birds.

A great deal of knowledge has already been gained during the captive-breeding program. Two high quality documents have been produced (e.g., Booth 2009 and Gubler et al. 2010). It is important that this information is collated so that the success of the program is made available to others contemplating a similar program and to refine the captive breeding techniques used as part of the program for future breeding success.

There is a need to bring these together in one cohesive document, along with the more recent captive breeding experience resulting from the addition of new wild birds into the captive population and following the transfer of the program to Currumbin Wildlife Sanctuary.

NSW is investigating the genetic diversity of the northern and central populations to assess the need and possibility of mixing the gene pool from both populations to increase the genetic vigour of the captive breeding colony at Currumbin Wildlife Sanctuary and eventually the wild population (the report is expected sometime in 2018). There are several other cases where the gene pool of closely related forms have been mixed for conservation management of a species, (e.g. Norfolk island Morpork, *Ninox novaeseelandiae undulata* and New Zealand Morpork, *N. n. novaeseelandiae*). These instances occurred in-situ and were untested in a captive breeding facility. In this case the mixing of northern and central eastern bristlebird gene pools would be in a caged environment and therefore controlled. The results would be studied for several generations to ensure that the offspring are viable, before any decision about release in to SEQ or NSW is made.

If the genetic investigation indicates that central population should not be mixed with the north population it will be a high priority to collect bristlebird eggs/chicks from the wild from within SEQ and provide them to Currumbin Wildlife Sanctuary (or alternative facility). The DES TSP project manager holds animal ethics approval until October 2018 to take two eggs or chicks per year from the wild. If collection of SEQ eastern bristlebirds is required, TSP staff could collect the eggs/chicks from one nest each year from a wild SEQ population for three years. These birds would be hand reared to create a total founder population of between five and ten pairs within five years.

The Eastern Bristlebird Recovery Team has determined that the take of 2 eggs/chicks per year (or one bristlebird clutch) for three years from the Queensland population, would have minimal impact on the population. This is based on the following rationale:

1. Bristlebird are known to re-clutch almost immediately if they lose a clutch.
2. The long term benefit to the species outweigh the short term loss – when two eggs/chicks are collected for hand raising both should survive and fledge, eventually breeding in the captive breeding program which will be used to breed birds for release. In the wild, only one chick will fledge and the survival rate of that chick during the first year is low.
3. Bristlebirds are no longer able to disperse between colonies (i.e. they now require human intervention).

The breeding aviaries at Currumbin Wildlife Sanctuary have been designed to replicate the bird's natural habitat. These are of sufficient size to enable the breeding birds to seek refuge and include appropriate vegetation, sound and light barriers between cages. Non-breeding birds are housed separately from breeding pairs. In 2015, the purpose built breeding aviaries were at capacity. To maintain a larger founder population in captivity the existing breeding facilities will need to be expanded or the birds moved to a different facility. The Eastern Bristlebird Northern Working Group are investigating options for funding the additional facilities through NSW State Government's Saving Our Species program or crowdfunding.

Improvements to the success of the captive breeding program will also need to include an update to the habitat suitability assessment protocol for reintroduction sites and in light of recent nest-site and survey data, reassessments of potential sites using these up-to-date protocols.

Recommendation 2: Increase genetic viability of the captive bred population of eastern bristlebirds at Currumbin Wildlife Sanctuary by a) introducing individuals from the SEQ wild population or, where deemed necessary by the genetic analysis of the central population b) facilitating the introduction of individuals from the central population.

4.2.2 Reintroduction

A series of pilot programs have successfully demonstrated that a reintroduction program could succeed. Transmitter attachment trials (cage and field) have also been successfully completed. A pilot reintroduction of eight birds has had some success. It is expected that a founder population of 12 birds (6 pairs) could produce 120-150 releasable progeny within five years.

Once there is a sufficient number of individuals these birds need to be released into suitable habitat in SEQ and monitored post-release for six to eight weeks.

There is a need to assess the release site options. These options are releasing birds at known existing sub-populations so as to increase the size of these sub-populations and therefore their potential long-term viability or re-establishing sub-populations in areas where birds no longer occur but where suitable habitat is available. Restoring the historical range of the eastern bristlebirds in SEQ by releasing captive reared individuals into priority sites (once the threats have been shown to be acceptably managed) is a priority. Assisting private landholders to implement appropriate fire and pest management actions on the properties in eastern bristlebird habitat will also be important (see below).

Preliminary research findings suggests that reintroduction should occur into larger patches with thick, tall grass close to occupied territories and where a suitable fire regime is implemented (Stone et al. 2018). The best available information (from 2015) indicates Lamington National Park would be the most suitable site for reintroduction and Main Range National Park the next best alternative with birds potentially still occurring there from the 2008 reintroduction. However, many of these sites have not been surveyed for nearly three years, nor have the sites where Penny detected birds been more thoroughly assessed to determine the size of the population/number of territories.

One issue for resolution is the property rights of captive bred bristlebirds at Currumbin Wildlife Sanctuary. Presently, NSW own the founder stock at Currumbin Wildlife Sanctuary. The in-house legal advice received by TSP is that the progeny of Queensland animals that are born in Queensland would be the property of Queensland. This means that if Queensland adults were added for breeding to the NSW animals and the NSW Government asserts its property rights over the progeny, there would be conflict over the two legislative regimes that would need to be resolved by a court. If the captive population is supplemented from the central population (i.e. in NSW) the progeny will be the property of NSW. Therefore there is a need to develop some agreement with NSW so that a court process is avoided.

Recommendation 3: Enter into a captive breeding agreement or a Memorandum of Understanding with Currumbin Wildlife Sanctuary and NSW Office of Environment and Heritage Protection to allow for a certain number of progeny from the captive population to be released into Queensland sites.

Recommendation 4: Assist in the development of a release site prioritisation in Queensland for eastern bristlebird.

4.3 Mitigating threats and habitat enhancement

Recent research has proved some valuable insights into the habitat requirements of the eastern bristlebird and it is expected further information will become available as other parts of Zoe Stone's PhD area published. This information will guide both habitat management and reintroduction site prioritisation.

Habitat rehabilitation works on private land will be essential as the majority of the northern population now occurs on private property. Habitat restoration on these properties requires a co-ordinated approach where fire and weed management, the primary threats, are integrated. A number of property management plans have been developed and these have proven invaluable in effectively and efficiently directing management effort to ensure the extent of available eastern bristlebird habitat is increased and the quality of that habitat is maximised.

Management actions on sites within national park will be undertaken by QPWS. Healthy Waterways and Catchments (HWC) (formerly known as SEQ Catchments) has previously obtained funding to assist landholders with implementing fire and pest management plans in eastern bristlebird habitat on private property, and it is anticipated that this assistance will continue. TSP will provide advice to key management stakeholders including QPWS, HWS, local NRM groups and management committees for the Gondwana Forests of Australia World Heritage Area.

In northern NSW, habitat enhancement trials on private property indicate that eastern bristlebird populations can increase if there is more habitat for the birds to move into. During these trials in northern NSW, there were three bristlebirds. After a combination of weed work and fire, the bristlebird population has increased to seven pairs (Charley, report in prep.)

Whilst there is increasing knowledge on the impact of threats and the management needs of the eastern bristlebird (see Zoe Stone's PhD) there are still areas that require further information. For example, field surveys suggest that nest predation and/or disturbance affects a majority of nesting attempts in each year but the impact this is having on recruitment is unknown (although likely to be significant). Fire is both a major threat and an important tool when managing the habitats of the eastern bristlebird. However, how eastern bristlebirds respond to individual fire events is unknown. Uncontrolled wildfires have been implicated in the local extinctions of a number of eastern bristlebird populations, whilst the exclusion of fire has resulted in the loss of suitable habitat. Other questions that require further investigation include: what are the characteristics of fire regimes for refugia used by these birds; where do the birds go in the event of a fire; what food resources do these displaced birds use; and how quickly do these birds reoccupy a burnt territory?

- **Recommendation 5:** Incorporate University of Queensland (UQ) research on eastern bristlebird habitat structure requirements into relevant planning documents and communicate with land managers.
- **Recommendation 6:** Provide advice to QPWS on the implementation of improved habitat, fire and pest management strategies at priority sites in suitable sections of national park.
- **Recommendation 7:** Provide advice to HWC on the implementation of improved habitat, fire and pest management strategies at priority sites on private land.
- **Recommendation 8:** TSP to continue its involvement in the Eastern Bristlebird Northern Working Group.

4.4 Potential impacts of future climate change

Smith (1977) suggested that remaining populations of eastern bristlebird are occupying marginal habitats, thus rendering them more vulnerable to small environmental changes. When climate change is superimposed on all other threats, it is expected to exacerbate their effects. As a result, current threats to eastern bristlebird, including fire, habitat loss, weeds and pest animals, are expected to intensify under climate change scenarios.

4.5 Characteristics of the eastern bristlebird making it amenable to recovery

The eastern bristlebird breeds readily in captivity and the initial captive breeding studies indicate it will be possible to produce sufficient offspring to both supplement the existing colonies and areas that contain suitable bristlebird habitat. It has also been shown that captive bred birds will survive in the wild with minimal preparation of the site before release and minimal follow up support following release.

4.6 Summary of recommendations

Recommendations for eastern bristlebird recovery include:

- **Population monitoring:**
 1. Survey the extent of known populations and for additional populations of eastern bristlebird on and off protected area estate through the recovery team.
 2. Provide survey data to Wildnet and provide technical advice to recovery group.
- **Captive Breeding Agreements (CBA) and reintroduction:**
 3. Develop a captive breeding agreement for Currumbin Wildlife Sanctuary should Queensland EBB eggs/chicks breed with NSW EBB under the current captive breeding program.
 4. Develop a Memorandum of Understanding with NSW Office of Environment and Heritage to allow for a number of progeny from the Currumbin Wildlife Sanctuary captive population to be released into Queensland sites (Qld /NSW mixed parent progeny).
 5. Identify potential and priority areas for the release of captive bred eastern bristlebirds in Queensland. These areas will be identified using criteria outlined in Zoe Stone's PhD thesis from the University Queensland.

○ **Mitigate threats and habitat enhancement:**

6. Incorporate UQ research on eastern bristlebird habitat structure requirements into a relevant planning document and communicate finding with relevant land managers (e.g. improved habitat, fire and pest management) at priority sites.

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Appendix 1

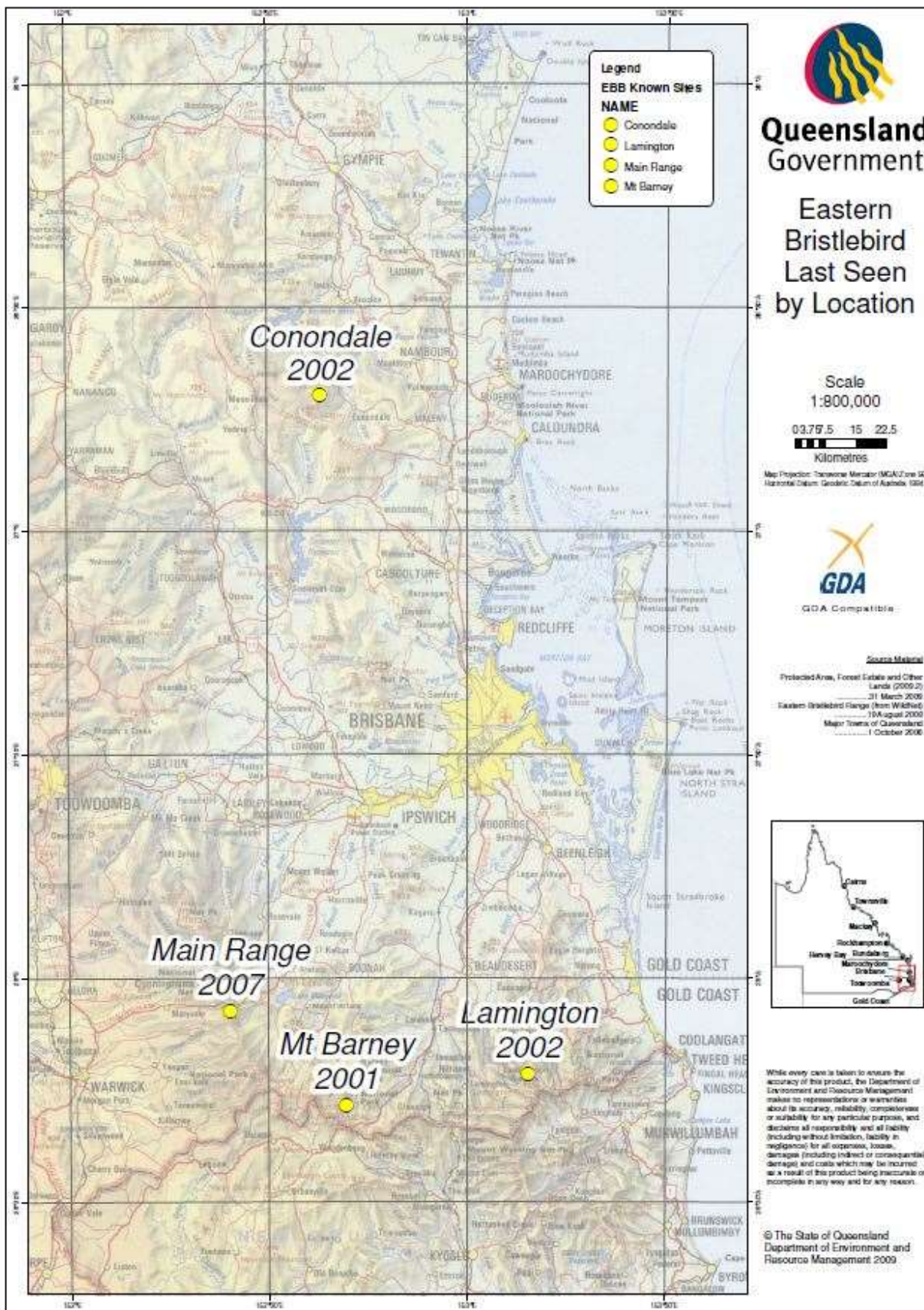


Figure 2. The location of the main eastern bristlebird areas on national park in SEQ (including the year last seen). Sightings at Main Range National Park in 2015 are thought to be birds released there in 2008.

Appendix 2

Methods: Eastern bristlebirds records from TSP surveys and Wildnet from 1943-2010 were vetted and the areas where they had been surveyed for were plotted against the Regional Ecosystems (RE). From this, five REs were identified as being preferred habitat for eastern bristlebirds (12.8.14, 12.8.16, 12.8.11, 12.8.19, 12.11.9/12.11.3). The areas circled in black and numbered between 1 and 32 were areas identified as priority areas to survey for eastern bristlebirds from this RE mapping.

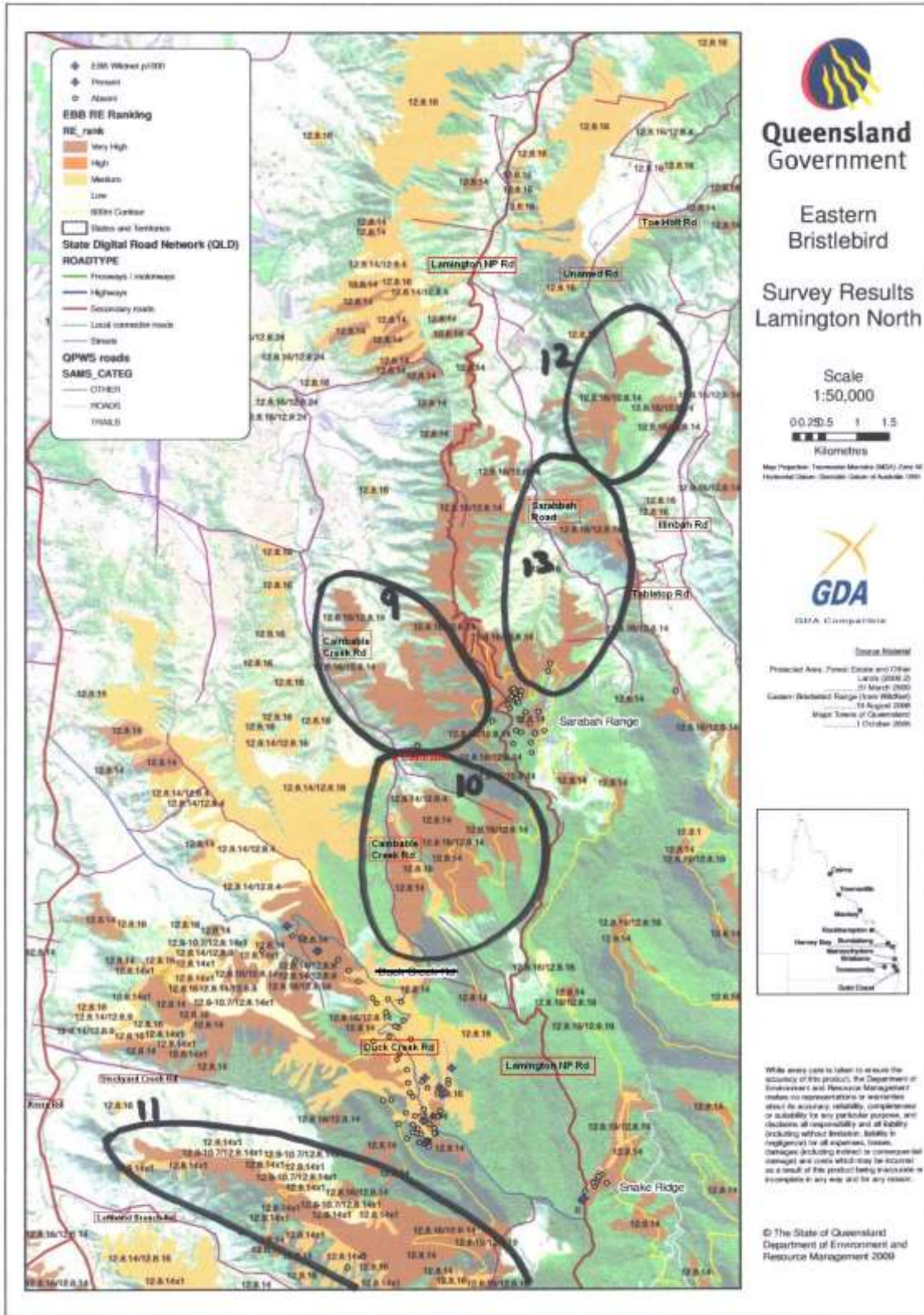


Figure 3. Lamington sites (1).Records based on surveys by TSP and Wildnet records for the years 1943-2010.

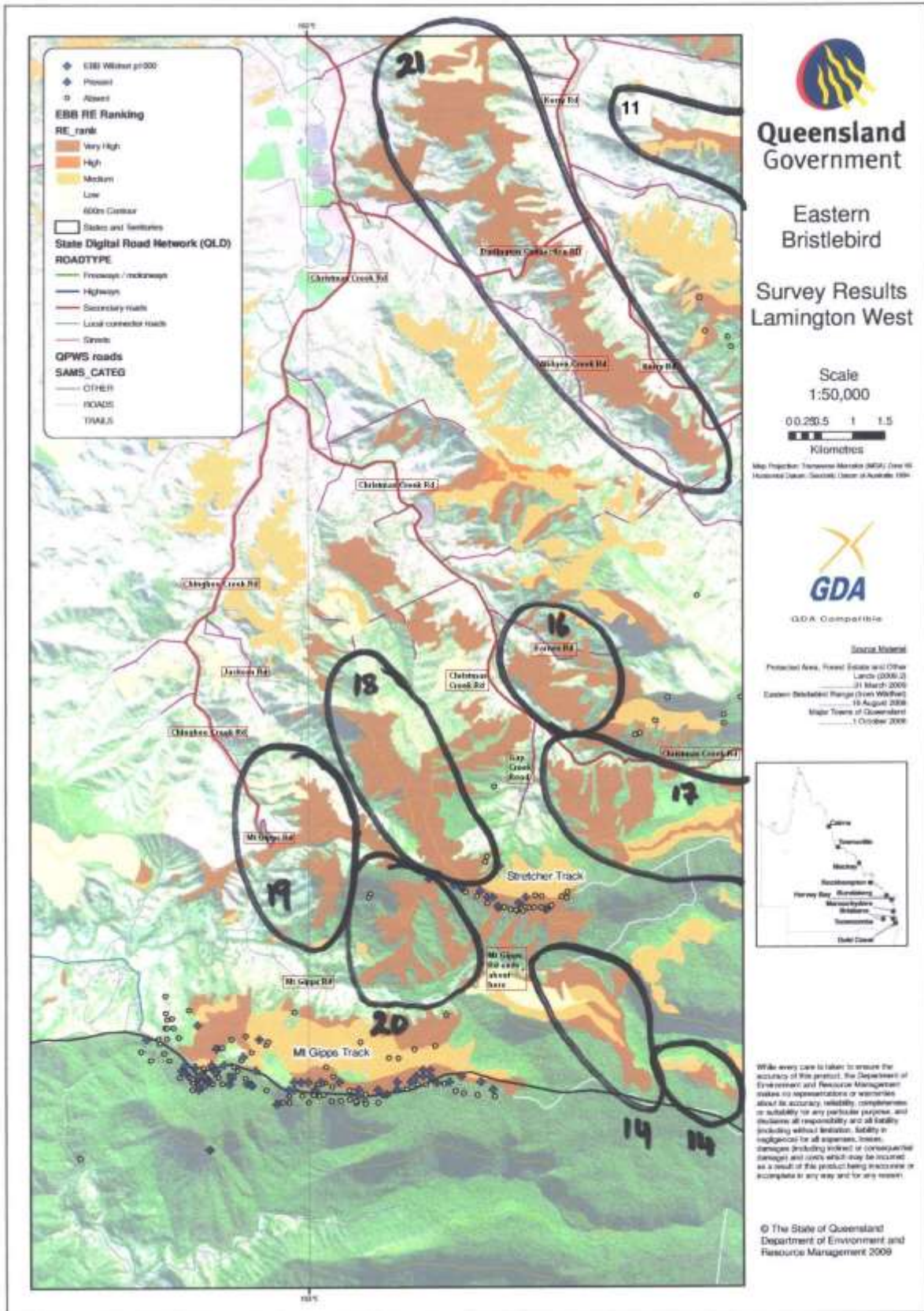


Figure 4. Lamington sites (2).Records based on surveys by TSP and Wildnet records for the years 1943-2010.

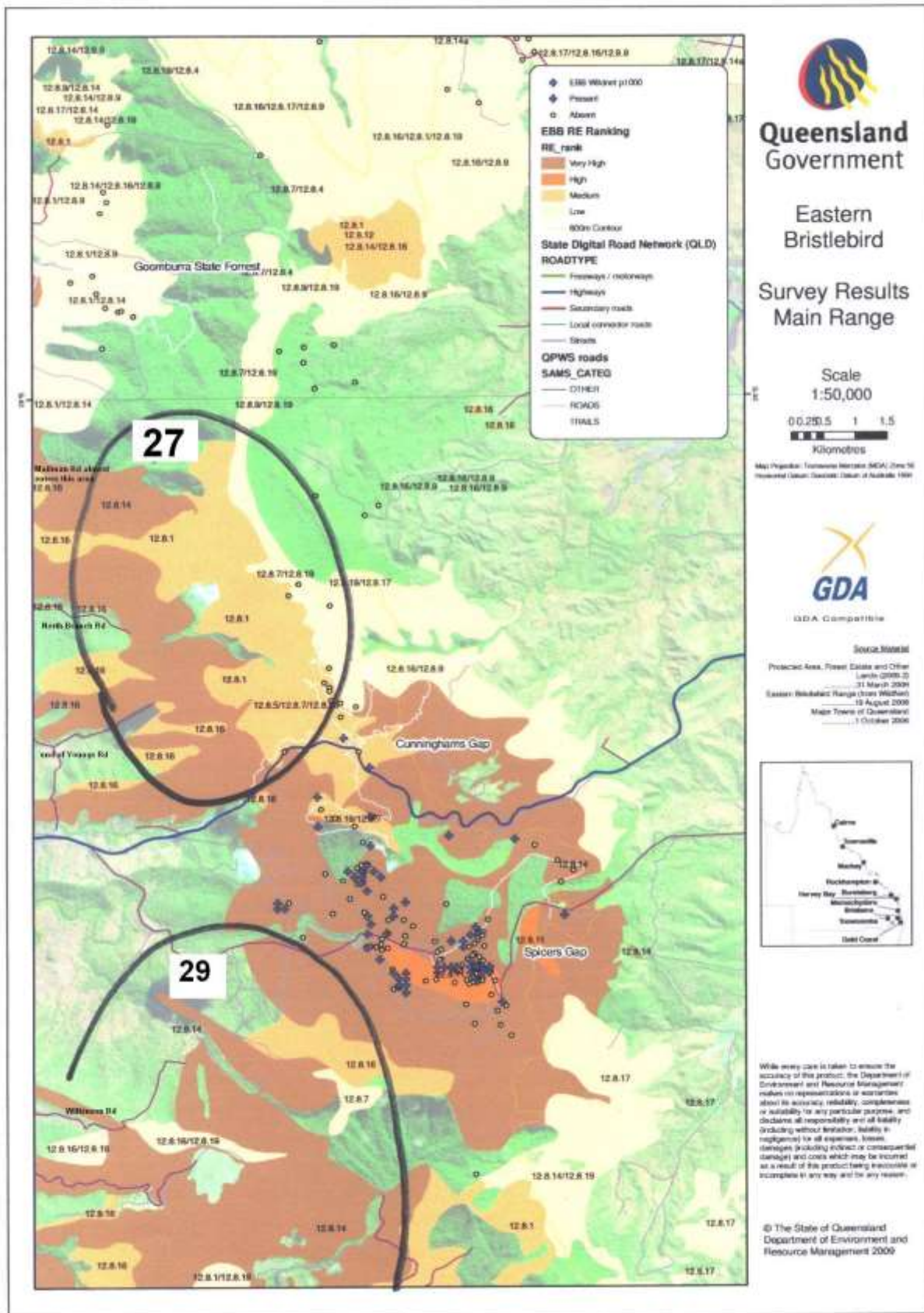


Figure 5. Main Range sites (1).Records based on surveys by TSP and Wildnet records for the years 1943-2010.

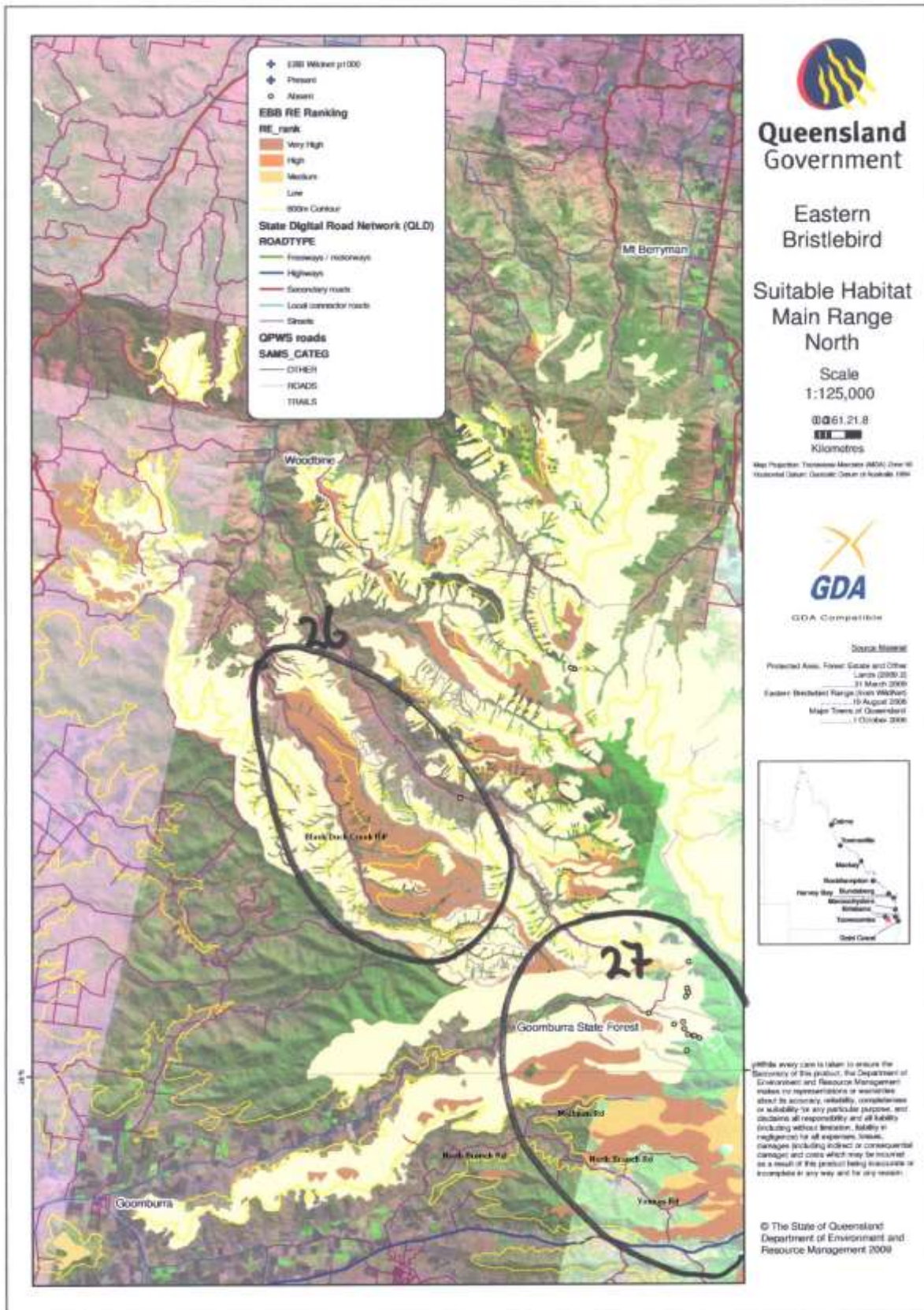


Figure 6. Main Range sites (2).Records based on surveys by TSP and Wildnet records for the years 1943-2010.

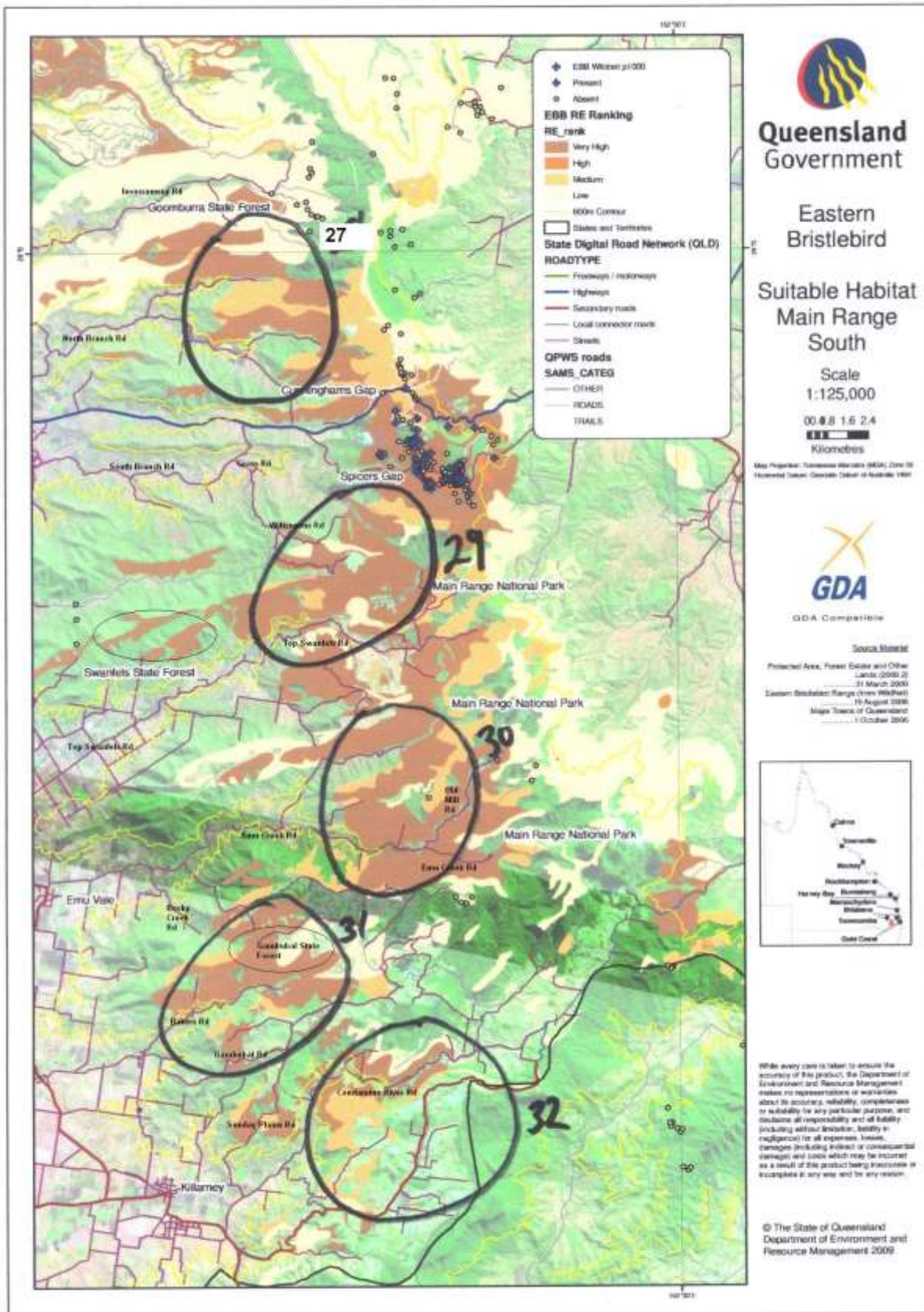


Figure 7. Main Range sites (3).Records based on surveys by TSP and Wildnet records for the years 1943-2010.

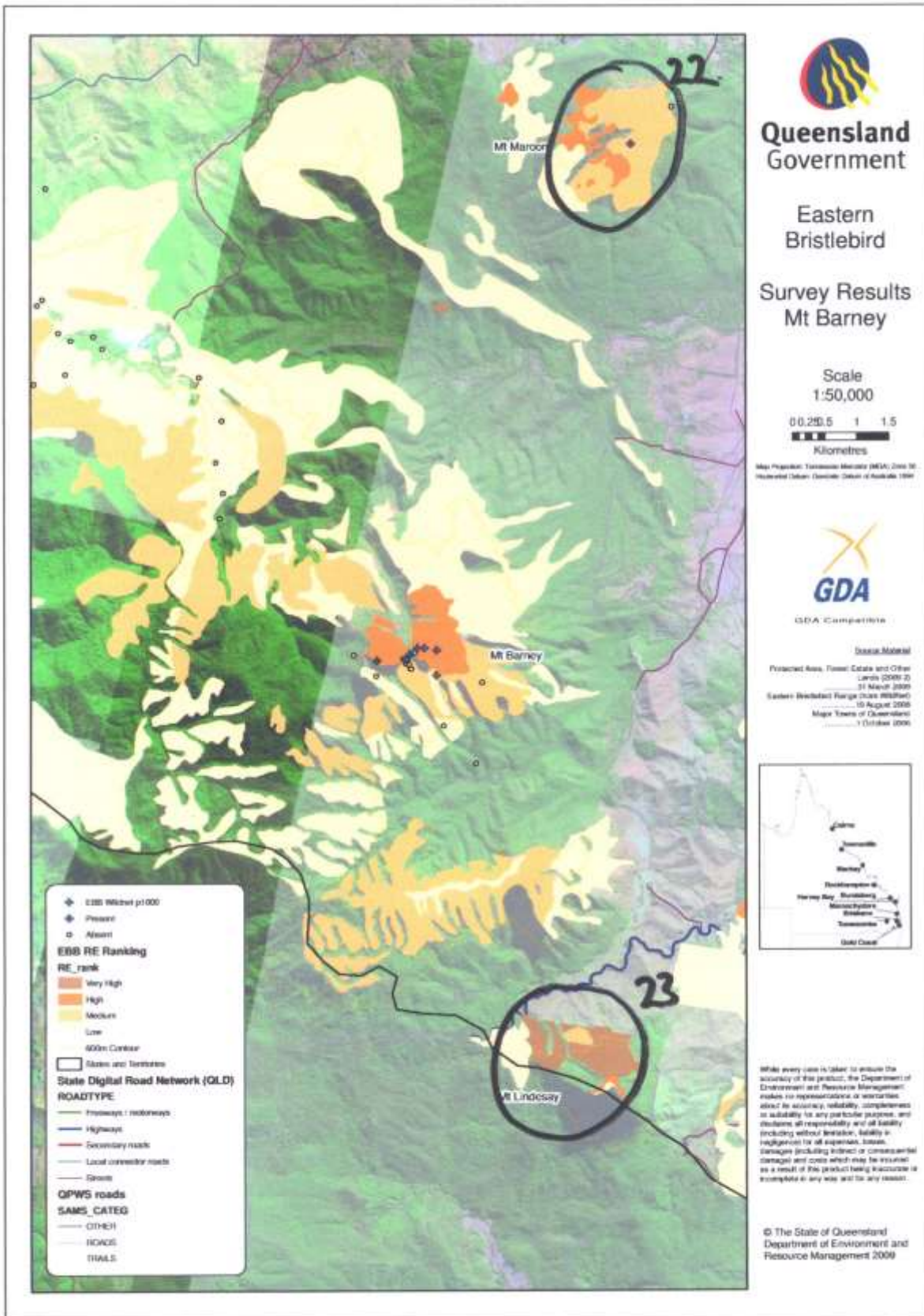


Figure 8. Mount Barney sites. Records based on surveys by TSP and Wildnet records for the years 1943-2010.

Appendix 3

Table 2. Management actions for eastern bristlebird area on Lamington Plateau (Stewart 2007a).

Threat Management Strategy		
Action	Responsible Party	Frequency
Fire		
3.1.1 Map existing EBB population / fire history	QPWS	Ongoing
3.1.2 Fire-break construction / maintenance	QPWS	Yearly
3.1.3 Fire on rotation prescription	QPWS / Land Manager	5 years
3.1.4 Vegetation monitoring	QPWS	Yearly
3.1.5 EBB – Hastings River mouse (<i>Pseudomys oralis</i>) association	Hastings River mouse Recovery Team	
Feral animals		
3.2.1 Monitoring feral cats in release areas	QPWS	Ongoing
3.2.2 External funds	EBB RT	
3.2.3 Training in the use of baits	QPWS	Once
3.2.4 Fox baiting	QPWS	Ongoing
Human disturbance		
3.3.1 Weed control	QPWS / Land managers	Ongoing
Human disturbance		
3.4.1 Birds Queensland and Birdlife Australia “Code of Conduct”	BQ / BA	Ongoing
3.4.2 Enhance the separation of bristlebirds and visitors to Lamington National Park by increased uniformed presence and fines for any one breaching the restricted access areas	QPWS	Ongoing
3.4.3 Educating tour operators	QPWS / Tour operators	Ongoing
Monitoring, Reporting and Review of Management Strategies		
Population monitoring	QPWS	
Vegetation	QPWS	
Fire	QPWS	

Table 3 Management actions for eastern bristlebird area in the Conondale Range (Stewart 2007b).

Threat Management Strategy		
Action	Responsible Party	Frequency
Fire		
3.1.1 Map existing EBB population / fire history	QPWS	Ongoing
3.1.2 Fire-break construction / maintenance	QPWS	Yearly
3.1.3 Vegetation monitoring	QPWS	Yearly
3.1.4 Burn bristlebird habitat on rotational	QPWS	4-5 years
Feral animals		
3.2.1 Feral Pig control	QPWS	As needed
3.2.2 Feral Animal control officer	QPWS	
3.2.3 Feral cat and fox	QPWS	As needed
3.2.4 External funds	EBB recovery Team	
3.2.5 Training	QPWS	As needed
3.2.6 Feral cat trapping and fox baiting program	QPWS	As needed
Human disturbance		
3.3.1 Weed control	QPWS / Land managers	Ongoing
Human disturbance		
3.4.1 Birds Queensland and Birdlife Australia "Code of Conduct"	BQ / BA	Ongoing
3.4.3 Educating tour operators	QPWS / Tour operators	Ongoing
3.4.3 Close South Booloumba Fire Management Trail	QPWS	
Monitoring, Reporting and Review of Management Strategies		
Population monitoring	QPWS	
Vegetation	QPWS	
Fire	QPWS	

Note:

Crofton weed was identified in a recent study as an important predictor of eastern bristlebird presence i.e. eastern bristlebirds were more likely to occur where crofton weed was in high density. This may be because crofton weed correlates with disturbance and other factors eastern bristlebird require.