



How to send a finch extinct

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ABSTRACT

Australia's high species extinction rate shows no sign of abating, with at least three vertebrate extinctions recorded within the last decade. In each case, scientists have published 'post-mortems' examining the context of these recent extinctions. By tracing the decline of a once-widespread and common bird to the point that it has disappeared from over 80% of its original range, and describing the circumstances under which habitat loss continues to be approved despite its formal protection, we present a 'pre-mortem' for the endangered, and endemic, southern black-throated finch (*Poephila cincta cincta*). The southern black-throated finch has suffered extensive habitat loss historically, much of which was unregulated. In 2000, Australia increased environmental regulation, and the southern black-throated finch was listed under the Commonwealth's *Environment Protection & Biodiversity Conservation Act*. Despite the increased environmental regulation and formal protection, habitat loss for the southern black-throated finch has continued, mostly incrementally but resulting in large cumulative loss. In the face of steep population decline and range contraction of BTF, five large coal mines were approved between 2012 and 2015 by both State and Commonwealth governments that will remove most of the largest area of high quality habitat that remains. We outline the policy settings under which the decline occurred, with a particular focus on recent ongoing habitat loss occurring within a highly regulated environment. We show that despite Australia's comparatively strong governance and regulatory frameworks, legally permitted habitat loss continues even for imperilled taxa formally listed under State and Commonwealth environment protection laws.

1. Introduction

Australia presents a global anomaly: it contains some of the largest tracts of wilderness of any continent on Earth (Watson et al., 2016), is a wealthy nation with comparatively effective governance (McDonald et al., 2015), yet has high rates of extinction, many of which have occurred remote from intensive anthropogenic impacts (Woinarski et al., 2015). Australia is a global case study of how environmental regulation can fail to protect threatened species even in a well-governed, high-income nation (McDonald et al., 2015). Detailed investigation is needed to understand why Australia's provisions for threatened species are failing to arrest declines, before more species become extinct.

Australia has had at least 90 extinctions since European settlement (Commonwealth of Australia, 2015), including three vertebrate extinctions in the last decade (Woinarski et al., 2017). In addition, several

more species are likely to be extinct but lack verification (Woinarski et al., 2015), and a further seven mammal and 10 bird species are predicted to go extinct by 2038 (Geyle et al., 2018). The declines and extinctions are not restricted to species with small ranges: many Australian extinctions have also involved species that once had widespread continental ranges (Woinarski et al., 2018).

Woinarski and colleagues (2017) took a coronial-inquest style approach to investigate the policy and management factors that led to Australia's three most recent vertebrate extinctions. While the loss of the last remaining individuals that led to the extinction were predominantly associated with indirect anthropogenic factors (sea level rise and introduced species), a lack of commitment to the prevention of extinction, lack of accountability and inadequate resources were major causal factors. Here, we use a case study to explore the specific policy and regulatory settings, and their implementation, that have allowed

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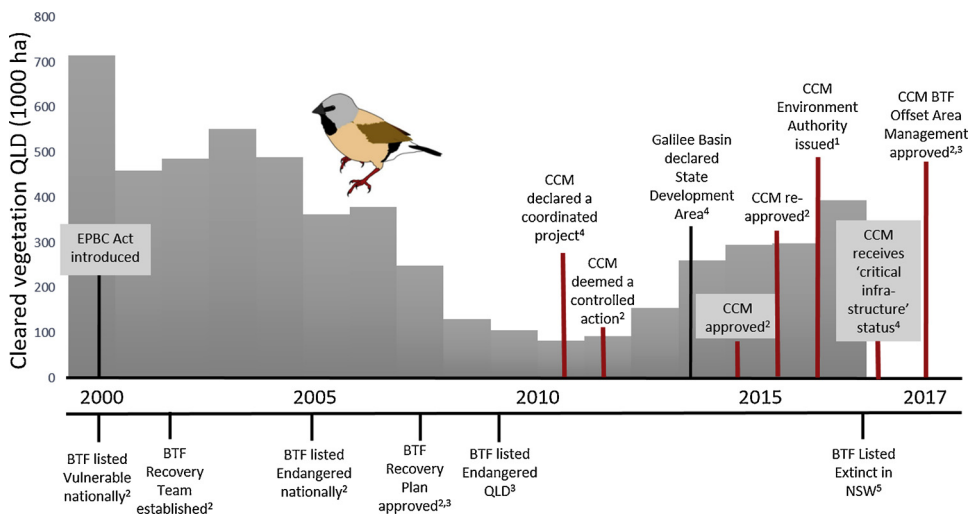


Fig. 1. Timeline of events that relate to the decline of the BTF. Grey bars represent the thousands of hectares of vegetation cleared in Queensland each year (DSITI, 2017). Carmichael Coal Mine (CCM) specific activities associated with red lines. NSW = New South Wales, QLD = Queensland.

¹Environmental Protection Act 1994 (EP Act QLD).

²Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act Commonwealth)

³Nature Conservation Act 1992 (NCA QLD)

⁴State Development and Public Works Organisation Act 1971 (SDPWO Act QLD)

⁵Threatened Species Conservation Act 1995 (TSC Act NSW)

for the largest remaining area of high-quality habitat for a formally protected endangered bird being approved for removal for development.

The southern black-throated finch (*Poephila cincta cincta*; hereafter BTF) is a small, granivorous bird, originally occurring widely across north-eastern Australia. The BTF is listed nationally and in Queensland as Endangered (Environment Protection and Biodiversity Conservation Act, 1999; Nature Conservation Act, 1992) and presumed extinct in New South Wales (Biodiversity Conservation Act, 2016). It received its first national listing in 2000 (Vulnerable), and has been listed as Endangered since 2005 (Fig. 1). The major threats to the BTF are habitat loss and degradation (through changes in the grassy substrate that reduce grass seeds availability) (Black-throated Finch Recovery Team, 2004), and these are continuing unabated both within and outside the regulatory frameworks governing vegetation management and threatened species habitat. If habitat loss and degradation are stemmed quickly, stabilisation and recovery may be possible.

Most recently, the BTF has been one element of a nationally significant debate surrounding a controversial development, the Carmichael Coal Mine (CCM) and Rail Project. This project is one of at least 14 greenfield thermal coal mines proposed for the as-yet undeveloped Galilee Basin in central Queensland. The proposed CCM site is home to the largest known population of BTF. Yet despite the importance of this site for the species and the protections implied by environmental policies and legislation, the proponent has received approval to clear or have a residual impact on more than 16,500 ha of BTF habitat (Queensland Government, 2014). Four other mines in this region also have approval to clear substantial area of BTF habitat (Table 1).

In this analysis, we first demonstrate the historical trajectory of habitat loss of the BTF, which led to a once-common and widespread bird becoming endangered. Using this historical context, we then examine how, despite both Commonwealth and State biodiversity and native vegetation protections, a stage has been reached in which approved developments will compromise the last remaining high-quality habitat for the BTF.

1.1. The southern Black-throated Finch

The BTF is one of 12 Australian endemic granivorous birds that have declined from the tropical savannas across Australia's north (Franklin, 1999). The BTF's distribution included the area of greatest granivore decline, where the now-extinct Paradise Parrot (*Psephotus pulcherrimus*) and probably-extinct Eastern Star Finch (*Neochmia ruficauda ruficauda*) (Garnett et al., 2011; Geyle et al., 2018) once occurred (Fig. 2a). These granivore declines are believed to be the result of clearing for intensive

agriculture, and habitat degradation from high intensity grazing (Franklin et al., 2005). By 2000, the BTF population was considered to be in rapid decline, leading to its national listing as Vulnerable (Commonwealth of Australia, 2000). In 2005 it was uplisted to Endangered because it was suspected to have undergone a severe reduction in population, and a severe reduction in the extent of occurrence in the previous decade had been observed (Commonwealth of Australia, 2005).

1.2. Remaining habitat and contemporary threats to the BTF

The primary threat to the BTF continues to be habitat loss, which is the complete removal ("clearing") of grassy woodland, predominantly to convert land to agriculture, urban development, mining and infrastructure (Black-throated Finch Recovery Team, 2004) (Fig. 2). Habitat degradation is the next biggest threat, caused by cattle grazing and the related factors of altered grass composition due to introduced grasses, which interrupt the year-round availability of their major food source of grass seeds (Rechetelo, 2015).

The remaining distribution of the finch is almost entirely restricted to two main areas: the Desert Uplands centred on the Galilee Basin, and the Townsville Coastal Plain (Vanderduys et al., 2016) (Fig. 2). Sightings outside these areas are very rare (Black-throated Finch Recovery Team, 2017a). Habitat in the Townsville Coastal Plain competes with the expansion of Australia's largest tropical city, and is fragmented and degraded by the high proportion of introduced grasses, forbs and shrubs (Melton, 2017; Mula-Laguna et al., 2019). The Desert Uplands is predominantly leasehold or freehold land used for cattle grazing, but has been grazed less intensively than bioregions elsewhere. As a result, the Desert Uplands has lower rates of degradation, and contains more intact vegetation, with a high diversity and cover of key native grass species (GHD, 2012). The Desert Uplands also has a high cover of remnant vegetation remaining (Reside et al., 2017), and the low intensity of land use in some parts, including grazing, is partly because of the presence of the native plant *Gastrolobium grandiflorum* which is poisonous to cattle and sheep (GHD, 2012). The importance of this high quality, continuous habitat to BTF is demonstrated by consistently larger flock sizes of BTF in the Desert Uplands, despite the long history of greater survey effort around Townsville (Mula-Laguna et al., 2019); the largest flocks ever recorded have been found in the Desert Uplands (Vine and Reside, 2014). The remaining habitat in the Desert Uplands and Townsville Coastal Plain is critical to the long-term persistence of the BTF (Mula-Laguna et al., 2019).

Table 1
Large mining developments in the Galilee Basin (Desert Uplands) that have received approval to clear BTF habitat.

Project	Proponent	SDPWO Act (QLD) Assessment	EP Act (QLD) Assessment	EPBC Act Referral decision	EPBC Act Approval decision	Approved BTF impact (ha)
Alpha Coal Project	Hancock Coal Pty Ltd, Hancock Alpha West Pty Ltd and Hancock Coal Infrastructure Pty Ltd	'Significant project' ^a 24 October 2008	Environment Authority granted 29 August 2014	'Controlled action' ¹ 13 January 2009	Approved with conditions (EPBC 2008/4648) 23 August 2012	Mine: 7154 Rail: 778
Carmichael Coal Mine and Rail Project	Adani Mining Pty Ltd	Coordinator-General approved the EIS 24 May 2012 'Significant project' 26 November 2010	Environment Authority granted 2 February 2016	EPBC assessment through QLD Bilateral Agreement by an EIS under SDPWO Act. 'Controlled action' ⁶ 6 January 2011	Approved with conditions (EPBC 2010/5736) 24 July 2014; re-approved 14 October 2015	16 500 ^b
Galilee (China First) Coal Project	Waratah Coal Pty Ltd	Coordinator-General approved the EIS 7 May 2014 'Significant project' 28 November 2008		EPBC assessment through QLD Bilateral Agreement by an EIS under SDPWO Act. Rejected under EPBC 18 July 2008 due to unacceptable impacts on the environment (EPBC 2008/4366). 'Controlled action' ⁷ 20 March 2009 (EPBC 2009/4737)	Approved with conditions (EPBC2009/4737) 19 December 2013	Mine: 2789 Subsidence: 801 Rail: 38
Kevin's Corner Project	GVK Hancock Galilee Pty Ltd	Coordinator-General approved the EIS 9 August 2013, subject to conditions 'Significant project' 11 September 2009		'Controlled action' ⁸ 8 September 2009	Approved with conditions (EPBC 2009/5033) 1 November 2013	1000
South Galilee Coal Project	AMCI Pty Ltd (Alpha) and Alpha Coal Pty Ltd (Alpha Coal)	Coordinator-General approved the EIS May 2013, subject to conditions 'Significant' project 4 June 2010		EPBC assessment through QLD Bilateral Agreement by an EIS under SDPWO Act. 'Controlled action' ⁹ 16 June 2010.	Approved with conditions (EPBC 2010/5496) 15 July 2015	229.6

EA: Environmental Authority under *Environmental Protection Act 1994* (Qld).

EP Act: *Environmental Protection Act 1994* (Qld).

EPBC Act: *Environmental Protection and Biodiversity Conservation Act, 1999* (Commonwealth).

SDPWO Act: *State Development and Public Works Organisation Act 1971* (Qld).

^a 'Significant projects' became 'coordinated projects' under SDPWO Act in December 2012.

^b Carmichael Coal Mine and Rail project: Coordinator-General's evaluation report on the environmental impact statement May 2014.

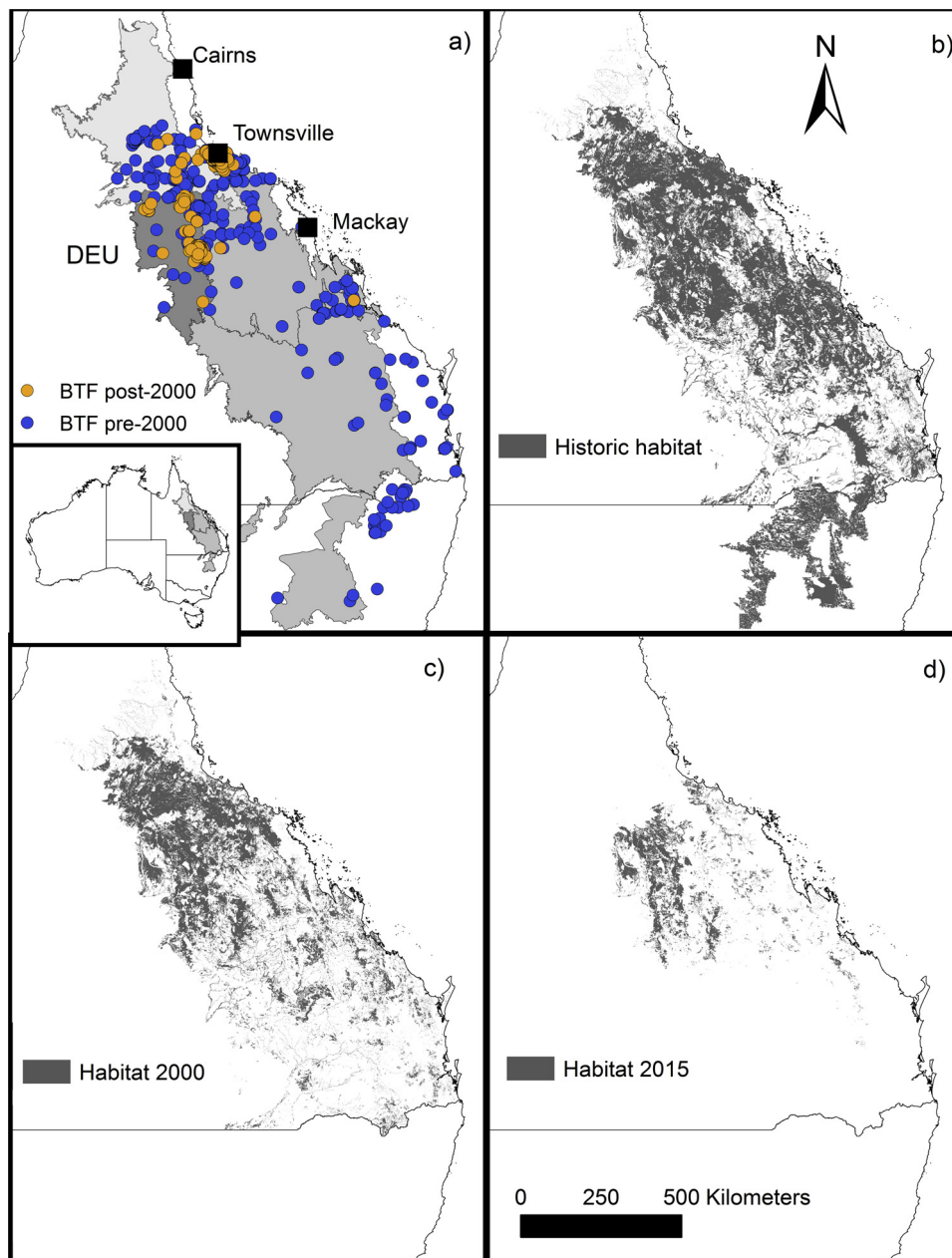


Fig. 2. Black-throated finch (BTF) historical and contemporary distribution. a) Historical records for BTF (pre-1999), and since 1999. DEU = Desert Uplands bioregion, shown in dark grey. b. Historical BTF habitat, mapped using the Queensland Herbarium's Regional Ecosystem preclearing data (ref) using all BTF historical records. c. BTF habitat still remnant in 2000. d. Contemporary habitat of BTF, shown as the extent of the remnant Regional Ecosystems that BTF have been recorded in since 2009.

2. Contemporary regulatory environment

While much of the historical loss of habitat for the BTF was unregulated, since 2000, Australia has increased legal mechanisms for protection of important vegetation and habitat. Environmental regulation in Australia is the responsibility of both the Commonwealth Government and State Governments, with Commonwealth responsibilities stemming from Australia's participation in international agreements (such as the Convention on Biological Diversity). In particular, the Commonwealth [Environment Protection and Biodiversity Conservation Act, 1999](#) (Cth) (hereafter, the EPBC Act), and the [Queensland Vegetation Management Act 1999](#) (Qld) (VM Act) came into force in 2000. We outline the role of these and other Acts relevant to this case study.

2.1. Environment Protection and Biodiversity Conservation Act (Cth)

The EPBC Act is the central environmental legislation in Australia. Main objects of the Act include to “provide for the protection of the environment, especially ... matters of national environmental significance”, and the “conservation of biodiversity”. The Act provides a regulatory framework relating to assessment, authorisation and offence provisions for assisting in the protection and management of actions which may have a ‘significant impact’ on entities, including nationally threatened species, listed as ‘Matters of National Environmental Significance’.

The EPBC Act regulates site-specific actions. Where an action could have a significant impact to Matters of National Environmental Significance, the EPBC Act requires the action be referred by the proponent of the action for assessment. The initial referral includes a

preliminary description of the project, from which the Commonwealth Environment Minister (or delegate) decides whether the project is likely to have a significant impact on one or more Matters of National Environmental Significance. If so, the project is deemed to be a ‘controlled action’, and in the great majority of cases a public impact assessment is required to be undertaken by the proponent via an ‘environmental impact statement’.

If the Minister or delegate decides there is unlikely to be a significant impact, the project is deemed “not a controlled action”, which means assessment is not required. In a few rare cases, projects have been deemed “clearly unacceptable” based on the proposed impacts. In these cases, the proponent may withdraw the referred project, and then has the opportunity to modify and resubmit the project. Projects deemed to have a significant impact to Matters of National Environmental Significance may require offsets (defined as measures that compensate for the residual adverse impacts of an action on the environment) as a condition of final approval (Commonwealth of Australia, 2012). An offset is an action that generates a benefit at least as large as the impact on the Matter of National Environmental Significance.

2.2. Vegetation Management Act 1999 (Qld)

The purpose of Queensland’s VM Act is to regulate vegetation clearing so that, among other things, threatened remnant vegetation is conserved, the loss of biodiversity is prevented, ecological processes are maintained, and sustainable land use is allowed. The VM Act works in conjunction with the *Planning Act 2016 (Qld)* to categorise and map vegetation types into ‘Regional Ecosystems’, and conservation status (e.g., remnant or high conservation value regrowth) and regulate the clearing of native vegetation. Clearing may be regulated through permits or under specified codes. Offence provisions may apply if regulated clearing is undertaken without a required permit or contrarily to an applicable code. Some clearing activities are exempt from the framework, such as for mining which is regulated under the *Environmental Protection Act 1994 (Qld)*, and clearing for an ‘urban purpose in an urban area’, which can be, but is not always, regulated by local government planning instruments under the *Planning Act 2016 (Qld)*.

The VM Act has been subject to numerous amendments (Reside et al., 2017). Clearing rates increased substantially directly before and after the Act was introduced (due mostly to landholders concerned about imminent restrictions), but amendments in 2004 substantially reduced broad-scale land clearing (Fig. 1; Reside et al., 2017). However, subsequent amendments (2013–2018) weakened the regulations to allow clearing of remnant vegetation through permits for ‘High Value Agriculture’, removed the need for government pre-assessment, and allowed clearing under self-assessable codes (Queensland Government, 2013b). The amendments also removed restrictions on clearing of high conservation value regrowth on freehold land. These amendments, coupled with reduced focus on compliance, were followed by an increase of more than three-fold in annual clearing rates compared with 2009–2010 (DNRM, 2015; Maron et al., 2015; Reside et al., 2017). The clearing continued to increase, so that over 395 000 ha was cleared in 2015–2016, the highest clearing rate since 2003–2004 (DSITI, 2017). In 2018, the VM Act was again amended, this time to remove ‘High Value Agriculture’ as an allowable purpose, to reinstate protection of high-value regrowth, and to reduce the scope of self-assessable codes (Cosgrove et al., 2018).

2.3. Nature Conservation Act 1992 (QLD)

The object of Queensland’s *Nature Conservation Act 1992 (Qld)* (NC Act) is the ‘conservation of nature’. The Act provides mechanisms for the declaration of protected areas with varying level of protection, development of management and conservation plans for critical habitats and offence provisions for impacts to protected flora and fauna. The

BTF has been listed as Endangered in Queensland under this Act since 2009.

2.4. Environmental Protection Act 1994 (Qld)

The *Environmental Protection Act 1994 (Qld)* (EP Act) is the primary legislation in Queensland to provide regulation and enforcement provisions for activities that cause likely or real environmental harm. The object of the EP Act is to protect Queensland’s environment while allowing for ecologically sustainable development. An ‘environmental authority’ and environmental impact assessment is required under this Act for most large-scale resource extraction activities, including the large mines proposed in the Galilee Basin.

2.5. State Development and Public Works Organisation Act 1971 (QLD)

The *State Development and Public Works Organisation Act 1971 (SDPWO Act)* provides the State Government with a range of powers and functions to facilitate the development of specified areas (e.g. ‘State Development Areas’) or declared ‘coordinated projects’ considered to be of interest to the State (previously known as ‘significant projects’), due to their complexity or their need for significant infrastructure. The Coordinator-General facilitates the coordination of declared projects, and can speed up decision making processes. The Minister for State Development can declare a project a ‘prescribed project’ (SDPWO Act, s76E), which enables the Coordinator-General to streamline decision processes (SDPWO Act, Part 5 A, Division 3), and at the same time declare ‘critical infrastructure status’ (SDPWO Act, s76E(4)) which together can remove most of the normal powers of the Queensland Courts to review and determine the lawfulness of decisions (SDPWO Act, s76 W). The Coordinator-General has the power to mandate conditions on a project approval, which cannot be disputed by the public, other Queensland Departments or the Land Court.

2.6. Interaction between environmental regulatory frameworks

Each of these regulatory frameworks operates somewhat separately. However, the EPBC Act can apply to actions regulated under any state Act, if it is likely to have a ‘significant impact’ on a Matter of National Environmental Significance (such as the BTF). Also, the SDPWO Act assists with the coordination of assessment between Acts, particularly between the EPBC Act and the EP Act. One of the common features of all of these regulatory frameworks is that they only assess site-specific actions; rarely, if ever, requiring the assessment of cumulative impacts of multiple activities. Importantly, most measures provided in state and federal environmental laws to protect species, such as restrictions on tree clearing of remnant vegetation provided by the *Vegetation Management Act 1999 (Qld)* and *Planning Act 2016 (Qld)*, can be overridden by other Acts allowing development or by regulatory frameworks which do not provide strict protections. For example, the declaration of a State Development Area under the *State Development and Public Works Organisation Act 1971 (Qld)* or a Priority Development Area under the *Economic Development Act 1994 (Qld)* over an area means that applications are not subject to the normal transparency and accountability measures that would otherwise be provided by other applicable Queensland Acts, and are no longer subject to restrictions on vegetation clearing provided by the *Vegetation Management Act 1999* and the *Planning Act 2016*. The Federal EPBC Act is not able to be overridden like state legislation, but it does not provide any strict prohibitions against impacts to matters, such as protected species habitat, and is subject to significant Ministerial discretion.

3. Habitat availability and BTF distribution before and after increased environmental legislation

We investigated the extent of BTF habitat: a) prior to 2000

(“historical habitat”), b) at the advent of both the EPBC Act and VM Act in 2000 (“habitat in 2000”), and c) as at 2015 (“contemporary habitat”). To approximate the historical habitat of BTF, we used all records from available databases that span the years 1901 to 2017 (Black-throated Finch Recovery Team 2017). We selected BTF-suitable habitat types by intersecting the BTF records with the pre-clearing mapping of Queensland’s Regional Ecosystems (Appendix A, Queensland Government, 2018), and showed the extent of these. To map the available habitat in 2000, we mapped the extent of these Regional Ecosystems that were still classed as remnant (i.e., had never been cleared) in 2000. To map the contemporary BTF habitat in 2015, we selected all Regional Ecosystems that had BTF records post-2009 (Appendix A). We used this timeframe to approximate the contemporary use of habitat types by BTF, because including historical records would have skewed the assessment of contemporary habitat by incorporating regional ecosystems only used in the portion of the BTF’s range from which it is now extinct. We mapped the extent of these that were classed as remnant in the most recent Regional Ecosystem data (2015) (Queensland Government, 2018).

We mapped the clearing of BTF-suitable Regional Ecosystems spanning 2000–2016 using the Statewide Landcover and Trees Study (SLATS) data (DSITI, 2017). We calculated the proportion of the clearing that occurred between 2000 and 2016 outside of any EPBC referral, by overlaying the EPBC referrals spatial extent (Referrals Spatial Database, 2018) over the BTF-suitable REs (historical habitat) that were cleared. All extents (e.g., clearing, habitat types) were measured in Albers conical equal area projection in ArcGIS 10.5.

4. Results: clearing occurring under regulation

Habitat for BTF was lost earliest in the southern part of its range, where clearing for agriculture and development has been more extensive and intensive (Fig. 2). Much of this was lost before the mid-1970s, with BTF confined to smaller patches after this (Black-throated Finch Recovery Team, 2004). Comparing the extent of the remnant Regional Ecosystems in which BTF were recorded historically, with that still remnant in 2000 suggested that 51% of their historical habitat was lost before 2000. Between 2000 and 2016, during which both the EPBC Act and VM Act were in force, over 631,000 ha of potential BTF habitat was cleared (Fig. 2d). Comparing the contemporary habitat (extent of the remnant Regional Ecosystems in which BTF have been recorded since 2009) with the historical habitat indicates that BTF no longer occur within 88% of their historical distribution.

Much of the clearing that occurred since 2000 was not associated with any referrals under the EPBC Act: 502,391 ha of loss of Regional Ecosystems in which BTF have been recorded did not correspond to the location of any known referral (Fig. 3). The details of each clearing event are unknown, so we do not know if any would have met the Commonwealth Government’s definition of potentially having a ‘significant impact’ to warrant an EPBC referral, or what state legislation might have applied. The non-referred clearing events were mostly small, and occurred throughout the BTF’s historical range rather than its contemporary range (Fig. 3). One-fifth (102,844 ha) occurred in the three years after relaxation of Queensland’s VM Act in 2013 (2013–2016). In this recent period, most of the clearing across the state was for pasture (93%), so it is likely that most of the clearing of BTF habitat was also for pasture and therefore the VM Act was likely to have applied (DSITI, 2016). Only a small proportion (1.4%) of the clearing across Queensland was for mining, which would be governed under the EP Act and possibly the SDPWO Act and NC Act. Some clearing may have occurred for urban or other large-scale regional development regulated under the planning law framework.

We identified 775 referrals under the EPBC Act for projects since 2000 (Referrals Spatial Database, 2018) in locations that intersect with habitat in 2000 (the BTF-suitable Regional Ecosystems remnant in 2000). Of these, 260 were determined as ‘controlled actions’ (for

various matters, not only the BTF), and more than half ($n = 410$) were ‘not controlled action’ (Fig. 4). Three were deemed ‘clearly unacceptable’. One ‘clearly unacceptable’ referral was a housing development near Townsville which was refused because the “proposed action will have an unacceptable impact on the BTF due to the loss and degradation of important, high-quality foraging and nesting habitat” (Australian Government, 2010). There was no clear trend in the number of referrals in BTF habitat over time. There were 40 referrals in 2017 alone, 13 of which were determined to be ‘not controlled action’. We could not calculate the clearing of BTF habitat since 2000 that coincided with a referred project, because that would require information on the progress of each project, and this information was unavailable for most projects. It is likely that some of the clearing that occurred within the EPBC referral footprint could be unrelated to the referred project (e.g. before the project was referred, or after the project lapsed); therefore, the amount of clearing that was not regulated by the EPBC Act is likely to be an underestimate.

4.1. Pending clearing that has received approval: Galilee Basin in the Desert Uplands

With so much of the habitat that once existed cleared or degraded, the remaining patches of habitat become increasingly important to the species’ persistence. The best known remaining habitat, where the larger of the two remaining populations of BTF occurs, is in the Galilee Basin (Vanderduys et al., 2016). This population is centred around the northern end of the mining lease of the Carmichael Coal Mine and Rail Project (CCM), at a site known as Ten Mile Bore (Vine and Reside, 2014). The largest flocks ever recorded (the largest was a flock of 400 birds sighted in 2013) have been found at this site (Black-throated Finch Recovery Team, 2017a). Other parts of the Galilee Basin have also been identified as high quality BTF habitat, and it is likely these largest remaining tracts of intact BTF habitat in this vicinity provide the greatest potential to sustain BTF populations (Mula-Laguna et al., 2019; Queensland Government, 2012; Vanderduys et al., 2016).

Over half of the BTF’s extant range sits under a mining development tenure (Vanderduys et al., 2016). The CCM is the largest of five large thermal coal mines that have received approval under the EPBC Act (Table 1) to remove and fragment BTF habitat (a substantially larger mine, Alpha North, has been proposed; proponents have applied for an Environmental Authority under the EP Act QLD and it has been referred under EPBC Act 6 April 2018). The CCM has received approval to clear or have a residual impact on more than 16,500 ha of BTF habitat (Queensland Government, 2014). Of this, over 6000 ha was deemed “critical habitat” for BTF by the proponent. Over 29,000 ha of BTF habitat has explicitly been approved for clearing under formal approvals across all five mines (Table 1). Included in the approved clearing is approximately 50% (4017 ha) of the Bimblebox Nature Refuge, which was gazetted under the NC Act for its high biodiversity values including BTF (Queensland Government, 2013a). Another 3422 ha of the Bimblebox Nature Refuge has the potential to be impacted by subsidence.

The approval of BTF habitat removal for the five proposed mines followed both state and federal processes and was evaluated at multiple steps for its likely impact on the BTF (Table 1). Initially, each mining project received ‘significant project’ (now known as ‘coordinated project’) status under the SDPWO Act, which facilitates coordinated assessment under various Acts. Then, the projects were referred to the Commonwealth Government under the EPBC Act and received ‘controlled action’ status because of the likelihood of significant impacts to multiple Matters of National Environmental Significance (including, in all cases, the BTF). The Queensland Coordinator-General reported the recommendation for each project to proceed (SDPWO Act QLD), often with extra conditions including some from the NCA (for example, approval for the Carmichael mine required a Species Management Plan for the BTF). Each project was also approved with conditions under the

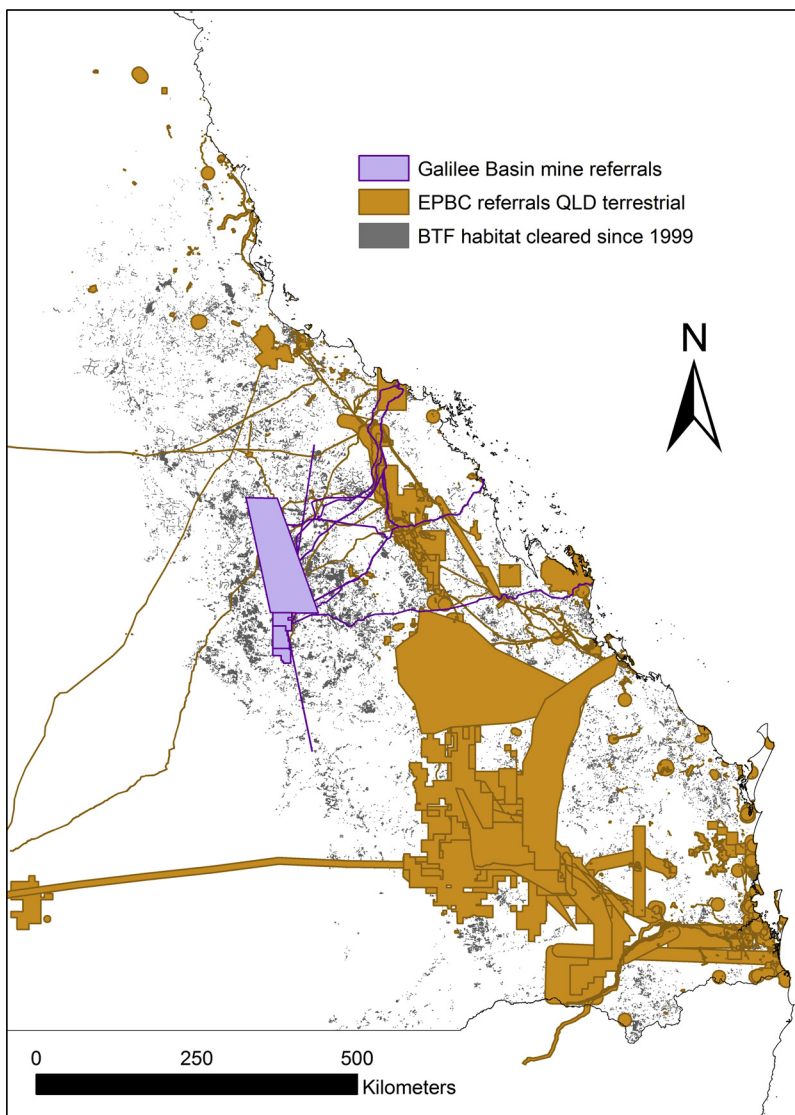


Fig. 3. EPBC referrals to the Australian Government from 1999 to 2018 for projects that are likely to impact a matter of national environmental significance (orange) across Queensland’s land. Referrals for the Galilee Basin mines (a subset of all of the referrals) are shown in purple. The grey represents BTF habitat that was available in 1999, and has been cleared since the advent of the EPBC that does not coincide with any referral (DSITI, 2017).

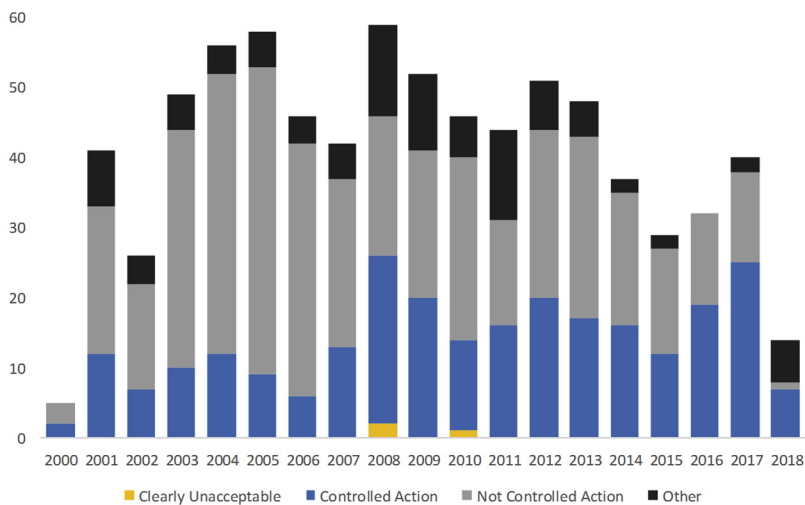


Fig. 4. The number of development projects (x-axis) that received EPBC referral that overlapped with BTF suitable Regional Ecosystems that were remnant in 1999. Blue: referred projects that were designated to be Controlled Actions. Grey: referred projects that were not designated as Controlled Actions. Yellow: projects deemed to be clearly unacceptable. Black: projects that were listed as another category, for example some were “Withdrawn-Completed” so there was no information on the decisions that were made for these projects. Some of the more recent referrals (e.g. 2017-18) have not received their referral decision yet.

EPBC Act. Two have received their state EP Act environment authority; the remaining three have not yet received this.

4.2. Pending clearing that has received approval: Townsville

Removal of BTF habitat near Townsville is ongoing, and continues to receive approval. For example, in March 2018, 106 ha of BTF habitat was approved for removal under the EPBC Act and Queensland Acts to make way for a housing estate (Australian Government, 2018b). A High Value Agriculture permit (allowing clearing of remnant vegetation, VM Act) to clear 295 ha of BTF habitat for sugar cane just south of Townsville received approval under the VM Act (date unknown) and EPBC Act (approved May 2018) (Australian Government, 2018a).

5. Conditions of development approval relevant to BTF habitat

Most of the EPBC-referred development projects that identified significant impact to BTF were subject to conditions of approval related to mitigating impacts on the BTF. For example, conditions for the CCM include that a “plan for the management of direct and indirect impacts of mining operations on Matters of National Environmental Significance” must be submitted to the Minister at least three months prior to the commencement of mining operations (Australian Government, 2015). Further conditions include to legally secure minimum offset areas within two years of commencement of the specified component of the action (Australian Government, 2015). The approved BTF offset plan for the CCM states that approximately 20,000 ha of existing BTF habitat will be ‘improved’ in order to compensate for the loss of over 6000 ha of critical habitat. Further offsets are also required to compensate for the loss of ‘core’ and ‘marginal’ habitat (Queensland Government, 2014).

Among the Coordinator-General’s conditions of approval for the CCM is Condition 7 (a)(v): “Evidence values to be impacted can be offset” (Queensland Government, 2014). Evidence that BTF habitat can be successfully offset is, however, lacking (Melton, 2017). Furthermore, the calculations used to support the approved BTF offset strategy for the CCM (CO2 Australia, 2016) rely on many assumptions including: 1) that habitat value for the BTF can be increased beyond that of sites that are already at ‘maximum stocking density’ for the BTF; and 2) that sites currently at maximum stocking density for BTF under the current management regime would decline in condition within 5 years if not used as an offset, but would increase still further in condition within 5 years if used as an offset. These outcomes were estimated with an 85% to 90% confidence value, despite no previous experience or research supporting the effectiveness of the proposed interventions (Black-throated Finch Recovery Team, 2017b). Existing offsets used to compensate for the loss of BTF habitat resulting from development projects around Townsville were found to be of low habitat value for BTF (Melton, 2017).

A large part of the benefit that the CCM offsets were expected to achieve was derived from an estimated reduction in the risk of complete clearing of a site. The reduction in risk of clearing was estimated to be reduced, due to the protection of the site as an offset, from 40% to 20% over a 20-year period. Both risks are much higher than observed recent rates of clearing in the region (Maseyk et al., 2017a). The justification for the estimate of reduced risk achieved by the offset was that future mining at the offset site is considered moderately likely, but that the offset would reduce the likelihood of habitat loss to mining (CO2 Australia, 2016). However, should such hypothetical future clearing of BTF habitat for mining have occurred, it would almost certainly have triggered another offset requirement (Maseyk et al., 2017a). Therefore, the offset benefit claimed for this ‘averted loss’ is problematic; the risk of loss due to mining ought to be excluded from the calculation, which would yield a much smaller estimated benefit from the offset (Maron et al., 2018). In short, the offsets appear unlikely to generate either the habitat improvement or the habitat protection benefits that were

estimated, but even if they did, the net result of the approved losses and the offsets would be an enduring reduction in BTF habitat, even after the time lag period has passed.

6. Discussion

Over half of the BTF’s habitat was lost by the time Australia’s primary environmental legislation, and Queensland’s vegetation laws, came into place in 2000. Since these two pieces of legislation were enacted, BTF habitat has continued to be cleared, both with and without government approval. Despite the diminishing extent of BTF habitat, and a corresponding contraction of the area where the BTF is sighted, only one development project has ever been refused on the grounds of an unacceptable impact to BTF. Queensland’s vegetation laws and other environment regulations were also unable to prevent loss of BTF habitat, which likely occurred through many small-scale clearing events on leasehold and freehold land. Despite over 700 referrals for development projects that intersected with potential BTF habitat, and the clearing that occurred outside of any referral, almost all applications to permit habitat loss for the BTF were approved, without an assessment of their cumulative impact. We chart a trajectory of habitat loss for a threatened taxon that continues to deplete the last few strongholds where the bird persists. Despite increased environmental regulation, the last high-quality habitat areas—the Desert Uplands and the Townsville Coastal Plain—continue to face strong development pressures from mining and urbanisation, respectively.

A 10-year review of the EPBC Act (Hawke, 2009) identified key issues limiting the effectiveness of the Act, all of which relate to the BTF case study. The review identified that the EPBC Act does not consider the potential for cumulative impacts of multiple developments, and only assesses each development if it on its own would have a significant impact. Furthermore, the EPBC Act provided no recourse to challenge the merit of the Minister’s decision about whether an impact can proceed. The review noted there appeared to be little appetite in the implementation of the Act for not approving projects that are likely to have a significant impact on a threatened species. To address these issues, the Hawke Review (2009) recommended an independent Environment Commission, greater access to the courts for public interest litigation, and a greater reliance on strategic assessments and bioregional plans. Statutory strategic assessments and bioregional plans provide assessment at the landscape scale across multiple individual projects, so that EPBC referral and approval are not required for each project, and the cumulative impact of multiple developments can be considered (Australian Government, 2012). A strategic assessment should identify important habitat areas that would remain protected from development, as well as areas of lower ecological value where development may be able to proceed with appropriate safeguards and offsets. However, caution is warranted, because while strategic assessments could have the potential to minimise impact to threatened species, substantial habitat loss can still be approved even for critically endangered species (Whitehead et al., 2017).

We urge that mechanisms to protect habitat for threatened species, as well as plans for offsets where habitat loss does go ahead, should be focussed on ecological outcomes that support species recovery. Calculation of anticipated gains from offsets must be done in a way that is logically consistent and evidence-based, with appropriate reflection of uncertainty and management of time lags (Maseyk et al., 2017b). While the EPBC Act framework for such offset calculations is designed to enable this (Miller et al., 2015), the way in which it has been used to calculate at least some BTF offset requirements appears to be flawed.

The International Union for the Conservation of Nature’s biodiversity offset policy recommends that offsets not be used “where the time lag between the residual loss of biodiversity caused by the project and the gains from the offset causes damage that cannot be remediated and/or puts biodiversity components at unacceptable risk” (IUCN 2016). The severe threat of extinction faced by the BTF

(Commonwealth of Australia, 2005) makes the anticipated time lags between habitat destruction and habitat improvement through the approved offsets particularly high-risk. Yet this key policy recommendation is not given adequate attention by state and Commonwealth agencies. Further, there is considerable uncertainty about whether, how, and over what time period habitat management can improve habitat quality for the BTF. In such circumstances, demonstrating the effectiveness of the offset intervention for the BTF prior to permitting the impacts (Bekessy et al., 2010; Gibbons et al., 2015) is an important step, but this is not currently required.

If threatened species are to recover, effective protection is needed not only of remaining occupied habitat, but also of habitat required for recovery (Camaclang et al., 2015). A comprehensive, adequate and representative national reserve system of protected areas may potentially help prevent habitat loss, but many threatened species depend upon off-reserve habitat, such as land managed primarily for production purposes (Watson et al., 2011). Furthermore, even gazetted protected areas can still be cleared for mining, such as the Bimblebox Nature Refuge, and not halt the threats that imperil species such as BTF (Kearney et al., 2018). Genuine protections for remaining habitat are required. At present there are no legislative mechanisms which provide absolute protection for protected species habitat that cannot be overridden by another law. In Queensland the strongest regulatory protection available for species habitat is where the habitat is protected as national park under the NC Act. Under this Act, no major development, including mining or gas activity (except pipelines) can be developed over national park declared areas. However, national park declarations can be revoked by regulation and there is a broad discretionary ministerial power to allow ‘ecotourism facilities’ and other ‘service facilities’ in national parks (NC Act s35). Given that less than 8% of Queensland is protected as national park (DEE, 2016), this level of protection is clearly inadequate for the vast amount of protected species habitat across Queensland alone. Similar levels of legal protection are provided for protected species habitat across Australia. In the case of the BTF, we recommend that habitat critical for its persistence and recovery should be mapped and explicitly protected from clearing or actions likely to reduce habitat value for the species, such as inappropriate grazing.

Despite a contemporary discourse focussed on stopping species declines (Australian Government, 2004), Australia faces a continuing extinction crisis. After the extinction of the Christmas Island Pipistrelle in 2009, Martin et al. (2012) warned that unless responsive and accountable institutional processes are in place for threatened species, further extinctions will occur. In practice, existing institutions are not clearly accountable for preventing the extinction of species in Australia. This lack of a responsible authority is combined with a regulatory environment that has had little appetite for restricting developments, which in turn is driven by apparent societal prioritisation of economic growth over environmental protection – despite the potential for such growth to be decoupled from environmental damage (Hatfield-Dodds et al., 2015). Greater institutional accountability, effective governance and regulation, adequate and efficient allocation of funds, and co-ordination across jurisdictions are necessary to prevent extinctions of threatened species whose habitat is facing development pressure, and to allow for their recovery (Hawke, 2009; Martin et al., 2012; McDonald et al., 2015; Scheele et al., 2018; Woinarski et al., 2017).

Under the EPBC Act, the relevant Minister must ensure that, at the very least, a ‘conservation advice’ is prepared for non-extinct species listed as threatened (EPBC Act s266B(1)), which must state why a species has been listed and what could be done, if anything, to stop the decline or support the species’ recovery. Recovery plans are more detailed documents that provide for the research and management actions necessary to stop the decline of, and support the recovery of, the species, but are optional. The Act also provides an option, but not a requirement, to map and provide a register of ‘Critical Habitat’ for protection to support listed species (EPBC Act s207 A). However, over 60%

of nationally threatened species do not have a Recovery Plan (Australian Conservation Foundation et al., 2015; Walsh et al., 2012) and only five species have registered Critical Habitat (Australian Government, 2018c). Further, while conservation advices must be prepared for listed species, there is no requirement to fund the strategies for population recovery; nor are there enforceability or accountability for implementation of these strategies.

The current policy framework at both state and Commonwealth levels has failed to prevent ongoing habitat loss for the once widespread, now endangered, BTF. Habitat loss continued despite an active Recovery Team, a (albeit now out of date) Recovery Plan, and scrutiny of development projects that impact BTF habitat. There has been an absence of dedicated funding for the implementation of the BTF Recovery Plan, meaning effective implementation has been hampered through lack of resources. Adequate resourcing for recovery of BTF should involve thorough surveys to determine the full extent of its current and potential future habitat, mapping and protection (via enforcing current legislation) of critical habitat, and implementation of grazing management that maintains habitat quality.

7. Conclusions

The BTF’s listing as Endangered is based on the EPBC Act criterion that it is “facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria”, but is not Critically Endangered (s179(4) EPBC Act). Combined with recent losses, the risk of clearly foreseeable future losses of habitat within its remaining distribution appears likely to push the BTF towards meeting the criteria for Critically Endangered under the EPBC Act (“an extremely high risk of extinction in the wild in the immediate future” per EPBC Act s179(3)). The anticipated increase in habitat removal in its core remaining range increases the risk of further severe population decline in the immediate future, increasing the chance that the BTF will meet EPBC Act criteria relating to rates of decline (Criterion A) or small population size and decline (Criterion C). Since the risk of a higher threat level is evident, and key drivers such as habitat removal are in principle under direct control of regulators, the window of opportunity to prevent uplisting to Critically Endangered and, potentially, extinction, is now open – but may close soon.

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Appendix A

Queensland’s Regional Ecosystem Description Database information can be found here:

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/about#redd>

Methodology for mapping Regional Ecosystems:

<https://www.qld.gov.au/environment/plants-animals/plants/herbarium/mapping-ecosystems>

More general information:

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems>

Historical (pre-European) BTF habitat mapping

We used the Black-throated Finch records, vetted for spatial accuracy (Vanderduys et al., 2016), and intersected these with the pre-clearing Regional Ecosystem mapping (<http://qldspatial.information.qld.gov.au/catalogue/custom/detail.page?fid={22E1BC4E-BDFA-470A-AED8-04F38B4FCFC3}>) version 10.1. © State of Queensland (Department of Science, Information Technology and Innovation) 2017.

We selected all Regional Ecosystems that BTF had been recorded in,

but we excluded records over water, oceans and estuaries.

BTF habitat mapping for post-1999

We used the same Regional Ecosystems as those in the pre-clearing (historical) mapping, and mapped the extent of these that were still remnant (never been cleared) in 1999

BTF habitat mapping for 'recent' (2015)

We selected the Regional Ecosystems that had at least 1 BTF record in them from 2010 onwards. We mapped these Regional Ecosystems that were still remnant (never been cleared) in the latest Regional Ecosystem mapping (<http://qldspatial.information.qld.gov.au/catalogue/custom/detail.page?fid={8FDF54D2-654C-4822-8295-1D8E8E772373}>) version 10.1. © State of Queensland (Department of Science, Information Technology and Innovation) 2017.

BTF Records

In Appendix A, the column "Historic no. BTFS records" refers to the number of occasions a Black-throated finch southern subspecies (*Poephila cincta cincta*) was recorded in that Regional Ecosystem, from 1901 to 2017.

For example, if there are 2 records, this means that on two occasions, at least one BTF was sighted there. Each record could be multiple birds, e.g. one record could be a flock of 20 birds, the second record could be a flock of three birds.

The column "≥ 2010 no. BTFS records" refers to the number of occasions at least one BTF was sighted in the Regional Ecosystem from the start of 2010 to 2017

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