Environment Protection and Biodiversity Conservation (National Recovery Plan for the Forty-spotted Pardalote (*Pardalotus quadragintus*)) Instrument 2024

I, Tanya Plibersek, the Minister for the Environment and Water, make the National Recovery Plan for the Forty-spotted Pardalote (*Pardalotus quadragintus*) in the following instrument, jointly with Tasmania.

Dated 27/8/24

Tanya Plibersek
Minister for the Environment and Water

1 Name

This instrument is the *Environment Protection and Biodiversity Conservation (National Recovery Plan for the Forty-spotted Pardalote* (*Pardalotus quadragintus)) Instrument 2024*.

2 Commencement

This instrument commences on the day after it is registered.

3 Authority

This instrument is made under subsection 269A(3) of the *Environment Protection and Biodiversity Conservation Act 1999*.

4 Jointly made recovery plan

The National Recovery Plan for the Forty-spotted Pardalote (*Pardalotus quadragintus*) in this instrument is jointly made with Tasmania, as agreed by the Minister for Parks and Environment (Tasmania).

Australian Government

Department of Climate Change, Energy, the Environment and Water

Tasmanian Government

National Recovery Plan for the Forty-spotted Pardalote (*Pardalotus quadragintus*)

Cataloguing data

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This publication is available at Species Profile and Threats Database: Pardalotus quadragintus.

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The Australian Government, in partnership with the Department of Natural Resources and Environment Tasmania, facilitates the publication of Recovery Plans relevant to Tasmania to detail the actions needed for the conservation of threatened native wildlife. This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved and may also be constrained by the need to address other conservation priorities. Approved recovery actions may be subject to modification due to changes in knowledge and changes in conservation status.

For information on the current listing status of this species under relevant state or territory legislation, see the Species Profile and Threats Database.

Acknowledgement of Country

Our department recognises the First Peoples of this nation and their ongoing connection to culture and country. We acknowledge Aboriginal and Torres Strait Islander Peoples as the Traditional Owners, Custodians and Lore Keepers of the world's oldest living culture and pay respects to their Elders past, and present

Image credits

Cover page: Forty-spotted pardalote *Pardalotus quadragintus* on Bruny Island © Barry Baker

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Acronyms

AOO	Area of occupancy
BLA	BirdLife Australia
BOM	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Commonwealth)
Cwlth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DNRET	Department of Natural Resources and Environment Tasmania
EOO	Extent of occurrence
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FPRT	Forty-spotted pardalote Recovery Team
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
NGO	Non-government organisation
RFA	Regional Forest Agreement
SPRAT	Species Profile and Threats
Tas	Tasmania
TSP Act	*Threatened Species Protection Act 1995* (Tasmania)
TSSC	Threatened Species Scientific Committee

1. Summary

Common name: Forty-spotted pardalote

Scientific name: *Pardalotus quadragintus*

Family: Pardalotidae

Current status of taxon:

1. *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth): Endangered
2. *Threatened Species Protection Act 1995* (Tas): Endangered
3. IUCN Red List of Threatened Species: Endangered

1.1 Species description, distribution and habitat

The forty-spotted pardalote is a small, cavity-nesting passerine measuring 9 to 10 cm in length and weighing approximately 10 g. Individuals are generally olive green in colour and pale yellow around the eye, cheek and on the rump. The wings are black with characteristic white spots. The species does not exhibit any apparent size or colour dimorphism between the sexes (Woinarski & Rounsevell 1983).

Forty-spotted pardalotes are endemic to Tasmania, occurring in three areas: on Bruny Island (including Partridge and Snake Islands) and nearby parts of mainland Tasmania, including Tinderbox and Coningham Peninsulas and at Ida Bay; on Maria Island; and in the Strzelecki Range of Flinders Island (Bryant 2018). Historically the species is thought to have been widely distributed in lowland forests of white gum (*Eucalyptus viminalis*) in eastern Tasmania and also on King Island (Rounsevell & Woinarski 1983; Brown 1986). Viable subpopulations appear to have now disappeared from Taroona, Darling Range (Flinders Island), Lime Bay State Reserve, Peter Murrell Reserve (Howden), and Coningham Peninsula (Bryant 2010; Bryant & Webb 2014; S Bryant & GB Baker pers. obs. cited in Bryant et al. 2021).

The species is found only in forests where white gums are present. Small pockets of white gum and even individual trees also provide important habitat for the species. The white gum provides most of the birds' food in the form of manna (a sugary secretion produced by the tree in response to incisions made on branchlets by the birds, as well as insect attack), along with invertebrates and lerp (Woinarski & Bulman 1985; Case & Edworthy 2016). Pairs actively defend permanent territories that are typically around 0.7 ha in size within white gum forest and woodland (Woinarski & Bulman 1985), and use hollows in white gums and other trees for nesting (Woinarski & Rounsevell 1983; Brown 1986).

1.2 Recovery Plan Vision, Objective, and Strategies:

1.2.1 Long-term vision

The forty-spotted pardalote population has increased in numbers to such an extent, or occurs in a sufficient number of secure locations, that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

1.2.2 Recovery Plan objectives

Within ten years, demonstrably reduce the severity of identified threats across the species' range.

Within ten years, increase the number of viable subpopulations of the forty-spotted pardalote across its current and historical range.

Within ten years, maintain and improve the extent, condition and connectivity of habitat of the forty-spotted pardalote.

Within ten years, measure and sustain an increased population trend compared to baseline counts in the number of mature individuals of forty-spotted pardalote.

These objectives will be achieved by implementing the actions set out in this Recovery Plan that minimise threats, protect and enhance the species' habitat throughout its range, adequately monitor the species, generate new knowledge to guide recovery, and increase public involvement achieving these objectives.

1.2.3 Strategies to achieve objectives

1. Implement management strategies to reduce known threats to the forty-spotted pardalote and its habitat.
2. Increase the number and viability of forty-spotted pardalote subpopulations through translocation and supplementation techniques.
3. Improve protection and increase the quality, extent, and connectivity of known and potential habitat for the forty-spotted pardalote.
4. Improve knowledge of the biology and ecology of the forty-spotted pardalote, and maintain a long-term monitoring strategy to identify population trends.
5. Increase stakeholder participation in forty-spotted pardalote conservation and management.
6. Coordinate, review and report on recovery progress.

1.3 Criteria for success

This Recovery Plan will be deemed successful if, within ten years, all of the following have been achieved:

- Threats within the range of the forty-spotted pardalote are managed and reduced to avoid or mitigate negative impacts on the species and its habitat.
- The number of subpopulations, area of occupancy or species range has increased, and risk of extinction from stochastic events has reduced.
- Research and planning to inform the feasibility of reintroduction and translocation as a management strategy has been conducted.
- The quality, extent and connectivity of forty-spotted pardalote habitat has improved throughout the species' current and potential range, and a network of sites is protected and managed for the species.
- Understanding of the species' ecology has increased, in particular knowledge of its current distribution, population trends, movement ecology, life history, threats, and critical habitat.
- The forty-spotted pardalote population has been adequately monitored using standardised methods, and an increase in the population from baseline counts is observed as a result of recovery actions.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

1.4 Recovery team

Recovery teams provide advice and assist in coordinating actions described in Recovery Plans. They include representatives from organisations with a direct interest in the recovery of the species, including those involved in funding and those participating in actions that support the recovery of the species.

The Forty-spotted Pardalote Recovery Team has the responsibility of providing advice, and coordinating and supporting the implementation of the recovery actions outlined in this Recovery Plan. The membership of the Recovery Team includes individuals with relevant government agencies, non-government organisations and expertise from independent researchers and community groups.

2. Introduction

This document constitutes the 'National Recovery Plan for the Forty-spotted Pardalote (*Pardalotus quadragintus*).' The plan considers the conservation requirements of the species across its range, and identifies the actions needed to ensure the species' long-term viability in nature and the parties that will undertake those actions.

The first Recovery Plan for the species was prepared under the Commonwealth's Endangered Species Program in 1991 (Bryant 1991). This Recovery Plan supersedes the previous Recovery Plan (TSS 2006) that was adopted under the EPBC Act in November 2006. A summary of the key achievements gained for the species over this thirty-year period is provided in Appendix A.

The second Forty-spotted Pardalote Recovery Plan (TSS 2006) was reviewed in February 2021 by the Forty-spotted Pardalote Recovery Team. The review noted that since the adoption of the Recovery Plan in 2006, a notable amount of progress had been made in facilitating the conservation of the species. Most effort was directed towards: securing perpetual covenants within the species' known and potential range, deploying nest boxes to support breeding, planting white gum to expand potential habitat, increasing public awareness of the species, and conducting research to test techniques to manage the ectoparasitic fly (*Passeromyia longicornis*) (Edworthy et al. 2019; Alves et al. 2020).

Many of the actions identified in the second Recovery Plan were still deemed relevant in recovering the species, though previously viable breeding subpopulations have now gone from locations at Taroona, Lime Bay State Reserve, Peter Murrell Reserve, and Coningham Peninsula. The review noted that there was a lack of coordinated response to threatening activities even though primary and secondary threats were quite well understood. It also noted the lack of funding to support recovery actions at the landscape scale. The review identified the following current threats in 2021: climate change, impact of ectoparasitic fly on nesting success, development expansion (including private land clearing and housing sub-divisions), and competitor species. Future actions deemed high priority were: developing and implementing fire management plans, nest box design and installation, and assessing the feasibility of translocation strategies.

The review of the second Recovery Plan determined that the actions required to conserve and promote recovery of the species include short- and long-term activities that need to be coordinated at a landscape/regional level with a range of stakeholder groups. These actions need to be informed by long-term monitoring to determine their success and status of the species. The review concluded that a new Recovery Plan should be developed for the forty-spotted pardalote.

Accompanying Species Profile and Threats Database (SPRAT) pages provide background information on the biology, population status and threats to the species.

2.1 Conservation status

The forty-spotted pardalote is a listed threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The species was eligible for listing under the EPBC Act as on 16 July 2000 and previously it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

The species is also listed as Endangered under Tasmanian legislation, the *Threatened Species Protection Act 1995* (TSP Act). The species is listed as Endangered on the International IUCN Red List (non-statutory).

Table 1. International, National and state conservation status of the forty-spotted pardalote.

Legislation	**Conservation Status**
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)	Endangered
Threatened Species Protection Act 1995 (Tas)	Endangered
Non-statutory listing status	
IUCN Red List (International)	Endangered

2.2 Taxonomy

Conventionally accepted as *Pardalotus quadragintus* (Gould 1838). No subspecies are described.

2.3 Species description

The forty-spotted pardalote is a small passerine measuring 9–10 cm in length and weighing approximately 10 g (Woinarski & Bulman 1985; Higgins & Peter 2002). Individuals are generally olive green in colour and pale yellow around the eye, cheek and on the rump. The wings are black with characteristic white spots. The species does not exhibit any apparent size or colour dimorphism between the sexes (Woinarski & Bulman 1985).

The forty-spotted pardalote can be distinguished from adults of the co-occurring *P. striatus* (striated pardalote) and *P. punctatus* (spotted pardalote) by its distinctive call and by having no prominent head markings, a duller body colour and rounder body shape (Higgins & Peter 2002). However, misidentifications can occur due to confusion with juveniles, especially of spotted pardalotes.

2.4 Species distribution in Australia

The forty-spotted pardalote is endemic to Tasmania. Historically, the species was widely distributed across the eastern half of Tasmania and also on King Island (Campbell 1903; Rounsevell & Woinarski 1983; Brown 1986; Bryant 2018); however, it is now largely confined to a few islands off the coast of Tasmania, and headlands and peninsulas in south and south-eastern Tasmania. The species currently occurs in three widely separated subpopulations located at:

1. Bruny Island (including Partridge and Snake Islands) and nearby parts of mainland Tasmania including Tinderbox, Howden, and Coningham Peninsulas, and at Ida Bay;
2. Maria Island;
3. Flinders Island (most recently in the Strzelecki Range) (Bryant 2018).

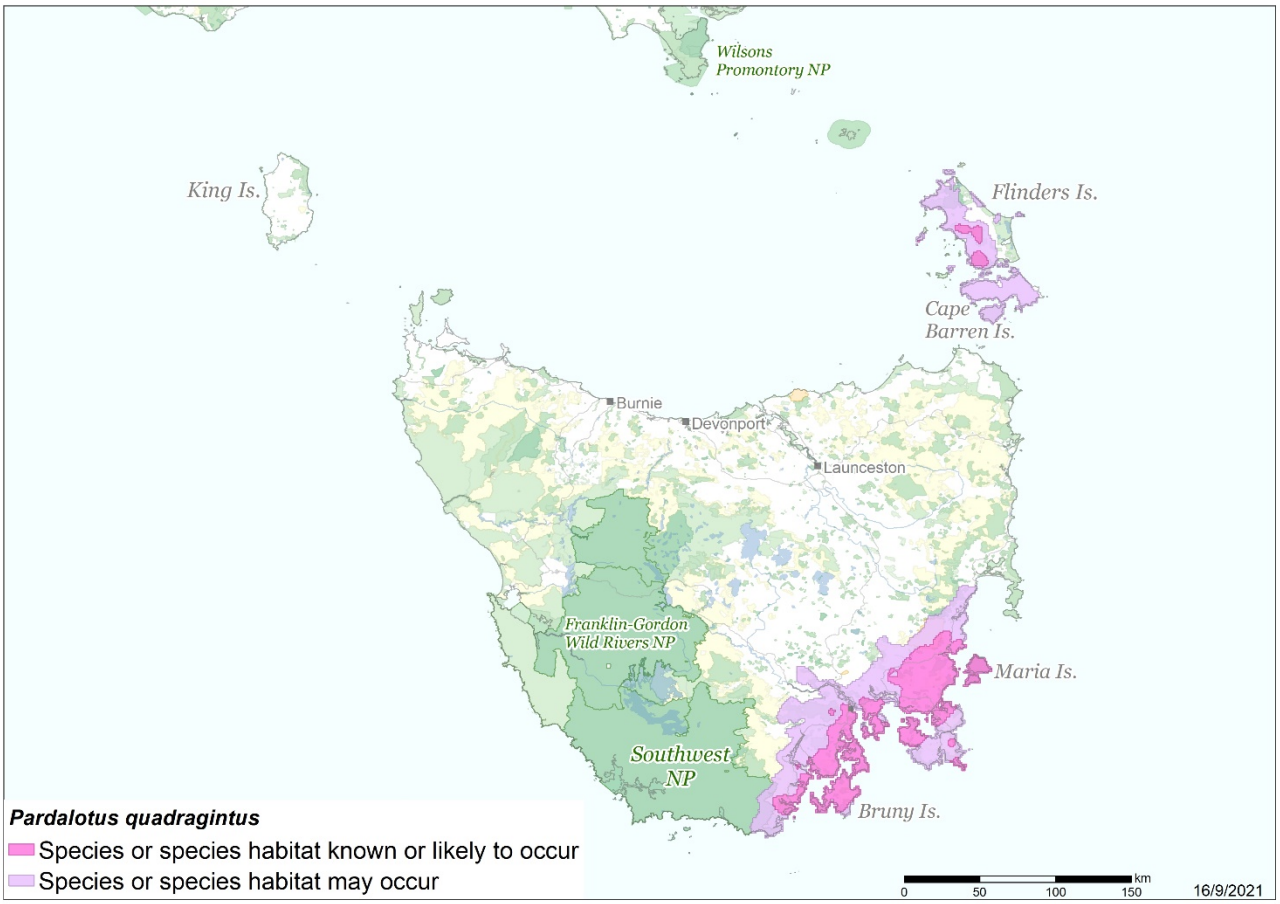
Breeding subpopulations appear to have been extirpated from locations at Taroona, Lime Bay State Reserve, Peter Murrell Reserve, and Coningham Peninsula (Bryant 2010; Bryant & Webb 2014; S Bryant & GB Baker unpublished cited in Bryant et al. 2021). The extent of occurrence (EOO) and area of occupancy (AOO) for the species is estimated at 17,000 km^2 (14,000–20,000 km^2) and 208 km^2 (200–220 km2), respectively (Bryant et al. 2021). The EOO is estimated to be stable (medium reliability), however the AOO has declined (medium reliability) (Bryant et al. 2021).

Table 2. Status of forty-spotted pardalote recently known locations.

Location	Tenure	Status	Confidence	Comments
Bruny Island (including Partridge Island)	National Park, Nature Reserve, Conservation Area, Public Reserve, Private (including the weetapoona Aboriginal Corporation), Game Reserve, State Forest, Kingborough Council	Present	High	Robust breeding colonies.
Maria Island	National Park	Present	High	Robust breeding colonies.
Flinders Island	National Park, Nature Reserve, Private	Present	Low	Data deficient, surveys urgently needed.
Mt Faulkner, Granton	Private, Conservation Area	Not present	Low	Data deficient, no recent surveys.
Taroona	Private, Conservation Area	Not present	Low	No evidence of breeding.
Howden	State Reserve, Conservation Area, Kingborough Council, Private	Present	High	Scattered records but not in Peter Murrell Reserves
Tinderbox	Private, Nature Reserve, Conservation Area, Kingborough Council	Present	High	Breeding sites recorded.
Coningham/Oyster Cove	Nature Recreation Area, Tasmania, Conservation Area, Public Reserve, Private (including Aboriginal Land Council of Tasmania)	Present	Medium	Data deficient, no recent evidence of breeding.
Lime Bay & Coal Mines	State Reserve & Historic Site	Not present	Low	No recent evidence of species presence.
Southport/Ida Bay	Private, State Reserve	Present	Medium	Data deficient
Lime Bay & Coal Mines	State Reserve & Historic Site	Not present	Low	Non-viable
Southport/Ida Bay	Private, State Reserve	Present	Medium	Data deficient

(Source: National Recovery Team, 2023)

Figure 1. Modelled distribution of the forty-spotted pardalote.



Source: Base map Geoscience Australia; species distribution data Species of National Environmental Significance database.
Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything contained herein.
Species distribution mapping: The species distribution mapping categories are indicative only and aim to capture (a) the habitat or geographic feature that represents recent observed locations of the species (known to occur) or habitat occurring in close proximity to these locations (likely to occur); and (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

2.5 Key Biodiversity Areas

The Key Biodiversity Area (KBA) programme aims to identify, map, monitor and conserve the critical sites for global biodiversity across the planet. This process is guided by a Global Standard for the Identification of Key Biodiversity Areas, the KBA Standard (IUCN 2016; KBA Standards and Appeals Committee 2019). It establishes a consultative, science-based process for the identification of globally important sites for biodiversity worldwide. Sites qualify as KBAs of global importance if they meet one or more of 11 criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; irreplaceability.

The global KBA partnership currently recognises four Key Biodiversity Areas as important for forty-spotted pardalote conservation and supporting the long-term persistence of the species. The four KBAs with forty-spotted pardalote as one of their Trigger species were also recognised prior to the introduction of the KBA standard as Important Bird Areas for the species in 2008, based on analysis undertaken by BirdLife Australia. They include:

Bruny Island: The whole of Bruny Island and some close inshore islets is considered a KBA because although fragmented, it supported one of the largest populations of forty-spotted pardalotes scattered across the whole island. Bruny is geographically two islands joined by a narrow sandy isthmus. Most of the island is eucalypt forest and livestock-grazed fields, but there are also several small towns, notably Alonnah, Adventure Bay and Lunawanna. Some forests are zoned as Permanent Timber Production or Future Potential Production Forests, but there are several formally protected areas, notably South Bruny National Park, The Neck Game Reserve, Dennes Hill Nature Reserve (declared specifically for the species), two Forest Reserves and ten permanently protected conservation covenants on private land.

Maria Island: This KBA is comprised of Maria Island, which lies off the eastern coast of Tasmania, and the nearby small islets of Ile de Nord (9.7 ha) and Lachlan (2.5 ha), each of which is important for seabirds. Maria is virtually two islands, joined by a low, narrow isthmus. The most extensive vegetation unit is open-forest of *Eucalyptus obliqua, E. globulus* and *E. viminalis* with a shrubby understorey. The KBA currently supports forty-spotted pardalotes across both the north and south of the island. The birds do not occur on Ile de Nord and Lachlan.

Central Flinders Island: The KBA includes a series of conservation reserves and adjacent land with similar habitat on central Flinders Island in Bass Strait. The KBA is defined by the distribution of previously documented breeding forty-spotted pardalotes and nearby similar grassy white gum woodland, though the species is now likely functionally extinct on Flinders Island. Forty-spotted pardalotes were located at three sites: 1) between Walkers Lookout and Lucks Hill in the Darling Range; 2) south-west of East Sugarloaf; and 3) east of Brougham Sugarloaf within Brougham Sugarloaf Conservation Area.

South-east Tasmania: The KBA includes grassy white gum woodland used by the forty-spotted pardalote. The forty-spotted pardalote has been recorded within the KBA since 1986 at Lime Bay, Taroona, Ida Bay, Howden, and Tinderbox Peninsula.

2.6 Population trends

The forty-spotted pardalote is a highly specialised species that has undergone significant population declines, and is now nationally Endangered. Historical records confirm the forty-spotted pardalote once occurred on King Island, Flinders Island, and down the east coast from Bridport to Southport (Higgins & Peter 2002). Despite this seemingly wide distribution, the species was always referred to as being uncommon or rare (Littler 1910; Milledge 1980; Woinarski & Bulman 1985).

The first estimate of the total population size of the forty-spotted pardalote was fewer than 850 birds in eight discrete geographic locations (Rounsevell & Woinarski 1983). A more detailed assessment across the species' entire range in the mid-1980s generated a total population estimate of 3,520 ± 704 birds at six discrete locations (Brown 1986, 1989). During the 1990s a similar population size of 3,840 ± 768 birds was estimated across four of the previous six locations (Bryant 1997; Bryant & Jackson 1999). A re-assessment in 2009 to 2010 generated a total population size estimate of 1,500 ± 300 birds (Bryant 2010), equating to an overall 60% decline in bird numbers across the species' entire range (TSS 2012).

Population surveys of the forty-spotted pardalote are undertaken infrequently (Bryant et al. 2021). The species occurs at a mean density of 2.7 (CI: 2–3.7) birds per hectare, though their density changes in relation to habitat quality (Alves et al. 2019). The *Action Plan for Australian Birds 2020* estimated the contemporary population to be approximately 1800 (range 1,400–11,200) mature forty-spotted pardalotes in the wild, but the reliability of this estimate is low and counts are variable (Bryant et al. 2021).

Recent population estimates are lacking from Maria Island, South Bruny Island and mainland Tasmania (Bryant et al. 2021). However, it is likely that the small population continues to decline as a result of ongoing habitat

deterioration and fragmentation, introduced predators, competitors, and the ectoparasitic fly (*P. longicornis*) causing severe nestling mortality (Edworthy 2016b; Edworthy et al. 2019; Bryant et al. 2021).

2.7 Cultural and community significance

The forty-spotted pardalote is a flagship species for woodland bird conservation in Tasmania. Its recovery program has rallied community support, especially on Bruny Island, not only for protection of this species, but for the conservation of dry sclerophyll forests in Tasmania generally.

The species only occurs in Tasmania on the lands of the Palawa/Pakana First Nations People (Bryant et al. 2021). Although the Indigenous cultural and community significance of the species is not widely known, its strongholds on Maria Island, Bruny Island and Coningham signify a strong cultural connection to Tasmania's Palawa people. Further research and discussion with First Nations people and their communities may benefit the conservation of the species by providing insights about traditional culture and land management, including appropriate fire management of white gum forests and woodlands.

Forty-spotted pardalote sites at Murrayfield Station on Bruny Island are managed by the weetapoona Aboriginal Corporation, and at putalina (Oyster Cove) by the Tasmanian Aboriginal Centre. Both organisations maintain a strong interest in the conservation of the species (Bryant 2023. pers comm 6 July).

The cultural, customary and spiritual significance of species' and the ecological communities they form are diverse and varied for Indigenous Australians and their stewardship of Country. This section describes some examples of this significance but is not intended to be comprehensive or applicable to, or speak for, Indigenous Australians. Such knowledge may be held by Indigenous Australians who are the custodians of this knowledge and have the rights to decide how this knowledge is shared and used.

2.8 Relevant biology and ecology

Forty-spotted pardalotes are habitat specialists, only found in forests where their preferred food tree, white gum, occurs. Habitat characteristics of the current distribution are: tree canopy layer at a projected cover of 10% or more; low annual rainfall ($\pm$760 mm yearly); high annual mean temperature (8 degrees Celsius minimum to 17.2 degrees Celsius maximum); low elevation (sea level to $\leq$250m asl); and on shallow, fertile soils (Brereton et. al. 1997). This geographical and environmental domain occurs in a narrow band between Bicheno and Southport, and all populations except those of Flinders Island occur within this region (Brereton et al. 1997).

More recently Alves et al. (2022) modelled 24 variables and assessed the likelihood of current occurrence of white gum outside known areas, and the likelihood of occurrence under a range of climate change scenarios. Modelling showed large areas of high probability of white gum occurrence outside known areas. For hotter and drier climate scenarios and for maximum consensus scenarios, significant gain in white gum occurrence was predicted. This information can be used to guide future habitat assessments, and inform translocation and reintroduction trials.

2.8.1 Feeding ecology

The forty-spotted pardalote is a foliage-gleaner feeding on manna, invertebrates and lerps. Manna is a sugary exudate produced by white gums in response to damage by the birds or insect attack; while lerp is the protective coat formed by foliage sap sucking psyllids (Woinarski & Bulman 1985; Case & Edworthy 2016). Manna is the key food component of the forty-spotted pardalotes' diet and during the breeding season is critical for provisioning of chicks, comprising 84.2% of the diet of young birds (Case & Edworthy 2016). The forty-spotted pardalote is the only species known to stimulate manna production by puncturing stem tissue using a hook on the beak (Case & Edworthy 2016). The species' invertebrate prey consists mainly of insects

such as beetles, flies, bugs, wasps and caterpillars, although it is also known to feed on millipedes and spiders (Woinarski & Bulman 1985; Brown 1986; Bulman et al. 1986; Higgins & Peter 2002).

2.8.2 Breeding ecology

Breeding takes place between August and January (Higgins & Peter 2002; Alves et al. 2019). Nests are built in hollows of live or dead trees, stumps of logged or fallen trees and limbs, and very occasionally in holes in the ground (Brown 1986; Bulman et al. 1986). Forty-spotted pardalotes prefer to nest in hollows with small entrances; however, in low quality habitats it is likely that birds nest in a variety of hollows (Woinarski & Bulman 1985). They build fully domed nests inside tree cavities using tree bark and grass, and use soft material such as feathers and fur to line their nests (Wall, 1966; Alves et al. 2020.) Both sexes build the nest and feed the young. The species is also known to use artificial nest boxes successfully (Edworthy 2016c).

Forty-spotted pardalotes lay 3–5 eggs (typically 4–5) and produce one to two broods per year (Edworthy 2016b; Alves et al. 2020). The incubation and nestling periods last up to 55 days in total (Edworthy et al. 2019). Nests are often re-used in successive seasons, and it is likely that pairs remain together for several years (Woinarski & Bulman 1985). Generation length is estimated at 2.1 years (range 1.6–2.6 years) (Bird et al. 2020).

Breeding attempts can fail when nests are flooded or preyed upon (Milledge 1978; Woinarski & Bulman 1985), or when nests are neglected by their parents because of frequent territorial disputes with other birds including striated pardalotes and *Petrochelidon nigricans* (tree martins) (Blakers et al. 1984, Edworthy 2016). Reduction in the availability of manna during unsuitable conditions can also cause breeding attempts to fail. Manna can be lost during strong winds and dissolved during extended periods of heavy rain (Woinarski & Bulman, 1985), causing nestling mortality (F Alves 2023. pers comm 25 July). In some breeding areas, a lack of suitable nesting sites may force birds to nest in suboptimal sites that are more prone to disturbance and consequently, they are less likely to fledge young successfully (Milledge 1978; Bulman et al. 1986).

Parasitism of nestlings by the larvae of an ectoparasitic fly (*Passeromyia longicornis*) is the main cause of nestling mortality in areas of high parasite prevalence (Edworthy et al. 2019). In areas of high prevalence, the larvae exploit 87% of forty-spotted pardalote nestlings, resulting in 81% mortality in parasitized nests (Edworthy et al. 2019).

2.8.3 Movement patterns

Forty-spotted pardalote pairs are territorial, and relatively sedentary at permanently occupied sites (Bryant et al. 2021). Territory sizes have only been quantified on Bruny Island where, in one high-density population, territories of pairs ranged from 0.3 to 1.6 ha in size (Woinarski & Bulman 1985).

A recent genetic study on the species detected similar genetic diversity and low genetic differentiation across Bruny Island and adjacent populations (Tinderbox, Southport and Partridge Island), showing connectivity among these populations. The more isolated Maria Island had slightly lower genetic diversity and higher differentiation from the other remaining populations. Migrants from Bruny Island detected on mainland sites further confirmed movement between southern populations (Alves et al. 2023).

2.8.4 Fire regime

Forty-spotted pardalotes rely on white gum for food and habitat, so it is important to prevent fire reaching the canopy of mature white gum trees. To avoid hot burns which can damage forty-spotted pardalote habitat, cool patchwork burning on an 8–14 year interval is recommended to prevent build-up and reduce fuel loads. Where time since last fire exceeds 20 years and fuel loads are already very high, extreme care needs to be taken in reducing fuel loads through burning. Manual removal of fuel loads around mature white gum trees in critical forty-spotted pardalote habitat may be considered as an alternative.

2.9 Habitat critical to the survival

Habitat critical to the survival of a species or ecological community encompasses areas that are necessary:

for activities such as foraging, breeding, roosting, or dispersal;

for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community);

to maintain genetic diversity and long-term evolutionary potential;

for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a Recovery Plan for the species or ecological community as habitat critical for that species or ecological community, and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act. Further information can be found in the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance.

Habitat critical to the survival of the forty-spotted pardalote include:

Foraging habitat:

All white gum forest within the known range of the forty-spotted pardalote. This includes any forest and woodland supporting white gum as dominant or subdominant canopy, including single trees.

Breeding habitat:

Living (mature) and dead trees of any *Eucalypt* species with hollows with small entrances and crevices suitable for nesting which are within the known range of the species.

Habitat for the long-term maintenance of the species or for the reintroduction of populations:

White gum forest that could support the reintroduction of a viable forty-spotted pardalote population. This may include, but is not limited to, habitat that recently supported breeding colonies;

All Key Biodiversity Areas with forty-spotted pardalote as a Trigger species;

Suitable habitat in future climate niches as information becomes available.

It is also important to consider and maintain connectivity, buffer zones, and refugia habitat for the species. Sympathetic management of areas adjoining forty-spotted pardalote habitats is important, such as woodland and forest. Habitat connectivity is important for maintaining or enhancing species genetic diversity and long-term evolutionary potential. Potential or planned release sites for translocations and reintroductions are also considered habitat critical to the survival of forty-spotted pardalote and should be afforded the same level of protection and conservation management as known sites.

Habitat critical to the survival of forty-spotted pardalote occurs across a range of land tenures, including freehold land and reserves, publicly owned forests and state reserves, and national parks. It is essential that the locations where the species regularly occurs are given the highest protection and conservation measures target these productive habitats.

Increasing the extent and quality of habitat critical to the survival of the species through protection and management of currently occupied habitat, and habitat suitable for potential or planned future reintroductions or translocations, would assist to increase the area of occupancy and population size of the forty-spotted pardalote.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

2.9.1 Key considerations in environmental impact assessments

When considering habitat loss, alteration or likely degradation to habitat in any part of the forty-spotted pardalote's range, including in areas where the species 'may occur', surveys for occupancy and identifying preferred habitat remain an essential tool in refining understanding of the area's relative importance for the species. Both recent survey data and historical records need to be considered when assessing the relative importance of a local area or region for the forty-spotted pardalote, and on-site assessments by experienced ornithologists are essential.

Habitat critical to the survival of the species should not be destroyed or modified. Actions that have indirect impacts on habitat critical to the survival should be minimised and adequately mitigated. Actions that compromise adult and juvenile survival should also be avoided, for example, actions that increase the transmission and introduction of diseases, or actions that might increase predation threat from either native or introduced predators. Actions should not be assessed in isolation, and consideration must be given to existing and future activities that may impact the species to ensure conservation outcomes on a landscape scale are achieved.

Actions that remove, fragment and/or degrade habitat critical to the survival of the species would interfere with the recovery of the forty-spotted pardalote, and potentially reduce the area of occupancy of the species. It is important for the recovery of the species to retain wet and dry sclerophyll forests or woodlands that contain white gum as described above (see 2.8 Relevant biology and ecology). If removal, fragmentation or degradation of habitat critical to the survival of the species cannot be avoided, then any offset must be consistent with state and Commonwealth policies.

3. Threats

3.1 Historical causes of decline

Loss, degradation and fragmentation of suitable habitat (dry sclerophyll forests and woodlands supporting white gum) through clearing for agriculture, forestry, industrial and residential development has been identified as the primary reason for the species' historical decline (Bryant 1991; Bradshaw 2012).

3.2 Current threatening processes

The major current threats to the species are habitat degradation and inappropriate fire regimes (Bryant et al. 2021). Over 80% of currently occupied habitat is at high risk of wildfire, with only 17% having burnt since 1969. Forty-spotted pardalote habitat is particularly vulnerable to fire on hot, windy days during drought (Webb et al. 2019). Drought frequency and severity are expected to increase (Evans et al. 2017), which will increase fire risk and direct drought threats to the trees. The extent and quality of habitat also continues to be reduced by land clearance for urban development and agriculture (Webb et al. 2019).

Ectoparasitic fly (*P. longicornis*) larvae are the principal cause of nestling mortality in areas where the fly is of high prevalence (Edworthy et al. 2019; Alves et al. 2020). This threat is also likely to increase with climate change as larval development is temperature dependent (Edworthy 2016b). The host-parasite dynamics are poorly understood and research is required to investigate drivers of fly populations and threat mitigation.

Several other species may be impacting on the survival and reproductive output of the forty-spotted pardalote. Striated pardalotes compete with forty-spotted pardalotes for food and nesting sites and may have a competitive advantage in altered habitat (Edworthy 2016a). Tree martins also usurp nest boxes used by forty-spotted pardalotes (T Cochran & A Hingston 2022. pers comm 10 January). *Manorina melanocephala* (noisy miners) and the introduced laughing kookaburra (*Dacelo novaeguineae*) are potential competitors or

predators, respectively (Bryant 2010; Webb et al. 2019). *Cracticus torquatus* (grey butcherbird), which is often associated with the noisy miner (Westgate et al. 2021), is also a potential predator. Though not documented, introduced Krefft's Gliders (*Petaurus notatus*; formerly sugar glider *P. breviceps* (Cremona et al. 2021)) may also prey on nestlings on the Tasmanian mainland.

Human activity, noise and other habitat disturbances may also contribute to declines in urban and public use areas (Bryant 2010).

3.2.1 Wildfire and inappropriate fire regimes

The principal current threat to the forty-spotted pardalote is wildfire and inappropriate fire regimes (Bryant et al. 2021). Hot fires have the potential to kill trees or scorch canopies critical for producing food. Structural changes to forest habitat as a result of fire that reduce tree canopy cover may lead to reductions in abundance, or the local extinction of the forty-spotted pardalote (Bryant et al. 2021). The reduction of cultural burning practices since European colonisation has brought about changed forest structures and increased wildfire intensity (Mariani et al. 2022).

Over 80% of the species' currently occupied habitat or AOO (now largely confined to Maria and Bruny Islands) is at high risk of wildfire; Only 17% of occupied habitat has burnt since 1969, most of that occurring during one fire event on Flinders Island (Bryant et al. 2021). The fire history of the adjacent mainland is indicative of the vulnerability of the habitat to fire on hot, windy days during drought (Webb et al. 2019). Single extensive fires on Maria, Bruny and Flinders Islands could result in local extinctions of a large proportion of the total population, and render affected locations unsuitable for recolonisation for many years (Bryant et al. 2021).

The forty-spotted pardalote would likely benefit from fire management that mimics the fire frequencies and intensities which regularly occurred prior to European colonisation. Controlled low-intensity burning regimes ranging from every 7–10 years for dry grassy white gum forests, to every 10–20 years for dry shrubby white gum forest will aid in maintaining ecosystem health, recruitment, and manage fuel levels to reduce the impacts of wildfire (DPIPWE 2015, Leonard 2021). Controlled burns should be planned outside of the key forty-spotted pardalote breeding season and under controlled conditions to ensure the intensity does not cause crown scorch.

3.2.2 Habitat loss and modification

In Australia, the main threats to bird survival in agricultural areas is habitat loss caused by clearing of native vegetation, and subsequent degradation of the remnant vegetation (Stevens 2001). Loss of suitable habitat (dry sclerophyll forests and woodlands supporting white gum) through land clearing for agriculture has been extensive in eastern Tasmania (Bryant et al. 2021). For example, grassy white gum forest in the southeast bioregion has been reduced by over 50% since European colonisation, and major clearing of dry sclerophyll forests has taken place along the coastal plains (TSS 2006). Remaining vegetation remnants are generally isolated and small, and often below the critical size needed to sustain healthy populations of forty-spotted pardalotes. However, Webb et al. (2019) noted that less than 2% of forty-spotted pardalote habitat has been cleared since 1996.

The historical reduction in suitable habitat is compounded by loss in quality of habitat through drought, tree decline, and probably a range of other factors including displacement by other competitive species of birds (Bryant 2010). Any loss of suitable habitat can lead to a loss of breeding populations and also increased fragmentation, resulting in reduced dispersal opportunities.

Development in forty-spotted pardalote habitat impacts the species, either through direct impacts from activities such as housing and road developments and the associated infrastructure (for example, increased window strike), or indirectly through increased human disturbance (noise from traffic, increased human

visitation from tourism), aggressive birds, and predation by domestic and feral animals (Webb et al. 2019). Habitat modification on edges of residential blocks for wildfire protection, and addition of non-native plant species can also degrade habitat.

The impact of large lot development and subdivision also likely threatens the species. Subdivisions can impact on significant areas of potential forty-spotted pardalote habitat if once subdivided, the land is not managed to maintain native birds under threat.

Illegal firewood collecting ('wood-hooking'), and clearance of individual paddock trees and small remnants also likely threaten the species' survival by reducing habitat quantity and quality.

3.2.3 Increased frequency or length of droughts

Since 1950, the number of record hot days (above 35°C) across Australia has more than doubled and the mean temperature has increased by about 1.4°C since 1910 (BOM & CSIRO 2020; IPCC 2021). Heatwaves are also lasting longer, reaching more extreme maximum temperatures, and occurring more frequently over many regions of Australia including Tasmania (Perkins-Kirkpatrick et al. 2016; Evans et al. 2017; Herold et al. 2018; BOM & CSIRO 2020).

It is likely that Australia will spend more time under drought conditions with more frequent, longer duration and more intense drought predicted to occur across southern Australia (Evans et al. 2017; Kirono et al. 2020). Heatwaves exacerbate drought, which in turn can increase wildfire risk and adversely impact resource availability (Climate Council of Australia 2018, 2019; BOM & CSIRO 2020). This may pose a risk to forty-spotted pardalotes, as birds are vulnerable to extreme heatwaves that overwhelm their physiological limits (McKechnie et al. 2012).

Extended dry periods have been implicated in the loss of forty-spotted pardalote habitat, leading to increased fragmentation and reduced patch size (Garnett et al. 2011). For example, on Bruny Island, extended periods of low rainfall have killed many white gum seedlings planted to assist the species, although several stands are now providing food (S Bryant unpublished cited in Bryant et al. 2021).

Droughts also negatively impact food resources such as insect and manna production, and white gums regularly show signs of dieback including 'Ginger tree syndrome' and parched receding canopies. This may result in decreases in forty-spotted pardalote abundance (Understory Network 2011).

3.2.4 Declining white gum health

Forty-spotted pardalotes are totally reliant on white gum; as such, any factor that impacts the trees also impacts the bird in the same way. White gums are known to be highly susceptible to stress due to climatic factors, and climate change projections indicate an increasing frequency and intensity of heat waves. 'Ginger tree syndrome' is the term often given to a condition affecting eucalypts following extreme heat events. Elevated ambient air temperatures can cause water stress and hence shrinkage of the bark and trunk, leading to the production of kino; a sap seeps through the bark, turning the trees 'ginger' and providing a visual means of identifying affected trees (Mitchell 2015). Tree mortality typically follows within 12 months.

Potts et al. (2016) found that white gum and *Eucalyptus dalrympleana* (mountain gum) are both moderately more susceptible to the fungal disease myrtle rust (*Austropuccinia psidii*) in comparison to other Tasmanian eucalypts—of 122 seedlings tested under laboratory conditions, 34% of white gum and 22% of mountain gum were susceptible (Potts et al. 2016).

3.2.5 Parasitism

The ectoparasitic fly *P. longicornis* parasitises forty-spotted pardalote nestlings, causing severe rates of mortality (Edworthy et al. 2019; Alves et al. 2020). The fly lays its eggs in the nests of forty-spotted pardalotes

and once the nestlings hatch, the larvae burrow under their skin and feed on their blood. This leads to very high mortality rates of fly-struck pardalote nestlings and is now the primary cause of nesting failure. In areas of high ectoparasitic fly prevalence on Bruny Island, up to 81% of all nestlings are killed, making it the primary cause of nesting failure (Edworthy et al. 2019; Alves et al. 2020).

The fly has been detected in other populations but prevalence across the forty-spotted pardalote range is unknown. The threat of parasitism may interact with increasing temperatures caused by anthropogenic climate change. The overall potential threat this poses is high given that fly development is temperature dependent (Edworthy 2016b), and so prevalence may increase as a result of increasing temperatures caused by climate change. The population decline of the forty-spotted pardalote further increases its vulnerability to parasitism-induced mortality (Edworthy et al. 2019).

Research by Alves et al. (2020) found that forty-spotted pardalotes could effectively "self-fumigate" their own nests when provided with sterilised chicken feathers treated with bird-safe insecticide. In self-fumigated nests, 95% of hatchlings survived to fledging compared to just 8% of hatchlings in untreated control nests (Alves et al. 2020). At present, this novel technique is a highly effective and inexpensive method of reducing parasitism of chicks. However, further research is required to manage this threat in the longer term.

3.2.6 Small population size

Small, isolated populations may lose their long-term genetic viability (Barrett et al. 1994; Frankham et al. 2019). Population bottlenecks—where a population's size is reduced for at least one generation—can significantly reduce genetic diversity through genetic drift (random changes in the gene frequencies of a population from generation to generation). A small population size can also lead to inbreeding depression, where the biological fitness (survival and fecundity) of the population is reduced due to mating between related individuals, and increased expression of deleterious genes.

Recent genetic analysis of forty-spotted pardalotes completed by Alves et al. (2023) showed previously undetected population genetic structure corresponding to geographical barriers and fragmentation. North Bruny Island has the highest allelic richness, followed by Tinderbox Peninsula, South Bruny Island and Maria Island (Alves et al. 2023). In terms of contribution to total allelic richness across the species, North Bruny Island and Maria Island populations contributed the most genetic diversity (Alves et al. 2023). Thus, conserving these two populations is of high conservation value. The genetic variability of the Flinders Island subpopulation is still unknown. Inbreeding, in addition to habitat loss from fire, may have contributed the rarity of forty-spotted pardalotes on Flinders Island (Bryant & Webb 2014).

Alves et al. (2023) concluded that genetic management of forty-spotted pardalotes at this present time is not needed, though some small local populations are vulnerable to genetic stochasticity. Instead, habitat restoration should be prioritised to increase population size, especially on Bruny Island and the adjacent Tasmanian mainland. This research can be used to inform any future translocation trials, including defining management units and sourcing founder stock (Alves et al. 2023). Genetic monitoring should also be implemented as this information will be crucial to identify whether genetic management will be required in the future.

Small population size may also make forty-spotted pardalotes more vulnerable to competition from striated pardalotes and other species. Small breeding populations of forty-spotted pardalotes are more vulnerable to invasion by nesting striated pardalotes (see 3.2.7 Competition for nest hollows) when compared to the core areas of large forty-spotted pardalote populations (Woinarski & Rounsevall 1983; T Cochran & A Hingston 2022. pers comm 10 January). This pattern likely reflects habitat conditions as in their optimal habitat, specialists are usually the dominant species, but in degraded habitats they can become the subordinate one (Futuyma & Moreno 1988; Kassen 2002).

3.2.7 Competition for nest hollows

Striated pardalotes and tree martins compete with forty-spotted pardalotes for nest cavities with small entrances and deep chambers, often evicting them from their nests even after eggs have been laid. Edworthy (2016a) found that 10% of forty-spotted pardalote nests were usurped by striated pardalotes but found no cases of forty-spotted pardalotes evicting striated pardalotes from nests. Tree martins also usurp nest boxes used by forty-spotted pardalotes. Forty-spotted pardalotes often spend many days trying to defend their nests from these competitors without success (T Cochran & A Hingston 2022. pers comm 10 January). Such competition reduces breeding opportunities for forty-spotted pardalotes, resulting in energy loss, delayed breeding, nest takeover, and loss of eggs (Edworthy 2016a). Additionally, striated pardalotes and tree martins are relatively insensitive to habitat disturbance and may have a competitive advantage over forty-spotted pardalotes in altered habitats (Bryant 2010).

3.2.8 Competition by aggressive native birds

The noisy miner is a native species that often aggressively excludes other small woodland birds from remnant vegetation (Willson & Bignall 2009). Noisy miners have benefited from landscape-scale clearing and fragmentation, possibly at the expense of forty-spotted pardalotes (Bryant 2010). The species typically dominates open eucalypt woodland remnants (such as tree corridors and clumps of paddock trees) on farms, especially those lacking a shrubby understorey (Crates et al. 2018). Although noisy miners do not currently co-occur with forty-spotted pardalotes, much of Maria Island, Bruny Island and the Tinderbox Peninsula is climatically suitable for noisy miners (Webb et al. 2019). Thus, local scale noisy miner control programs at critical breeding sites may be needed in the future.

3.2.9 Predation by introduced species

The Krefft's glider is non-native to mainland Tasmania (Gunn 1851; Rounsevell et al. 1991; Lindenmayer 2002; Hui 2006; Campbell et al. 2018) and is a known predator of *Lathamus discolor* (swift parrot) adult females, nestlings, and eggs within nest hollows (Stojanovic et al. 2014; Heinsohn et al. 2015). Hence, it is possible that forty-spotted pardalotes nesting on the mainland of Tasmania are also similarly affected if using hollows with entrances large enough to permit access by gliders. Such an impact could explain why forty-spotted pardalotes have largely disappeared from mainland Tasmania while persisting on the glider-free Maria and Bruny Islands. The black rat (*Rattus rattus*) is a potential predator of the forty-spotted pardalote, as it is capable of climbing into trees and depredating bird nests (Smith et al. 2016).

Additionally, there has been a significant change in bird populations across Australia (BirdLife Australia 2015), and there are knowledge gaps in terms of the impacts of these changes on predation and competition of native and introduced bird species. Common starlings (*Sturnus vulgaris*) have been documented evicting swift parrots from hollows and breaking their eggs (Stojanovic et al. 2020), and the same could apply to forty-spotted pardalotes.

Other introduced species may also prey upon forty-spotted pardalotes. For example, western honey bees (*Apis mellifera*) have been recorded killing nestlings of swift parrots in the process of usurping hollows (Stojanovic et al. 2014).

3.2.10 General recreation

Recreational access and use of land and water can result in disturbance to native birds, leading to breeding failure, avoidance and abandonment of habitat, and significant energetic and physiological impacts related to disturbed feeding and roosting (Taylor & Knight 2003; Banks & Bryant 2007). Human activity, noise and other habitat disturbances may be contributing to forty-spotted pardalote declines in urban and public use areas, for example at Peter Murrell Reserves (Bryant 2010).

Of particular concern is the potential for over-use of call playback to disrupt breeding and foraging activity. Forty-spotted pardalotes are highly sought by bird watchers and photographers (T Cochran & A Hingston 2022. pers comm 10 January), some of whom attempt to attract the birds into the open by playing conspecific calls, which has the potential to disrupt breeding and foraging activities (Woinarski & Bulman 1985). While tourism undertaken in a controlled way may have minimal impact on the species, ad-hoc and nature guided tours that do not consider their disturbance to forty-spotted pardalotes pose additional threats to the species. The use of call playback to increase the likelihood of sighting the species is of additional concern as it can draw birds away from their feeding and breeding activities to defend their territories from perceived invaders. Both Bruny and Maria Islands are seeing significantly increased tourism much of which is nature based, with viewing forty-spotted pardalotes one of the major draw cards.

3.3 Threat prioritisation

Each of the threats outlined above has been assessed to determine the risk posed to the forty-spotted pardalote using a risk matrix. This in turn determines the priority for actions outlined below. The threats were considered in the context of the current management regimes. The impact of each threat has been assessed assuming that existing management measures continue to be applied appropriately. If management regimes change then the level of risk associated with threats may also change.

The risk matrix considers the likelihood of an incident occurring and the consequences of that incident. Threats may act differently in different parts of the species range and at different times of year, but the precautionary principle dictates that the threat category is determined by the subpopulation at highest risk. Population-wide threats are generally considered to present a higher risk.

The risk matrix uses a qualitative assessment drawing on peer reviewed literature and expert opinion. In some cases, the consequences of activities are unknown. In these cases, the precautionary principle has been applied. Levels of risk and the associated priority for action are defined as follows:

Very High—immediate mitigation action required.

High—mitigation action and an adaptive management plan required; the precautionary principle should be applied.

Moderate—obtain additional information and develop mitigation action if required.

Low—monitor the threat occurrence and reassess threat level if likelihood or consequences change.

Each threat has been described in Section 3.2 Current threatening processes) in terms of the extent to which it is operating on the species. The risk matrix (Table 3) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; the spatial extent, and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed in consultation with experts and using available literature.

Table 3. Forty-spotted pardalote Residual Risk Matrix*

Likelihood	Consequences				
	Not significant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain		• Predation by introduced species	• Competition for nest hollows	• Habitat loss and modification • Parasitism	
Likely				• Declining white gum health	• Wildfire and inappropriate fire regimes
Possible		• General recreation • Competition by aggressive native birds	• Increased frequency or length of drought • Small population size		
Unlikely					
Unknown					

*Threats are assessed over a 10 year timeframe

Risk Matrix legend/Risk rating:

Low Risk	Moderate Risk	High Risk	Very High Risk

Categories for likelihood are defined as follows:
Almost certain—expected to occur every year
Likely—expected to occur at least once every five years
Possible—might occur at some time
Unlikely—such events are known to have occurred on a worldwide basis but only a few times
Rare or Unknown—may occur only in exceptional circumstances; OR it is currently unknown how often the incident will occur
Categories for consequences are defined as follows:
Not significant—no long-term effect on individuals or populations
Minor—individuals are adversely affected but no effect at population level
Moderate—population recovery stalls or reduces
Major—population decreases
Catastrophic—population extinction (within 10 years)

4. Populations under particular pressure

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area (see Significant Impact Guidelines 1.1 – Matters of National Environmental Significance). In relation to Critically Endangered, Endangered or Vulnerable threatened species, occurrences include but are not limited to:

A geographically distinct regional population, or collection of local populations; or

A population, or collection of local populations, that occurs within a particular bioregion.

The actions described in this Recovery Plan are designed to provide ongoing protection for the forty-spotted pardalote throughout its range. As 100% of known mature individuals exist in three subpopulations at five locations (range 3–10) (Bryant et al. 2021), particular attention may be given to the following areas:

Subpopulations on Maria Island and in the Strzelecki Range of Flinders Island are important due to their size and their occurrence on state-owned land.

Subpopulation on Flinders Island due to its isolation and lack of information on its viability.

All individuals on Bruny Island (including Partridge Island) on unprotected or inappropriately managed habitat.

Populations on mainland Tasmania including those at Peter Murrell Reserve, Howden, Tinderbox and Coningham Peninsulas and at Ida Bay, as they appear to be the last remnant populations within an area where the species was once widespread.

Subpopulations in areas where there is a history of significant vegetation fragmentation, such as Taroona and Lime Bay, may not persist because of habitat patch size and limited opportunities for re-colonisation.

5. Vision, Objectives and Strategies

5.1 Long-term Vision

The forty-spotted pardalote population has increased in size to such an extent or number of secure locations that the species no longer qualifies for listing as threatened under any of the *Environment Protection and Biodiversity Conservation Act 1999* listing criteria.

5.2 Recovery Plan Objective

Within ten years, demonstrably reduce the severity of identified threats across the species' range.

Within ten years, increase the number of viable subpopulations of the forty-spotted pardalote across its current and historical range.

Within ten years, maintain and improve the extent, condition, and connectivity of habitat of the forty-spotted pardalote.

Within ten years, measure and sustain an increased population trend compared to baseline counts in the number of mature individuals of forty-spotted pardalote.

These objectives will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery, and increasing public involvement achieving these objectives.

5.3 Strategies to achieve objectives

1. Implement management strategies to reduce known threats to the forty-spotted pardalote and its habitat.
2. Increase the number and viability of forty-spotted pardalote subpopulations through translocation and supplementation techniques.
3. Improve protection and increase the quality, extent, and connectivity of known and potential habitat for the forty-spotted pardalote.
4. Improve knowledge of the biology and ecology of the forty-spotted pardalote and maintain a long-term monitoring strategy to identify population trends.
5. Increase stakeholder participation in forty-spotted pardalote conservation and management.
6. Coordinate, review and report on recovery progress.

6. Actions to achieve the specific objectives

Actions identified for the recovery of the forty-spotted pardalote are described below and have been considered within a 10-year timeframe. It should be noted that some of the objectives are long-term and may not be achieved prior to the scheduled five-year review of the Recovery Plan.

Implementing this Recovery Plan is subject to budgetary and other resource opportunities and constraints affecting partners. The cost of implementation of this plan should, where possible, be incorporated into the core business expenditure of the affected organisations, and through additional funds obtained for the explicit purpose of implementing this Recovery Plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources.

Priorities assigned to actions should be interpreted as follows:

Priority 1:	Taking prompt action is necessary in order to mitigate the key threats to the forty-spotted pardalote and also provide valuable information to help identify long-term population trends.
Priority 2:	Action would provide a more informed basis for the long-term management and recovery of the forty-spotted pardalote.
Priority 3:	Action is desirable, but not critical to the recovery of the forty-spotted pardalote or assessment of trends in that recovery.

Strategy 1: Implement management strategies to reduce known threats to the forty-spotted pardalote and its habitat

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
1.1	Develop a management strategy for habitat critical to the survival of forty-spotted pardalote.	1	Habitat critical to the survival of the forty-spotted pardalote has been defined and mapped, including: Current and predictive modelling used to map white gum distribution. White gum DBH criteria for retention has been defined. White gum habitat distance (km) from the coast, or nearest known colony has been defined. Spatial data and accurate vegetation mapping (including Habitat Critical to the Survival) have been developed, stored and made available to all relevant management agencies and decision makers. Management strategy for white gum habitat likely to support forty-spotted pardalote populations created and maintained.	**State Agencies** **Local government** **NRM regional bodies** **Traditional Owners** NGOs Academic institutions	$50,000

			White gum management strategy adopted by government agencies, industry and community groups. Threat abatement is prioritised at known sites to promote, improve and secure existing populations where threats are understood. Key Biodiversity Areas have been reviewed and updated as new information becomes available.		
1.2	Implement a management strategy for white gum habitat likely to support forty-spotted pardalote.	1	All potential habitat containing white gum within the species' range has been mapped and used to identify priority areas of conservation significance. Planning mechanisms to protect and restore potential habitat have been implemented. White gum habitat (including individual trees) has been managed and protected from potential impacts of habitat clearing or habitat modification. Increased community understanding of habitat requirements of forty-spotted pardalotes.	**State Agencies** **Local government** **NRM regional bodies** **Traditional Owners** NGOs Academic institutions	$100,000 pa
1.3	Develop and implement strategies to mitigate wildfire risk, fuel reduction and inappropriate fire regimes to habitat critical to the survival of forty-spotted pardalote.	1	Forty-spotted pardalote habitat is identified as an asset to be prioritised for protection during wildfire suppression and fuel reduction activities. Spatial data that maps forty-spotted pardalote habitat and fire histories are made available to key stakeholders such as Tasmania Fire Service (TFS), Parks and Wildlife Service (PWS), and volunteer firefighters from local brigades. Fire management impacts are considered at the population scale and: • Site-specific fire management plans, and Guidelines for protection of Critical Habitat during planned hazard reduction burns, have been developed and implemented. • Cultural burning knowledge-holders are included in management of white gum habitat.	**State Agencies** **Local government** **Traditional Owners** **Private landowners** **Emergency services** **Parks and Wildlife** **Tasmania Fire authorities** Academic institutions NGOs NRM regional bodies	$150,000 pa

			• Prescriptions for protection of forty-spotted pardalote habitat (white gum and trees with breeding hollows) during planned or cultural burns are embedded into TFS and PWS fire management procedures and kept updated. A wildfire emergency response plan has been developed (including rapid suppression and, where relevant, extraction planning and capacity building). Key stakeholders (such as TFS, PWS and volunteer firefighters from local brigades) are informed of critical habitat mapping.		
1.4	Develop an ongoing management strategy for the ectoparasitic fly (*Passeromyia longicornis*).	1	Ecology of the ectoparasitic fly (*Passeromyia longicornis*) is better understood and other ways to mitigate the threat of parasitism are investigated. Guidelines for managing the ectoparasitic fly are developed and implemented. Monitoring of ectoparasitic fly infestation and mortality conducted and results inform review of guidelines. Management actions to control ectoparasitic fly have been incorporated into relevant relocation or release site management plans. Funding and resources have been acquired for long-term monitoring of ectoparasitic fly.	**State Agencies** NRM regional bodies NGOs Academic institutions	$50,000
1.5	Ensure no impacts on the forty-spotted pardalote and its habitat in all populations from clearing or degradation of habitat.	1	Within and adjacent to known populations, there have been no removal of white gum trees as part of subdivision activities, including single white gum trees. Development activities that threaten white gum trees have been prevented, mitigated and/or resulted in a net increase in protected populations in white gum habitat within the forty-spotted pardalote range. Development activities which may increase general levels of noise, human activity, vehicular traffic, window strike and other disturbances have been	**Australian Government** **State Agencies** **Local governments** Recovery Team	$50,000 pa

			prevented/mitigated within or adjacent to known populations. Cat management and window strike risk addressed in new buildings and subdivisions.		
1.6	Identify and mitigate threats of climate change on forty-spotted pardalote habitat.	2	Modelling techniques have been used to investigate the potential impacts of climate change on the forty-spotted pardalote and its habitat critical to the survival. Model outputs have been incorporated into local management plans to improve forty-spotted pardalote habitat resilience to climate change. A management strategy has been developed for white gum forests and woodlands in response to climate change (see action 1.1). Habitat restoration projects use appropriate seed sources and are situated in areas such that new plantings have the best chance of survival under an altered climate.	**Australian Government** **State Agencies** **Academic institutions** NRM regional bodies NGOs	$200,000 pa
1.7	Examine the use of known forty-spotted pardalote nest cavities by introduced and native species to ascertain the level of competition and predation.	1	• Through the use of non-invasive surveying techniques, the main species (both introduced and native) competing for forty-spotted pardalote hollows have been identified throughout its range. • Areas with high levels of competition throughout the species' range have been identified, particularly where introduced species are the main threat. • An improved understanding of hollow use and competition (and potential predation) can be demonstrated. • Any new knowledge has been incorporated into management interventions.	**Academic institutions** **State Agencies** Private landowners NGOs NRM regional bodies	$100,000 pa
1.8	Refine current knowledge of nest site requirements, and improve the effectiveness of nest boxes and artificial hollows to improve breeding success.	1	• Improved knowledge on the nest site requirements of forty-spotted pardalotes has been generated. • Development of a long-lasting nest box or hollow log design that reduces competition for nest sites and does not require frequent replacement or maintenance.	**Academic institutions** **State Agencies** Private landowners NGOs NRM regional bodies	$100,000 pa

			• A nest box strategy for the forty-spotted pardalote has been developed and implemented including aspects such as optimal spacing of nest boxes and reducing intraspecific competition with striated pardalotes. • Funding and resources have been acquired for long-term monitoring and maintenance of nest box programs.		
1.9	Assess and manage introduced predators .	3	• Impact of introduced predators has been assessed and areas of high impact identified. • A standardised monitoring program for relevant predators has been designed and implemented across all known forty-spotted pardalote populations. • Actions to control introduced predators undertaken if required. • Reporting on introduced predator monitoring is coordinated and results are accessible by responsible agencies and recovery partners.	**Australian Government** **State Agencies** **Traditional Owners** **Private landowners** NGOs NRM regional bodies	$350,000 pa
1.10	Manage recreation and other human activities that negatively impact the species.	2	• Activities which could kill or damage forty-spotted pardalote habitat (e.g., off-road vehicles, trail-bike riding, horse-riding off formed tracks, lighting of fires) or disturb birds are prevented in critical forty-spotted pardalote habitat. • Activities which may increase general levels of noise, human activity, and vehicular traffic have been prevented or mitigated within or adjacent to known populations. • Develop guidelines for managing human activity, including criteria for approval of commercial enterprises, in forty-spotted pardalote habitat.	**State Agencies** **Local governments** **Community groups**	$50,000 pa

Strategy 2: Increase the number and viability of forty-spotted pardalote subpopulations through translocation and supplementation techniques

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
2.1	Use Population Viability Analysis (PVA) to determine the viable population size, and where mortality in the life cycles has the greatest effect on population trends.	1	• Update PVA with new information on the species ecology to inform adaptive management. • PVA results inform management.	**Academic institutions** Recovery Team NGOs	$75,000
2.2	Assess whether reintroduction (wild to wild translocation) is a feasible management strategy for the species and the potential impact of harvesting founders from remaining populations.	1	• A translocation risk assessment has been developed to evaluate the potential impact on founder populations and on individuals harvested for translocations.	**Academic institutions** **State Agencies** NGOs NRM regional bodies	$75,000
2.3	If translocation strategy (see action 2.2) is proven feasible, develop wild to wild translocation trial.	2	• Forty-spotted pardalote wild to wild translocation trial proposal has been developed and approved. • Monitoring and risk assessment of potential source and release sites including determination of habitat suitability, food availability and threats, etc. has been completed. • Genetic assessments and age of independence of juvenile forty-spotted pardalotes have informed translocation trials. • Management of receiving site/s has been carried out including predator and competitor management. • Post translocation monitoring is undertaken to evaluate the outcome. • Translocation trial has been undertaken and reported on • The translocation meets agreed success criteria.	**Australian Government** **State Agencies** **Academic institutions** **Private landowners** NGOs NRM regional bodies	$200,000 pa commencing after 2.2 complete and if 2.2 recommends wild to wild translocation
2.4	Investigate establishing a captive population to act as an insurance and	3	• A feasibility study has been undertaken to determine	**State Agencies** **Zoo and Aquarium Association**	$175,000 (If translocation

	breed for release population.		whether a captive breeding program is feasible. • Supplementary feeding trials have been investigated. • Best-practice captive-breeding and animal husbandry information has been collated.	Academic institutions NGOs	is not considered viable)
2.5	Undertake genetic analysis of Flinders Island population. Note: 2022 surveys of installed nest boxes did not detect forty-spotted pardalote. Further searches required.	1	• Genetic analyses have supported any translocation trials.	**Academic institutions** Recovery Team NGOs	$50,000 (If Flinders Island population found to be persisting)

Strategy 3: Improve protection and increase the quality, extent and connectivity of known and potential habitat for the forty-spotted pardalote

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
3.1	Protect, improve connectivity and restore known and potential white gum habitat in strategic locations close to, and within key sites and movement corridors.	1	• An increase in habitat critical to survival protected can be demonstrated. • White gums have been regenerated within and between known key sites using appropriate seed or tube stock resilient to drought. • Targeted fencing at identified sites has been carried out to reduce browsing by stock and native animals. • Targeted replanting in wetter areas to compensate for climate change impacts have been completed. • Connectivity among, and quality of, habitat patches has improved. • Indices to measure white gum health are developed and incorporated into habitat restoration monitoring programs. • Habitat restoration is being measured, monitored and reported. • Where appropriate, high priority private lands have been secured through conservation covenants and	**Australian Government** **State Agencies** **Local Governments** **NRM regional bodies** **Private landholders** Academic institutions NGOs	$150,000 pa

			statutory agreements that meet the required guidelines.		
3.2	Maintain or improve habitat quality of existing populations.	1	• New knowledge has been used to target habitat restoration activities within known populations including white gum planting, fencing, nest boxes and feather dispensers.	**Australian Government** **State Agencies** **Local Governments** **NGOs** **NRM regional bodies** **Private landholders** Academic institutions	$75,000 pa
3.3	Develop agreements with priority local and state government agencies to facilitate rehabilitation, enhancement and protection of forty-spotted pardalote habitat.	2	• Priority areas of degraded habitat are identified and being rehabilitated. • Management agreements have been developed with local and state government agencies which maintain and enhance forty-spotted pardalote habitat. • Management agreements and perpetual covenants have prevented further habitat loss or encroachment within or near urban areas.	**State Agencies** **NRM regional bodies** Local Governments Private landholders	$350,000 pa
3.4	Continue to improve reservation status and/or develop management agreements with private landowners.	2	• Implement a covenanting program to protect forty-spotted pardalote habitat on private land. • Key breeding and foraging sites on private land identified, habitat quality assessed and perpetual covenants with appropriate management are in place. • Landowners have been encouraged to enter covenanting or other private land conservation programs, where relevant.	**State Agencies** **Private landowners** NRM regional bodies NGOs	$100,000 pa

Strategy 4: Improve knowledge of the biology and ecology of the forty-spotted pardalote and maintain a long-term monitoring strategy to identify population trends

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
4.1	Develop and implement a long-term monitoring strategy to inform species status and effectiveness of management interventions.	1	• Long-term monitoring strategy has been developed and implemented. • Monitoring incorporates standardised bird count methodology. - Acoustic monitoring techniques have been developed to support bird monitoring and expand public involvement.	**Australian Government** **State Agencies** **Traditional Owners** **Private landowners** **Academic institutions** NGOs NRM regional bodies	$100,000 pa

			• Current baseline information on population distribution, size and trends is being collected and reported on. • Knowledge of forty-spotted pardalote distribution, movement ecology and life history are better known and used to inform conservation status. • Status of Flinders Island population better understood. • Effectiveness of management actions being monitored, reported on and regularly reviewed.		
4.2	Surveys of forty-spotted pardalote populations are undertaken regularly to determine population trends and potential new populations.	1	• Standardised surveys in mapped known and potential habitat are confirming species presence/absence. • Urgent surveys on Flinders Island have identified birds and viability of population. • Surveys and monitoring are consistent in methodology and information provided to state and Commonwealth authorities. • Total population size is known and trends for locations surveyed reported regularly.	**Australian Government** **State Agencies** **Private landowners** **Academic institutions** **NGOs** NRM regional bodies Citizen Scientists	$100,000 pa
4.3	Design and implement research projects to address knowledge gaps, circulate widely and keep current.	1	• Gaps in knowledge required to inform species management have been identified and addressed. Understanding of the following priority parameters has improved: • Wild population breeding success factors and trends. • Habitat carrying capacity for different populations at fine scales (including interactions with the striated pardalote). • White gum decline, and the interaction between habitat health and forty-spotted pardalote population health. • Investigate the importance of *Eucalyptus dalrympleana* (mountain white gum) as forty-spotted pardalote habitat and its potential as translocation sites. • The sources of nest predation and disturbance, and the effects of this disturbance on breeding outcomes.	**Australian Government** **State Agencies** **Private landowners** **Academic institutions** **Recovery Team** **NGOs** NRM regional bodies Citizen Scientists	$250,000 pa To commence in year 2/3 once knowledge gaps clearly identified

			• Post-breeding movement and dispersal by juveniles or non-breeding birds. • Population level impacts of introduced predators. The impacts of climate change on all forty-spotted pardalote populations have been identified and addressed, including: • Populations most at risk of climate change impacts have been identified and actions to mitigate risks undertaken. • Impacts of increased drought, heat waves, and changes in rainfall patterns on habitat have been modelled and associated refuge sites identified and protected. • Threat mitigation planning incorporates synergistic impacts of climate change.		

Strategy 5: Increase stakeholder participation in forty-spotted pardalote conservation and management

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
5.1	Establish extension activities with private landholders to protect forty-spotted pardalote habitat.	2	• A private landowner network with an interest in forty-spotted pardalote is established. • The private landowner network facilitates access to survey sites. • The private landowner network facilitates improved forty-spotted pardalote habitat management through extension activities.	**Private landowners** **State Agencies** **NRM regional bodies** **Recovery Team** Local Governments NGOs	$75,000 pa
5.2	Maintain and expand community involvement in the species recovery program.	1	• Dedicated website developed and providing easy access to research, habitat, site and ecological information. • Information sessions provided to the broader community about forty-spotted pardalote conservation at appropriate key breeding and non-breeding sites. • Forty-spotted pardalote awareness is incorporated into wider conservation programs, such as swift parrot recovery and landscape-scale conservation education. • Educational resources have been developed for key user groups	**Recovery Team** **State Agencies** **Australian Government** **Local Governments** Private landowners NRM regional bodies Traditional Owners NGOs	$50,000

			especially land use planning agencies and major infrastructure agencies and communities on the potential impacts of their decisions, for example: - large lot purchases and subdivisions. - Inappropriate or unintentional removal of white gum or exotic native plantings.		
5.3	Assist volunteers to identify the species with confidence, especially landholders to take on monitoring populations on a regular basis.	1	• New and existing community/volunteer monitoring programs maintained or expanded for nest boxes, tree plantings and habitat restoration and for bird monitoring using apps and sound recorders. • Outcome of surveys and monitoring (including nil observations) submitted to the Natural Values Atlas and other appropriate repositories.	**Recovery Team** **State Agencies** Traditional Owners NRM regional bodies NGOs Private landowners Citizen Scientists	$50,000
5.4	Respect, assist and engage Traditional Owners in recovery actions.	1	• Traditional Owner involvement in the recovery effort has increased. • The conservation and management of the forty-spotted pardalote considers Traditional Owners knowledge and cultural values. • The cultural significance of the forty-spotted pardalote is identified across the species' distribution and relevant knowledge incorporated into recovery planning and events. • If supported by First Nations communities, the forty-spotted pardalote name is formally changed to recognise Indigenous heritage.	**State Agencies** **Traditional Owners** **Recovery Team** NRM regional bodies NGOs Academic institutions	$50,000

Strategy 6: Coordinate, review and report on recovery progress

Action	Description	Priority	Performance Criteria	Responsible Agencies and potential partners	Indicative Cost
6.1	Maintain a Recovery Team that effectively organises, implements, reviews and reports on recovery outcomes.	1	• The Recovery Team continues to coordinate, review and report on recovery outcomes for the life of this plan. • The Recovery Team liaises with other threatened species Recovery Teams with overlapping geographic distributions (such as the Swift Parrot Team) to avoid duplication, maximise efficiency of program delivery, and minimise any potential	**All**	$30,000 pa

			conflict between recovery strategies. • The Recovery Team represents diverse stakeholders.		
6.2	Approve Recovery Team governance arrangements.	1	• Terms of Reference for the Recovery Team have been approved in accordance with national best practice guidelines. • The Recovery Team has been registered nationally.	**Recovery Team** **Australian Government** **State Agencies**	Core government business
6.3	Submit annual reports on progress against recovery actions.	1	• Recovery Team annual reports have been submitted each year in accordance with the national reporting framework.	**Recovery Team** **Australian Government**	Core government business
6.4	Review the Recovery Plan five years after making.	1	• In consultation with relevant stakeholders, a five yearly review of the Recovery Plan has been undertaken and endorsed by the Recovery Team. • The conservation status of the forty-spotted pardalote has been reviewed every 5 years in conjunction with the Recovery Plan review.	**Recovery Team** Australian Government State Agencies	$10,000
6.5	Facilitate knowledge exchange and awareness among relevant threatened species land managers, researchers and decision makers.	1	• Recovery Team members to communicate back to their represented stakeholder group any relevant, non-confidential information and report any questions or concerns back to the Recovery Team. • Meetings or workshops between land managers and researchers have occurred when and if required to facilitate collaborative recovery planning and implementation. • Traditional Owners have been consulted and Indigenous knowledge incorporated into relevant management actions.	**Recovery Team**	$30,000 pa
6.6	Secure funding and public support to maintain recovery actions in the long-term.	1	• Sufficient funding has been secured long-term (10 years) to undertake all recovery actions and maintain monitoring.	**Australian Government** **State Agencies** Recovery Team	Core government business

7. Duration and cost of the recovery process

The cost of implementation of this plan should be incorporated into the core business expenditure of the affected organisations, and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. All actions are considered important steps towards ensuring the long-term survival of the species.

Table 4. Summary of recovery actions and estimated costs for the first five years of implementation*.

Actions	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Strategy 1	$1,050,000	$1,150,000	$1,100,000	$1,100,000	$1,100,000	**$5,500,000**
Strategy 2	$80,000	$220,000	$275,000	$200,000	$200,000	**$975,000**
Strategy 3	$675,000	$675,000	$675,000	$675,000	$675,000	**$3,375,000**
Strategy 4	$200,000	$450,000	$450,000	$450,000	$450,000	**$2,000,000**
Strategy 5	$145,000	$145,000	$145,000	$145,000	$145,000	**$650,000**
Strategy 6	$60,000	$60,000	$60,000	$60,000	$70,000	**$310,000**
TOTAL	$2,210,000	$2,700,000	$2,705,000	$2,630,000	$2,640,000	**$12,810,000**

* Estimated costs do not consider inflation over time.

8. Effects on other native species and biodiversity benefits

Measures to mitigate threats to the forty-spotted pardalote and protect their habitat will benefit other threatened plant and animal species and ecological communities within the species' range. Foremost is the swift parrot, whose breeding range co-occurs on Maria and Bruny islands and other locations such as Tinderbox Peninsula and Howden. Threatened woodland bird communities and Key Biodiversity Areas triggered by the forty-spotted pardalote include many other (threatened and near-threatened) species that will benefit from protection (BirdLife International 2021). These include: swift parrot, *Turnix varius* (painted-button quail), *Artamus cyanopterus* (dusky woodswallow), *Cinclosoma punctatum* (spotted quail-thrush), *Platycercus caledonicus* (green rosella), *Melithreptus validirostris* (strong-billed honeyeater), *Melithreptus affinis* (black-headed honeyeater), *Nesoptilotis flavicollis* (yellow-throated honeyeater), *Acanthiza ewingii* (Tasmanian thornbill), *Petroica boodang* (scarlet robin), *Petroica rodinogaster* (pink robin), *Petroica phoenicea* (flame robin), *Melanodryas vittatae* (dusky robin) and *Acanthornis magna* (scrubtit).

There are also a number of Ecological Communities listed at the state and Commonwealth level that will benefit from increased efforts to protect and conserve forty-spotted pardalote habitat. Many mammals, invertebrates and plants will also receive benefits as a result of measures put in place to protect and improve forty-spotted pardalote habitat.

9. Social and economic considerations

The main social and economic impacts of this Recovery Plan will be on those who require approval to remove or modify forty-spotted pardalote habitat and are prevented from doing so, or are required to modify their

proposal by a consent authority. This may include increased costs due to the assessment processes, requirement to secure or rehabilitate habitat, or for other threat mitigation work.

Landholders may be eligible for various government grants and funding programs that support threatened species, including the forty-spotted pardalote. Landholders may also be provided with opportunities to participate in a range of conservation programs that benefit a wide range of threatened species. These may include covenanting programs to protect habitat critical to the survival of the species, incentive or stewardship programs to restore or maintain high quality foraging or breeding habitat for the species, and other opportunities to be involved in conservation management on their land.

BirdLife Tasmania and a network of community volunteers actively but irregularly survey for this species, including monitoring threats in its habitat inside and outside Key Biodiversity Areas, and exploring conservation actions. Involvement in forty-spotted pardalote conservation can provide social benefits with community members and engaged groups having a sense of achievement, inclusion, community spirit and pride whilst gaining enjoyment and appreciation of their surrounding natural environment. The community education components of the program also promote community ownership, provide community support and encourage active involvement in protecting local natural resources.

The Recovery Plan includes opportunities for First Nations Peoples to lead, manage and be involved in recovery programs on Country. These include: developing and implementing adaptive management plans for forty-spotted pardalote; leading and participating in forty-spotted pardalote surveys and long-term population monitoring programs; developing, managing and implementing threat abatement programs for pest animals, stock, fire and/or weeds; leading and participating in research programs to improve the long-term prospects for the forty-spotted pardalote.

In addition, there is the potential for financial gains through ecotourism ventures and holiday accommodation operators in areas where forty-spotted pardalote are reliably seen. Such areas are more likely to be in regional areas of Tasmania through the breeding season. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of Indigenous cultural values.

10. Affected interests

Organisations and individuals likely to be affected by the actions proposed in this plan include: government agencies (Commonwealth, state, local), particularly those involved with environment and conservation programs; regulators; private landholders; Indigenous land and sea management groups (including ranger programmes); researchers; Bushcare, Landcare and Wildcare groups; bird watching groups; conservation groups; wildlife interest groups; 4WD and fishing groups; environmental consulting companies; tourism operators; mining companies; industry and commercial bodies; proponents of agricultural development in the vicinity of important habitat.

This list should not be considered exhaustive, as there may be other interest groups that may like to be included in the future or need to be considered when specialised tasks are required.

Table 5 lists some of the interest groups, how they could contribute to the success of the Recovery Plan and the potential benefits/impacts that may emerge from the plan's implementation.

Table 5. Forty-spotted Pardalote Recovery Plan interest groups.

Interest Group	Contribution	Impacts/Benefits
Australian Government	Responsible for development, coordination and evaluation of the plan. Responsible for implementation of the plan in Commonwealth areas. Subject to available resources, providing financial support for implementation of the plan.	Informed decision making regarding the EPBC Act referral and assessment process. Greater ability to deliver on domestic and international obligations regarding biodiversity conservation. Increased knowledge of the forty-spotted pardalote and its habitats, and increased exchange of information between decision makers and the community.
State government agencies	Responsible for development, coordination and evaluation of the plan. Potential implementation of the plan within jurisdictional boundaries. Subject to available resources, providing financial and/or in-kind support for implementation of the plan.	Informed decision making regarding the *Threatened Species Protection Act 1995* assessment and implementation process. Greater ability to deliver on state obligations regarding biodiversity conservation. Increased knowledge of the forty-spotted pardalote and its habitats and increased exchange of information between decision makers and the community.
Local Government	Contributing to the development of the plan and taking the plan into consideration when reviewing planning schemes. Potential implementation of on-ground activities within jurisdictions.	Increased knowledge of the forty-spotted pardalote and its habitats and increased exchange of information. Enhanced ability to deliver obligations regarding biodiversity conservation. Supports local tourism industry.
Natural Resource Management (NRM) regional bodies	Integrating the plan into NRM regional plans. Opportunity to deliver on-ground activities.	Increased awareness of regional importance of important habitat sites. Informing managers of biodiversity values. Opportunity to seek funding for conservation projects under biodiversity conservation programs.
Land councils and Traditional Owners (including those that have co-management or sole management responsibilities for important habitats)	Contributing to the development of the plan and development and implementation of site management plans. Research and monitoring activities. Contributing traditional knowledge in accordance with Indigenous Cultural and Intellectual Property policy.	Increased knowledge of the forty-spotted pardalote and its habitats and increased exchange of information. Opportunity to seek funding for conservation projects and achieve ownership of projects. Develop research partnerships with scientists and the community. Develop traditional burning practices that consider the ecological requirements of the forty-spotted pardalote.
Conservation Groups	Contributing to the implementation and evaluation of the plan, particularly in conducting research and monitoring programs. Implementing on-ground activities.	Opportunity to seek funding for conservation and awareness projects under biodiversity conservation programs. Greater coordination of targeted conservation projects. Delivering on charitable/not-for-profit goals benefiting the public.

Interest Group	Contribution	Impacts/Benefits
Community and special interest groups	Contributing to the plan and volunteering for conservation activities. Implementing on-ground activities. Adding to the knowledge of the forty-spotted pardalote via contribution to datasets.	More forty-spotted pardalotes to enjoy. Opportunity to participate in conservation projects.
Researchers	Contributing to the implementation of the plan and priority research activities.	Increased exchange of information. Opportunity to seek funding for research. Opportunity to establish collaborations within Australia and internationally.
Recreational users of sites—camping, 4WD, field and game groups	Contributing to the development of the plan during the public consultation period.	Some leisure activities that affect important habitat sites may need to be managed. These groups will be one of the main recipients for education and awareness activities that focus on how they may continue their activities and contribute to the conservation of threatened birds at the same time.
Landholders	Contributing to the development and implementation of the plan.	These groups will be the target of education and awareness activities. Opportunity to access voluntary incentives to comply with recommendations, where relevant and available. Enhance certainty regarding EPBC Act referrals.
Commercial users of sites or surrounding area—agriculture, mining, farmers (surrounding land use), forestry, tourism operators, property developers	Contributing to the plan during the public consultation period and implementing measures that minimise the impact of their operations on threatened birds.	These groups will also be some of the main recipients for education and awareness activities, although theirs will focus on minimising the impacts of their operations on the threatened woodland birds and the habitats on which they depend. Enhance certainty regarding EPBC Act referrals.

11. Consultation

The *Recovery Plan for the Forty-spotted Pardalote (Pardalotus quadragintus)* has been developed through extensive consultation with the national Recovery Team and a broad range of stakeholders. The consultation process included a stakeholder workshop with key species experts and conservation managers from a range of different organisations, who categorised ongoing threats to the forty-spotted pardalote and identified knowledge gaps and potential management options.

Consultation included representatives from government agencies, non-government organisations, researchers, and local community groups. During the drafting process, the Department of Climate Change, Energy, the Environment and Water (Cwlth) continued to collaborate closely with key stakeholders.

Notice of the draft plan was made available for public comment for three months between 16 September and 23 December 2022. Any comments received that were relevant to the survival of the species were considered by the Threatened Species Scientific Committee as part of its assessment process.

12. Organisations and persons involved in evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publicly available. The review will determine the performance of the plan and assess:

- whether the plan continues unchanged, is varied to remove completed actions, or varied to include new conservation priorities; or
- whether a Recovery Plan is no longer necessary for the species as either conservation advice will suffice, or the species is removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department of Climate Change, Energy, the Environment and Water (Cwlth) in association with the Recovery Team, Tasmanian Government and key stakeholder groups such as non-government organisations, local community groups and scientific research organisations.

Key stakeholders who may be involved in the review of the performance of the *Recovery Plan for the Forty-spotted Pardalote (Pardalotus quadragintus)* include organisations likely to be affected by the actions proposed in this plan and are expected to include:

Australian Government

Department of Climate Change, Energy, the Environment and Water (DCCEEW)

Tasmanian Government

Department of Natural Resources and Environment Tasmania (NRE)

Tasmanian Government Forest Practices Authority (FPA)

Department of Communities Tasmania

Local Government Authorities: Kingborough, Huon, Hobart, Flinders Island, Glamorgan Spring Bay Council (which includes Maria Island)

National Recovery Team

The Recovery Team includes representatives from the Tasmanian Government, Commonwealth Government, Parks and Wildlife Service Huon District, Parks and Wildlife Service Maria Island, BirdLife Australia (Tas Group), Kingborough Council, Bruny Island Environmental Network, Covenanted Landholder Bruny Island, Australian National University Research Institution, and other species specialists.

Non-government organisations and individuals

BirdLife Australia

Bruny Island Environmental Network

NRM (South, North)

Other community groups

Tasmanian Land Conservancy

Traditional Owner Groups

Universities

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APPENDIX A - Key Achievements

Achievements of the 1991–1997 Recovery Plan (from Threatened Species Section 2006)

Populations of the species and the area of known habitat were maintained.

Additional populations were identified on Flinders Island and at Kingston and Howden on the Tasmanian mainland.

92 hectares (ha) on Dennes Hill, Bruny Island was acquired by the Crown and proclaimed as a Nature Reserve. Dennes Hill is the most significant breeding subpopulation on private land.

A subpopulation on private land at Walkers Hill on Flinders Island was acquired by the Crown through a land swap and proclaimed as a Nature Reserve.

280 ha of Crown Land on Flinders Island known to support the species was incorporated into the new Brougham Sugarloaf Conservation Area through the Regional Forest Agreement.

At the beginning of the Recovery Plan, 55% of the known habitat of the species was protected through reservation. During the life of the Recovery Plan a further 11% of the populations by area were protected.

Prescriptions for conservation of the species and its habitat were developed and incorporated into Forest Practices and Local Government planning processes.

Several thousand white gum seedlings were grown and distributed to landowners. Plantings were undertaken in historically cleared areas of Dennes Hill Nature Reserve and experimental plots were established on cleared land and pasture on Bruny Island.

A major publicity campaign resulted in a dramatic increase in public awareness in eastern Tasmania of the species and its plight and a subsequent Honours research project in 1999.

Achievements of the 2006-2010 Recovery Plan (from Threatened Species Section 2012)

Increased protection of populations on private land through perpetual covenants and management agreements, increasing the species reservation status to 77%.

Bruny Island Threatened Species Recovery Plan produced—*Managing Threatened Species & Communities on Bruny Island* (Cochran 2003).

Post-wildfire survey undertaken on Flinders Island (TSS 2006).

Nest box trial commenced on Bruny Island.

Trial plantings undertaken on Dennes Hill, Woodlands Estate and other private properties on Bruny Island, and incentive money provided for small scale works (NRM South, Threatened Species Network).

Increased landholder awareness in threatened species protection through the NRM South Mountain to Marine program.

A resurvey of the species throughout its entire range (Bryant 2010).

Masters Thesis completed at Peter Murrell Reserve, Howden (Iijima 2010).

Achievements since 2010 (supplied by Recovery Team)

Resurvey and installation of next boxes on Flinders Island.

Purchase and protection of land used by Tinderbox Hill subpopulation by Tasmanian Land Conservancy.

Identification of small subpopulation at Ida Bay, Southport.

Covenanting of populations by Kingborough Council Offset program and Department of Natural Resources and Environment Tasmania's Private Land Conservation Program, improving protection of habitat.

Expansion and proliferation of nest box program on Bruny Island.

Research from two PhDs (ANU) and two Honours theses (UTAS) completed and new research underway.

Initiation of long-term monitoring and re-survey program across the species range.

Continued awareness generated by Bruny Island Environment Network, Bruny Island Bird Festivals and other public activities.

First ecological burn undertaken on Maria Island in 2021.