National Recovery Plan
for the
Swift Parrot *Lathamus discolor*

Birds Australia
CONSERVATION THROUGH KNOWLEDGE

Tasmania
Explore the possibilities

State Government Victoria
Department of Sustainability and Environment

Queensland Government

NSW GOVERNMENT
Office of Environment & Heritage

Australian Government

Government of South Australia

ACT PARKS CONSERVATION AND LANDS

National Recovery Plan for the Swift Parrot *Lathamus discolor*

Prepared by:
Debbie Saunders (Australian National University) and Chris Tzaros (Birds Australia)
Swift Parrot Recovery Team
C/- Birds Australia
Suite 2-05, 60 Leicester Street
Carlton Victoria 3053
Ph: +61 3 9347 0757

Disclaimer

The Australian Government, in partnership with Birds Australia, the New South Wales Office of Environment and Heritage, the Victorian Department of Sustainability and Environment, the Queensland Department of Environment and Resource Management, the Tasmanian Department of Primary Industries, Parks, Water and the Environment, the South Australian Department for Environment and Natural Resources and the Australian Capital Territory Department of Parks, Conservation and Lands facilitates the publication of recovery plans to detail the actions needed for the conservation of threatened native wildlife. 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.

Publication reference

Saunders, D.L. and Tzaros, C.L. 2011. *National Recovery Plan for the Swift Parrot Lathamus discolor*, Birds Australia, Melbourne.

ISBN: 978-0-646-57238-3

Cover Photo: Swift Parrot © Chris Tzaros

Summary

This document constitutes the formal National Recovery Plan for the Swift Parrot *Lathamus discolor*. The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure its long-term viability in nature and the parties who will undertake these actions. This is the third such recovery plan, and replaces the 2001 plan.

The Swift Parrot is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and is also listed as a threatened species in each state and territory in which it occurs (New South Wales, Tasmania, Victoria, ACT, Queensland and South Australia).

Swift Parrots breed in Tasmania and migrate to mainland Australia in autumn. During winter the parrots disperse across a broad landscape, foraging on nectar and lerps in eucalypts mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south eastern South Australia and southern Queensland.

Based on current knowledge of the ecology and distribution of the Swift Parrot the persistence of this species is mainly threatened by loss and alteration of habitat from forestry activities including firewood harvesting, clearing for residential, agricultural and industrial developments, attrition of old growth trees in the agricultural landscape, suppression of forest regeneration, and frequent fire. The species is also threatened by the effects of climate change, food and nest source competition, flight collision hazards, psittacine beak and feather disease, and illegal capture and trade.

The overall objective of this plan is to prevent further population decline of the Swift Parrot and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. These objectives will be achieved by implementing recovery actions for each of the following specific recovery objectives:

Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures

Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

Objective 4: To monitor population trends and distribution throughout the range.

Abbreviations

ANU	Australian National University
BA	Birds Australia
CMA	Catchment Management Authority
DERM	Department of Environment and Resource Management, Queensland
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities, Commonwealth
DPIPWE	Department of Primary Industries, Parks, Water and Environment, Tasmania
DSE	Department of Sustainability and Environment, Victoria
PCL	Parks, Conservation and Land, ACT
IUCN	International Union for Conservation of Nature
NRM	Natural Resource Management
OEH	Office of Environment and Heritage, New South Wales
SADENR	Department for Environment and Natural Resources, South Australia
WWF	World Wildlife Fund (Australia)

Contents

Introduction

The Swift Parrot *Lathamus discolor* is listed as 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is also listed as a threatened species in each other state and territory in which it occurs, as detailed below:

- Tasmanian *Threatened Species Protection Act 1995* (TSP Act) (Schedule 4, Endangered)
- New South Wales *Threatened Species Conservation Act 1995* (TSC Act) (Endangered)
- Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) (Schedule 2, Endangered)
- South Australian *National Parks and Wildlife Act 1972* (NPW Act) (Schedule 7, Endangered)
- Queensland *Nature Conservation Act 1992* (NC Act) (Endangered)
- Australian Capital Territory *Nature Conservation Act 1980* (ACT NC Act) (Section 21, Vulnerable)

The Swift Parrot is also listed as 'Endangered' on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN 2004).

Under the EPBC Act, a national recovery plan is required for the Swift Parrot. This is the third recovery plan for the species with the implementation of previous plans (Brereton 1998; Swift Parrot Recovery Team 2001) providing a wealth of information and advancing the conservation of this species markedly over the past 10 years. Such achievements are documented in the *National Swift Parrot Recovery Program Achievements 1995-2004* report (Saunders 2005) and provide a basis for both ongoing and new conservation strategies identified in this plan.

Supporting information for this recovery plan and further details about the Swift Parrot are available in the *Background Document - Swift Parrot Recovery Plan* (Saunders *et al.* 2010). The background document includes a species description as well as information on breeding, dispersal and migration, and summaries of published papers on the Swift Parrot. Results from the Tasmanian population monitoring and mainland volunteer survey components of the program (1995-2008) are also provided.

New directions incorporated into this plan include focusing efforts on:

- identification and protection of breeding habitat in Tasmania
- identification and protection of priority habitats in New South Wales
- increasing survey effort and habitat conservation measures on private properties
- involvement of indigenous people in the recovery program
- identifying movement patterns throughout the species' range
- identification and protection of mass roosting sites
- identification and monitoring of the potential impacts of climate change

In addition, an important part of the recovery process is to establish and maintain a long-term population monitoring program and continue the national volunteer surveys to provide a greater understanding of population trends and habitat use by the species' throughout its range.

Distribution

The Swift Parrot breeds in Tasmania during the austral summer and the entire population migrates north to mainland Australia for the austral winter (Figure 1). They occupy habitats across all tenures, with the majority of habitats occurring outside formal conservation reserves. The breeding range of the Swift Parrot is largely restricted to the east and south-east coast of Tasmania where it occupies an area of less than 500 km^2. The breeding range closely mirrors the distribution of Blue Gum *Eucalyptus globulus* in Tasmania. The species breeds in the north-west of the state between Launceston and Smithton, however, the number of birds involved and frequency of these breeding events is not well understood. Potential breeding habitat remaining in the north-west is scarce and highly fragmented.

Whilst on the mainland the Swift Parrot disperses widely, foraging on flowers and lerps in *Eucalyptus* spp. mainly in Victoria and New South Wales. In Victoria, Swift Parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts and they are occasionally recorded south of the divide in the Gippsland region. During periods of drought in central Victoria, Swift Parrots may concentrate in coastal drought refuge habitats in New South Wales, as observed in 2002 and 2009 (Tzaros *et al.* 2009).

In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Small numbers of Swift Parrots are observed in the Australian Capital Territory and in south-eastern Queensland on a regular basis. The species is less frequently observed in the Southern Mount Lofty Ranges and the Bordertown-Naracoorte area in south-eastern South Australia.

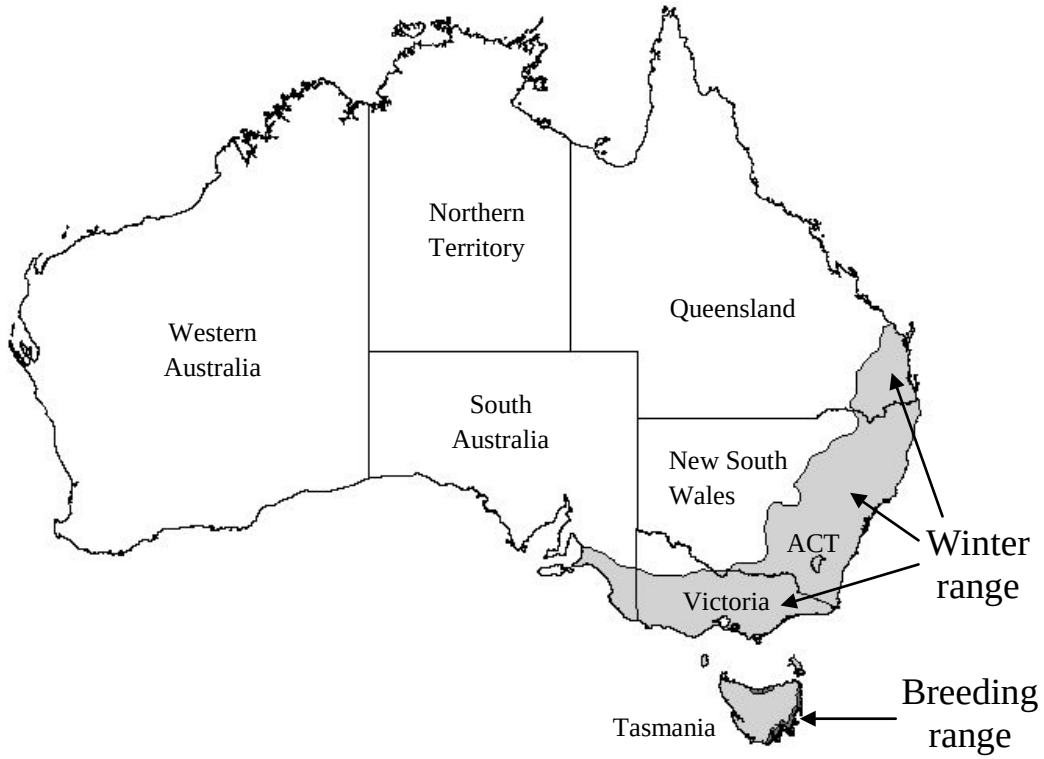

Figure 1 - Distribution of the Swift Parrot in Australia

Population

The Swift Parrot occurs as a single, migratory population. Following a significant decline in the population (from an estimated 1320 pairs in 1988, to 940 pairs in 1995) a population monitoring program was established in grassy Blue Gum forests of eastern Tasmania. This program was implemented for several years to monitor the population density of Swift Parrots and indicated that although the population is low, it is, at best, stable.

Throughout the winter range of the species, there have been 29 national volunteer surveys conducted over 15 years (1995-2009). These surveys were held twice a year (in May and August), involving hundreds of volunteers and community groups. As a result of this survey effort, volunteer experience and knowledge of habitat requirements has increased substantially.

For a summary of the population monitoring program and more information on the mainland volunteer survey results refer to the *Background Document – Swift Parrot Recovery Plan* (Saunders *et al.* 2010)

Habitat

Vegetation communities and key tree species that provide important nesting and foraging habitat for Swift Parrots are detailed below (Table 1 and 2). The use of these habitats is dependant on prevailing climatic conditions and corresponding food availability. The production of lerp and nectar food resources in these habitats and the availability of nesting hollows are considered the main limiting factors to the species' survival and capacity to breed. Due to the variable production of nectar and lerps across this species' range, it is considered important to protect and manage a broad range of habitats to provide a range of foraging resources (Kennedy and Overs 2001; Brereton *et al.* 2004; Kennedy and Tzaros 2005; Saunders *et al.* 2007; Saunders 2008; Tzaros *et al.* 2009). Improving the protection of nest hollow resources in proximity to foraging habitats is also an important focus of this plan.

Table 1: Swift Parrot habitats and their regional distribution in Tasmania

Habitat types - Tasmania	Key tree species scientific name	Regional distribution (NRM regions*)
Nesting Habitat		
Hollow bearing eucalypt forest	*Eucalyptus spp.*	Eastern (South, North), Northern (Cradle Coast)
Foraging Habitat (breeding)		
Blue Gum dominated forest	*Eucalyptus globulus*	Eastern (South, North)
Black Gum dominated forest	*Eucalyptus ovata*	Eastern (South, North), Northern (Cradle Coast)
Forest types where Blue Gum occurs as sub-dominant	*Eucalyptus globulus*	Eastern (South, North)
Forest types where Black Gum occurs as sub-dominant	*Eucalyptus ovata*	Eastern (South, North)
Foraging Habitat (post-breeding)		
Range of *Eucalyptus* species including *E. delegatensis, E. dalrympleana, E. obliqua, E. pauciflora* and *E. viminalis*		Eastern (South, North), Northern (Cradle Coast)

Table 2: Swift Parrot habitats and their regional distribution on mainland Australia

Foraging habitat types – mainland		Regional distribution (natural resource management regions)			
Key tree species – common name	**Key tree species – scientific name**	**Victoria**	**New South Wales/ACT**	**Queensland**	**South Australia**
Yellow Gum	*Eucalyptus leucoxylon*	Central and Western (North Central, Glenelg Hopkins, Wimmera)			South-east (South-east, Murray Darling Basin, Adelaide & Mt Lofty Ranges)
Red Ironbark	*Eucalyptus tricarpa*	Central (North Central)			
Mugga Ironbark	*Eucalyptus sideroxylon*	North-east (North East, Goulburn Broken)	Western Slopes and Central Coast (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir, Hawkesbury - Nepean)		

Foraging habitat types – mainland		Regional distribution (natural resource management regions)			
Key tree species – common name	**Key tree species – scientific name**	**Victoria**	**New South Wales/ACT**	**Queensland**	**South Australia**
Grey Box	*Eucalyptus microcarpa*	Central, North-east and West (North Central, North East, Goulburn Broken, Wimmera)	Western Slopes and Central Coast (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir, Hawkesbury - Nepean)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary)	South-east (South-east, Murray Darling Basin, Adelaide & Mt Lofty Ranges)
White Box	*Eucalyptus albens*	Central, North-east (North Central, Goulburn Broken, North East)	Western Slopes (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir)		
Yellow Box	*Eucalyptus melliodora*	Central, North-east, South, West (Wimmera, Glenelg Hopkins, Port Phillip Westernport, North Central, West Gippsland, Goulburn Broken, North East)	Western Slopes (Murray, Murrumbidgee, Lachlan, Central West, Namoi, Border Rivers - Gwydir) ACT (Murrumbidgee)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary	
Swamp Mahogany	*Eucalyptus robusta*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)	South-east (Burnett Mary, South East Queensland)	
Forest Red Gum	*Eucalyptus tereticornis*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)	South-east (Border Rivers Maranoa-Balonne, Condamine, South East Queensland, Burnett Mary)	
Blackbutt	*Eucalyptus pilularis*		Coastal (Hunter - Central Rivers, Northern Rivers, Hawkesbury - Nepean)		
Spotted Gum	*Corymbia maculata*		Coastal (Southern Rivers, Hunter - Central Rivers, Northern Rivers, Sydney Metro, Hawkesbury - Nepean)		

- Maps of natural resource management regions are provided at http://www.nrm.gov.au/nrm/region.html .

Nesting habitat (Tasmania)

The Swift Parrot nests in hollows of live and dead eucalypt trees. In eastern Tasmania, most recorded nest sites have been located within 10 km of the coast. In northern Tasmania nest sites have been found much further inland in the Gog Range (Swift Parrot Recovery Team 2001). The most common tree species used by Swift Parrots for nesting are Stringybark *Eucalyptus obliqua,* White Peppermint *Eucalyptus pulchella,* Blue Gum *Eucalyptus globulus,* White Gum *Eucalyptus viminalis,* Gum-topped Stringybark *Eucalyptus delegatensis* and dead stags. The majority of recorded nest sites occur in Dry *E. obliqua* forest and Wet *E. obliqua* forest, Dry *E. pulchella* forest and Dry *E. globulus* forest. Nest sites have also been recorded in other dry and wet eucalypt forest types. In general, the prevalence of hollows in eucalypt forests and woodlands and their proximity to a foraging resource is considered more important than forest type and/or tree species. Existing nest records are likely to be a reflection of availability of these forest types and tree species rather than preference. Similarly, the more common occurrence of nest records on upper slopes and ridge tops (Brereton 1997) may be largely attributed to the distribution of hollows across the landscape resulting from past land use practices (e.g. land clearance and timber harvesting). Where suitable hollows are available, nest sites can be found in all topographic positions (Webb *et al.* in prep).

Swift Parrots select trees and forest patches with a high number of hollows (Voogdt 2006). Nesting hollows used by Swift Parrots are found predominantly in older growth trees located in forest patches of greater than 100 hectares (Brereton 1997). Nest trees are typically characterised by having a diameter at breast height greater than 0.7 m, several visible hollows and showing signs of senescence (Brereton 1997).

The distribution of nesting Swift Parrots each breeding season is largely determined by the distribution and intensity of Blue Gum flowering across the breeding range. Where there is good Blue Gum flowering in association with abundant tree hollows aggregations of up to 50 nesting pairs covering over 100 hectares have been recorded (Webb 2008). Reuse of nesting sites recorded over several different years highlights the importance of these areas to the species. Reuse of individual nest hollows by Swift Parrots has also been recorded. The presence of a foraging resource will determine whether an area is suitable on a year to year basis. Monitoring of Blue Gum flowering and the occurrence of Swift Parrots across the breeding range in the south and east (Webb in prep) suggests that some nesting sites are used on a cyclic basis when there is suitable flowering in surrounding areas. These variations in Blue Gum flowering have a strong influence over the availability of potential nesting habitat from year to year. The protection of aggregated nesting sites and associated foraging habitats is important to the recovery of the species.

Important forest types within the breeding range for nesting habitat are listed in Table 1. This list should not be considered exclusive and, as mentioned above, the proximity of suitable nest hollows to a foraging resource is considered more important than forest type or tree species. Priority sites in Table 3 are not an exhaustive list and the viability/quality of some known breeding sites is unclear due to a lack of knowledge of habitat loss and disturbance within these areas.

Foraging habitat – breeding (Tasmania)

During the breeding season, Swift Parrots are strongly associated with Blue Gum *Eucalyptus globulus* dominated forests and woodlands where they feed on the nectar from the flowers of these eucalypts (Brereton 1997). There is considerable inter-annual variation in the flowering intensity of Blue Gums in Tasmania (Brereton *et al.* 2004; Mallick *et al.* 2004). Flowering varies both spatially and temporally across the landscape. A lack of hollow bearing forest in some areas may result in areas of potential foraging habitat not being available for nesting birds.

Blue Gum forests in the south-eastern and eastern region of Tasmania are considered to be a vital component of the species' breeding habitat. In areas where Blue Gum forests are scarce or do not occur, or years when flowering is poor in this forest type, other communities where Blue Gum is subdominant are important foraging habitats (e.g. wet eucalypt forests, dry eucalypt forests, forest remnants and paddock trees) (Webb in prep). Similarly, planted Blue Gums (e.g. street and plantation trees) in north-west Tasmania may provide an important local food resource in some years. Black Gum *E. ovata* forest is an important foraging resource early in the breeding season and in years when flowering of Blue Gum is generally poor (Brown 1989; Brereton 1997; Swift Parrot Recovery Team 2001). In the north-west Black Gum forest may represent the primary foraging resource.

Generally, the larger the tree the more foraging value it has for Swift Parrots. Brereton *et al* (2004) demonstrated a greater flowering frequency and intensity in larger Blue Gums and a preference by Swift Parrots to forage in these larger trees. During the breeding season Swift Parrots can often be seen feeding on lerps, wild fruits such as Native Cherry *Exocarpos cupressiformis* and introduced eucalypts. The relative importance of other food sources during the breeding season is not well understood.

Foraging habitat – post-breeding (Tasmania)

Post-breeding habitat in Tasmania has not been studied in detail and current information is based on opportunistic observations. Post-breeding habitat is considered to mainly occur in the wetter forests in west and north-west Tasmania where summer and autumn flowering eucalypt species are abundant, particularly stringybark *E. obliqua*, White-topped Stringybark *E. delegatensis*, White Gum *E. viminalis*, Mountain Gum *E. dalrympleana* and Cabbage Gum *E. pauciflora* (Swift Parrot Recovery Team 2001). The Swift Parrot will also forage on the flowers of Smithton Peppermint *Eucalyptus nitida* in the south-west and west of the state.

Foraging habitat – autumn-winter (mainland Australia)

During the winter migration period, the majority of the population frequents eucalypt woodlands and forests in Victoria and New South Wales. Research within winter habitats has identified key foraging habitat types and characteristics as detailed in Table 2 (Kennedy 2000; Mac Nally and Horrocks 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005; Saunders and Heinsohn 2008). Within these habitats, Swift Parrots have been found to preferentially forage in large, mature trees (Kennedy 2000; Kennedy and Overs 2001; Kennedy and Tzaros 2005) that provide more reliable foraging resources than younger trees (Wilson and Bennett 1999; Law *et al.* 2000).

Although Swift Parrots have been recorded in a wider range of habitats than those provided in Table 2, some of these are considered to be used opportunistically rather than providing a reliable quantity and quality of resources upon which the species can depend. For example, planted eucalypts are sometimes used by this species opportunistically when natural foraging resources are scarce. Although the species can adapt to utilise such a variety of habitats, the prolonged use of such habitats and co-existence with aggressive species that tend to inhabit disturbed areas may be energetically expensive and reduce overall fitness and survival of the species. Contributing factors may include reduced food quality, increased distance travelled in search of food, increased competition from large, aggressive bird species and/or increased exposure to collision hazards in the built environment.

In Victoria habitat mapping has focused on public land throughout the box-ironbark regions and 40 priority sites have been identified where Swift Parrots have a high level of site fidelity, or have occurred in large flocks (Saunders *et al.* 2007). An additional 121,000 hectares of box-ironbark forests and woodland have been added to the state's national parks and reserves system, with the majority of the priority sites now within these reserved areas (Environment Conservation Council 2001). The focus of work in central Victoria is now on mapping habitats on private land and incorporating this with existing public land mapping for a more complete picture of habitat availability and use by Swift Parrots (Saunders *et al.* 2007).

In New South Wales, habitat mapping has been limited by the availability of suitable vegetation mapping with some areas of the species' range not currently mapped. Due to the highly fragmented nature of some Swift Parrot sites in New South Wales, some important habitats, such as those within coastal urban environments, are not evident from vegetation mapping alone. Therefore Swift Parrot records need to be combined with vegetation mapping to get a clearer indication of habitat use in New South Wales. Prioritisation of New South Wales sites is currently being undertaken; however this is primarily on public land. Therefore further work is needed to survey and identify sites on private properties. The majority of Swift Parrot foraging sites in New South Wales, Queensland and South Australia occur outside conservation reserves and therefore continue to be vulnerable to loss, fragmentation or disturbance.

Many of the Swift Parrot foraging sites in Queensland occur on council reserves or parkland. The Regional Ecosystems containing preferred Swift Parrot forage tree species have been mapped and overlaid for the recorded areas of Swift Parrots in Queensland.

Priority habitats

Of particular importance for conservation management are habitats which are used:

- for nesting,
- by large proportions of the Swift Parrot population,
- repeatedly between seasons (site fidelity), or
- for prolonged periods of time (site persistence).

Site fidelity is considered to be important for the long-term survival of migrants at both breeding and non-breeding sites (Villard *et al.* 1995). Information obtained through the recovery program demonstrates the importance of site fidelity for the Swift Parrot population (Kennedy and Tzaros 2005). However, the importance of areas where site fidelity has not yet been established should not be dismissed since this may be due to observational and accessibility limitations and long-term resource availability cycles (Saunders *et al.* 2007).

Table 3: Priority habitat for conservation management of Swift Parrot nesting and foraging resources.

State	Priority sites/regions
Tasmania	East coast: Potential and known breeding habitat (i.e. foraging and nesting) on the east coast between Cockle Creek and the Gardens within approximately 10 km of the coast. Between Sorell and Orford this area extends to within 15 km of the coast. Known breeding sites include but are not limited to Maria Island, Mt Wellington and surrounds, Meehan Range, Tasman Peninsula, Wielangta, the D'Entrecasteaux Channel area including Bruny Island, Nelsons Tier, Tinderbox, Chain of Lagoons to Binalong Bay and Southern Forests. North West Coast: Known sites include Gog Range, Kelcey Tier, Badger Range, Mt Careless, Round Hill, Dial Range.
Victoria	Local/Regional/State parks: Bendigo Regional Park, Dookie Bushland Reserve, Muckleford Historic and Cultural Reserve, Paddy's Ranges State Park, Warby Ranges State Park. Nature Conservation Reserves/National Parks: Big Tottington, Chiltern-Pilot, Crosbie, Dalyenong, Deep Lead, Dunach, Havelock, Heathcote-Graytown, Illawarra, Jallukar, Moliagul, Morrl Morrl, Pilchers Bridge, Shelbourne, Spring Plains, Stoney Creek, Timor, Tunstalls. State Forests: Costerfield, Diamond Dam, Glynwylln, Havelock, Illawarra, Kingower, Lockwood South, Maldon, Mount Hooghly, One Eye, Redcastle, Rushworth, Sandon, Sedgwick, St Arnaud, Timor, Waanyarra, Wareek.
New South Wales	Priority sites to be identified within the following CMAs: Hawkesbury - Nepean, Hunter - Central Rivers, Lachlan, Murray, Murrumbidgee, Northern Rivers, Southern Rivers, Sydney Metro.
Queensland	South-east Queensland: Brisbane - Bowman Park, Bardon; Rafting Creek Reserve Kenmore/Fig Tree Pocket. Toowoomba - Glen Lomond Park

Conserving a combination of known priority habitat and potential habitat in perpetuity in different regions is essential for the long-term survival of the Swift Parrot. Habitat critical to the survival of the Swift Parrot includes; those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team. Actions 1.1, 1.2, 2.1, 2.2 and 4.2 are expected to elicit information that further defines the ecological characteristics and spatial distribution of habitat critical to the survival of the Swift Parrot.

Roosting habitat

Roost site characteristics, and the importance of such sites for the Swift Parrot, are relatively unknown. Roost sites have been recorded in Victoria, New South Wales and Tasmania. Recent observations of mass roosting events suggest that roosting sites may play an important role in facilitating social interactions and communication and may be used repeatedly within and between seasons. Vegetation structure and proximity to foraging sites are likely to be important for roost site selection however further information is required to identify these habitat components and their importance for the species.

Movement pathways

Movement pathways used by Swift Parrots throughout their range are not well understood given observations of such events are rare and tracking individuals over long distances is not currently possible with existing satellite tracking technology. Although large scale movement trends have been demonstrated across mainland Australia (Saunders *et al. in prep*), it is not known if long distance movements across Bass Strait or on the mainland are undertaken in groups, nocturnally or diurnally, at specific heights or what triggers such movements. Further information is required to identify potential movement pathways, the importance of such pathways and potential threats that occur in these areas.

Threats

Major threats to the survival of the Swift Parrot population include the loss and alteration of foraging and nesting habitat through forestry activities, including firewood harvesting, and residential, industrial and agricultural development. Other identified threats include climate change impacts, competition for foraging and nesting resources, mortality from collisions with human-made objects, Psittacine beak and feather disease, and illegal bird capture and trade. These threats are described in more detail below.

Habitat loss and alteration

Habitat loss through land clearing for plantation development and intensive native forest silviculture poses the greatest threat to survival of the Swift Parrot population. The clearance of foraging and nesting habitat has been extensive and dramatic in many areas reducing the available nesting and foraging habitat to small remnants of what previously existed (Prober and Thiele 1995; Saunders *et al.* 2007). Twenty ecological communities providing potential habitat for Swift Parrots have been listed as endangered or vulnerable (Table 4), and in Tasmania important foraging habitat including grassy Blue Gum forest and Black Gum forest are recognised as threatened vegetation communities. Habitat loss and alteration also occurs through residential, agricultural and industrial development, and dieback in agricultural and urban areas.

Forestry activities including firewood harvesting

Forestry activities, including firewood harvesting result in the loss and alteration of nesting and foraging habitat throughout the Swift Parrot's range. In Tasmania, in the absence of adequate management prescriptions, foraging and nesting habitat in wet forest types has been particularly prone to loss and alteration by forestry activities. Habitat loss from forestry activities occurs from either conversion to plantation or from intensive native forest silviculture.

Firewood collection is a threat to nesting habitat in Tasmania and foraging habitat on mainland Australia. Trees targeted by firewood collectors are often dead or dying trees supporting many hollows suitable for Swift Parrot nesting, or are large, mature forage trees.

In addition to habitat loss and alteration caused by forestry activities, including firewood harvesting, there is an additional risk of mortality caused by felling of trees containing active nests where operations in potential breeding habitat are undertaken during the breeding season.

The harvesting of mature box-ironbark woodlands of central Victoria and coastal forests of New South Wales for forestry reduces the suitability of these habitats for this species by removing mature trees which are preferred by Swift Parrots for foraging and that provide more reliable, as well as greater quantity and quality of food resources than younger trees (Wilson and Bennett 1999; Kennedy and Overs 2001; Kennedy and Tzaros 2005).

Table 4: Threatened ecological communities containing habitat suitable for Swift Parrots.

	Threatened Ecological Community	*Conservation Status*	*Habitat use*	*Remaining habitat (varies regionally)*
1.	Grassy Blue Gum Forest	Threatened (Tas)	Nesting, Foraging	<30%
2.	Grassy/Shrubby Black Gum Forests	Threatened (Tas)	Nesting, Foraging	<10%
3.	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Endangered (Federal)	Foraging	<5% (<400ha unmodified in New South Wales)
4.	Box Ironbark Forest (EVC 61)	Vulnerable – Depleted (Vic)	Foraging	10-30%, 30-50%
5.	Plains Grassy Woodland (EVC 55)	Endangered (Vic)	Foraging	<10%
6.	Limestone Box Forest (EVC 15)	Vulnerable (Vic)	Foraging	10-30%
7.	Bega Dry Grassy Forest	Endangered (NSW)	Foraging	10%
8.	Cumberland Plain Woodland*	Critically Endangered (Federal and NSW)	Foraging	8%
9.	Hunter Lowland Red Gum Forest	Endangered (NSW)	Foraging	27% (<500ha)
10.	Lower Hunter Spotted Gum - Ironbark Forest	Endangered (NSW)	Foraging	<25%
11.	River-Flat Eucalypt Forest on Coastal Floodplains	Endangered (NSW)	Foraging	20-30%
12.	Shale Sandstone Transition Forests*	Endangered (Federal and NSW)	Foraging	20-40%
13.	Shale Gravel Transition Forests*	Critically Endangered (Federal and NSW)	Foraging	31%
14.	Swamp Sclerophyll Forest on Coastal Floodplains	Endangered (NSW)	Foraging	3-30%
15.	Bangalay Sand Forest	Endangered (NSW)	Foraging	20-30%
16.	White Box/Yellow Box/Red Gum Grassy Woodland	Endangered (NSW)	Foraging	1-7%
17.	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered (preliminary listing, NSW)	Foraging	15%
18.	Yellow Box/Red Gum Grassy Woodland*	Endangered (ACT)	Foraging	10%
19.	Gippsland Red Gum Grassy Woodland and Associated Native Grassland	Critically Endangered (Federal)	Foraging	1-5%
20.	Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered (Federal)	Foraging	<5%

* Recovery Plan/Action Statement prepared

Information in this table is summarised from state and federal threatened vegetation community listings, descriptions and action plans.

Residential and industrial development

Urban, rural residential and industrial developments pose a significant threat to habitat throughout the range of the species, within important breeding areas in Tasmania and key areas in Victoria, New South Wales and Queensland being of particular concern. In Tasmania, the greatest potential for negative impacts is in the urban and rural residential areas of the greater Hobart area, particularly in important breeding areas. Where potential breeding habitat is retained adjacent to developments there is an increased likelihood that potential nest trees could be removed for 'human safety reasons' (Webb pers. obs.).

In central Victoria, urban and rural residential developments are increasingly encroaching into Box-Ironbark habitats such as those around Bendigo. In New South Wales, urban and industrial expansion on the central and north coasts pose an ongoing threat of habitat loss with an increasingly large proportion of the human population (about 86%) residing in coastal areas of Australia (Natural Resource Management Ministerial Council 2003).

In Queensland, urban development is of particular concern to the Swift Parrot at the northern extent of their winter range. In particular, the Gold Coast, Toowoomba and the Greater Brisbane region are at risk from negative impacts associated with residential and industrial development.

Agricultural tree senescence and dieback

Much of the habitat used by Swift Parrots in agricultural landscapes is forest remnants and isolated or scattered paddock trees. However this habitat continues to be lost through senescence, dieback and over grazing with limited or no recruitment. This is of particular concern in eastern Tasmania, central Victoria and on the western slopes and northern tablelands of New South Wales.

Regeneration suppression

Urban impacts, grazing and declining tree health all contribute to reduced tree regeneration in Swift Parrot habitats. By inhibiting natural regeneration these threats alter the age structure of habitats and reduce the long-term viability of foraging and nesting resources. Where natural regeneration is inhibited, the health of existing mature trees and the seed source are also reduced. This is of particular concern in nesting and foraging habitat in Tasmania, in regions of coastal New South Wales where key habitats remain predominantly as mature trees within the urban environment, and on agricultural land in central Victoria and on the western slopes and northern tablelands of New South Wales.

Frequent Fire

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectarivorous birds (Woinarski and Recher 1997). This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat. Such developments are required to comply with new fire safety regulations involving clearing trees within fire protection zones and undertaking hazard reduction burns. With an increase in the human population residing adjacent to potential Swift Parrot habitat and increased accessibility to bushland areas, an increase in the incidence of accidental and deliberate fire may also be an issue.

The relationship between fire and the formation and destruction of hollows is complex. Fires may kill canopy trees but these (and their hollows) may persist as dead stags. Fires may also lead to hollow formation (or a change in dimensions of existing hollows) in surviving trees or destroy hollow-bearing trees. Frequent fire may alter natural wildfire tree recruitment processes and hence dictate future availability of hollows (Woinarski and Recher 1997).

Climate change

Loss of nesting and foraging habitat from climate change, caused by anthropogenic emissions of greenhouse gases, is likely to pose a significant threat to the Swift Parrot. The Swift Parrot has been identified by Bennett *et al.* (1991) as potentially having suitable climatic conditions within its current range reduced by 50% in Victoria as a result of increased temperatures (3 degrees Celsius) due to global warming (based on bioclimatic models only). Brereton *et al.* (1995) identified the Swift Parrot as being particularly vulnerable to changes in spatial and temporal distribution of its habitats. Climate change in Australia may affect the geographic range, migration patterns, physiology and abundance of species (such as the Swift Parrot) as well as the phenology and community composition of their habitats (Chambers *et al.* 2005). Climate change management requires both domestic and international action to stop further accumulation of anthropogenic greenhouse gases. Although management of this global issue is beyond the scope of this plan, long-term monitoring of the species in conjunction with climate monitoring stations may be needed to understand the sensitivities of the Swift Parrot to climate change. Such a monitoring program may provide valuable insights and a basis for future adaptive conservation management strategies. The cumulative effects of other threats together with climate change need to be considered for effective and adaptive long-term management of the Swift Parrot.

Collision mortality

Collisions with wire netting or mesh fences windows and cars may cause mortality to Swift Parrots in urban areas throughout the species' range (Pfennigwerth 2008). Continuing urban encroachment into breeding and foraging habitat is likely to exacerbate this problem. Swift Parrots are sometimes found injured or dead from collisions during the breeding season, with few birds released back into the wild. The threat is exacerbated in years when foraging resources are scarce due to drought, causing Swift Parrots to concentrate in urban areas to forage on remnant and planted eucalypts. With an increasingly large proportion of the human population (over 86%) residing in coastal areas of Australia (Natural Resource Management Ministerial Council 2003), urban and other built environments are expanding into areas of foraging and nesting habitat and impacts from fatal collisions are likely to increase.

Collisions are of particular concern in the greater Hobart and Melbourne areas and New South Wales Central and North Coast regions, where injuries and fatalities have previously been recorded (Tzaros 2002).

The construction of wind energy turbines in south-eastern Australia may have implications for the conservation of the Swift Parrot where they are poorly sited (Barrios and Rodriguez 2004).

Competition

Swift Parrots can experience increased competition for food and nesting resources from large, aggressive honeyeaters within altered habitats (Ford *et al.* 1993; Grey *et al.* 1998; Saunders and Heinsohn 2008) and introduced birds and bees (Brown 1989; Paton 1993; Hingston *et al.* 2004).

Resource competition with the introduced European Honeybee *Apis mellifera* is likely to pose a threat to the Swift Parrot with up to 2,000 tonnes of honey being produced each year from Swift Parrot foraging habitats in the Victorian box-ironbark woodlands on public land alone (Environment Conservation Council 2001). The invasive Large Earth Bumblebee *Bombus terrestris* may also compete for foraging resources with the Swift Parrot. This species is known to invade areas of breeding habitat in Tasmania and the potential introduction of this species to mainland Australia could further reduce the availability of food resources in over-wintering habitat for the Swift Parrot (Hingston *et al.* 2002; Hingston *et al.* 2004).

Swift Parrots are less likely to occur at known foraging sites as the abundance of large, aggressive nectar feeders (e.g. Noisy Miner *Manorina melanocephala* and Rainbow Lorikeet *Trichoglossus haematodus*) increases (Saunders and Heinsohn 2008). Impacts by Noisy Miner and Rainbow Lorikeet are likely to increase with further habitat loss and fragmentation that promote suitable conditions for these species to thrive.

Introduced birds such as European Starlings *Sturnus vulgaris*, and the European Honeybee are known to compete with Swift Parrots for nest hollows. The impacts and relative importance of these interactions are not well known, however, European Starlings have been notably absent from all known aggregated nesting sites (Webb pers. comm.).

Psittacine Beak and Feather Disease

Psittacine Beak and Feather Disease (PBFD) is a common and potentially deadly disease of parrots caused by a circovirus. The disease appears to have originated in Australia and is widespread and continuously present in wild populations of many Australian parrots. The potential effects of the disease on parrot populations range from inconsequential to devastating, depending on environmental conditions and the general health of the parrots (Department of Environment and Heritage 2005a). This disease could potentially have serious implications for the Swift Parrot population should the general health of these birds be reduced from stress associated with competition for nesting and food resources. In addition, the Swift Parrot population may be at increased risk of PBFD through the rehabilitation and release of injured birds back into the wild. It has been found that rehabilitated birds may remain latently infected, with the virus persisting in their livers, and therefore potentially increasing the dose of virus in the wild (Department of Environment and Heritage 2005a). A large number of lorikeets that are rescued and rehabilitated often carry the PBFD virus when released back into the wild. While PBFD is known to occur in Swift Parrots in the wild and in captive birds, the prevalence and pathogenicity of the disease is currently not known. Any fresh Swift Parrot found dead should be tested for PBFD.

Even if it is assumed that the virus can be transferred between lorikeets and Swift Parrots, there are no practical actions that can be identified to address this threat. This is because there is no capacity to control the interaction of two wild bird populations where their habitats overlap. Accordingly, actions to confirm this assumption, or to respond to this assumption, are not included in this plan.

Illegal wildlife capture and trading

Unregulated trade in wildlife has become a major factor in the decline of many species of animals and plants. Therefore the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established and is enforceable under the EPBC Act 1999 (Department of Environment and Heritage 2005b). The Swift Parrot is a unique species that is valued internationally and domestically by bird keepers and breeders and may be particularly susceptible to such illegal activities. The extent of such activities and their impact on the wild population are currently unknown.

Listed threatening processes

Threatening processes listed under legislation which are relevant to Swift Parrots and their habitats are shown in Table 5. Government jurisdictions that have prepared Threat Abatement Plans or Action Statements are indicated by an asterix (*).

Table5: Threatening processes relevant to the Swift Parrot

Listed threatening processes	State/Federal legislation
Clearing of native vegetation	Federal, NSW
Fauna habitat fragmentation	Victoria
Infection by Beak and Feather Disease (Psittacine Circoviral Disease)	Federal*, New South Wales
Introduction and spread of the Large Earth Bumblebee *Bombus terrestris*	Victoria, New South Wales
Competition from feral honeybees *Apis mellifera*	Victoria, New South Wales
Ecological consequences of high frequency fire	Victoria, New South Wales
Spread of the root-rot fungus *Phytophthora cinnamomi* causing tree dieback	Federal*, Victoria, New South Wales, Tasmania
Predation of native wildlife by cats *Felis catus*	Federal*, Victoria*, New South Wales
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	Federal, Victoria, New South Wales

Cumulative impacts

Each of the identified threats to the Swift Parrot has the potential to compromise the long-term survival of the species, and where more than one threat is present the cumulative effect is likely to be substantially greater than the sum of the individual threats. When assessing threats to the Swift Parrot, combinations of threats need to be considered to provide a realistic assessment of impacts on the species.

Evaluation of performance of the previous Swift Parrot Recovery Plan

The previous National Swift Parrot Recovery Plan (2001) resulted in significant improvements for Swift Parrot conservation as a result of unprecedented spatial and temporal data collection and improved understanding and protection of the species' habitat throughout their range. Based on this information new knowledge gaps and actions have been identified and ongoing recovery efforts are moving towards a more landscape based approach to conservation for this migratory species. However all key threats to this species remain and the overall objectives of the recovery plan have not yet been achieved. That is, the species' endangered status remains and, despite some improvement in the conservation of habitats, there has not yet been a demonstrable sustained improvement in the quality of habitat to increase carrying capacity.

The 2001 recovery plan contained six specific objectives with 13 recovery actions and five recovery criteria. Although all specific objectives and recovery actions have been addressed to some extent, only one of the five recovery criteria has been fully achieved, as summarised in Table 6. The poor outcome of these recovery criteria is due to one or a combination of the following:

- some criteria operate on a time scale beyond the life of the recovery plan;
- important information on the species breeding ecology (e.g. knowledge of aggregated nesting, importance of wet forest habitats, variations in temporal and spatial flowering patterns over landscape scales, etc) was not available for much of the life of this plan;
- conflicting interests between habitat protection and socio-economic factors;
- some criteria were not measurable (e.g. quantifying the incidence of collisions and habitat loss)

Table 6: Assessment of recovery criteria in 2001 Recovery Plan

Recovery Criteria	Status
Priority habitats and sites have been identified and protected	Some progress
Management strategies to protect breeding and foraging habitat have been implemented	Some progress
The incidence of collisions is reduced	Unknown
The population density and/or extent and quality of habitat is not reduced and ideally is enhanced	Not achieved
Community based networks are maintained and a newsletter is produced	Achieved

Further details of the achievements and limitations for each of the objectives, recovery actions and recovery criteria are provided in Appendix 1. As part of the performance evaluation, each recovery action was assessed according to the performance indicator and scored between 0-3 using the following criteria:

0 No progress / cannot be assessed

1 Insufficient action to meet criteria

2 Action underway – most elements of action met or it is anticipated they will be

3 Criteria met – further action may or may not be required

Recovery objectives

The achievements of the recovery program from 1995-2009 have resulted in positive conservation outcomes for the Swift Parrot and its habitat, and have identified new directions for the ongoing conservation of this species (Saunders 2005). However, as the recovery program reveals more about the Swift Parrot ecology, knowledge gaps also become evident. The following recovery strategy aims to address knowledge gaps and ongoing conservation issues to ensure the Swift Parrot population is self-sustainable in the long term.

Overall objectives

To prevent further decline of the Swift Parrot population.

To achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity.

Recovery actions and performance criteria

The following actions are designed to achieve the overall objectives of this plan, as detailed in Table 7 and Table 8.

Recovery actions

Action 1 - Identify the extent and quality of habitat.

Action 2 - Manage and protect Swift Parrot habitat at the landscape scale.

Action 3 - Monitor and manage the impact of collisions, competition and disease.

Action 4 - Monitor population and habitat.

Supporting actions

Action 5 - Increase community involvement in, and awareness of, the recovery program.

Action 6 - Coordinate, review and report on recovery process.

Table7: **Swift Parrot Recovery Actions, Performance Criteria and Potential Contributors**

	Description	Priority	Performance Criteria	Potential Contributors
Action 1	*Identify the extent and quality of habitat.*			
1.1	**Identify and map foraging and nesting habitat throughout the breeding range and prioritise sites.**	1	Annual monitoring program undertaken to determine breeding distribution under different climatic conditions. Mapping and update report on distribution of nesting habitats and prioritisation completed annually. Report disseminated to relevant natural resources management and land-use planning and approvals bodies in Tasmania. Assessment of habitat loss since 1996 and pre-1760 determined for potential nesting and foraging habitat.	DPIPWE
1.2	**Identify and map foraging and roosting habitat**			
1.2a	Identify and map foraging habitat throughout the range of the species: • Victoria – refine and update existing foraging habitat mapping (when information becomes available) and map priority sites • New South Wales – refine and update habitat mapping as more vegetation mapping becomes available, including priority sites • Queensland/ACT/SA – identify and map the extent of foraging habitat	2 2 1	GIS mapping on foraging habitats and priority sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 3. Review, and if necessary update, mapping by Year 5.	DSE, OEH, DERM, PCL, SADENR.
1.2b	Identify and map roosting habitat throughout the range of the species with an emphasis on communal and repeatedly used roosting sites.	3	GIS mapping on communal and repeatedly used roosting sites throughout the range of the species provided to DSEWPaC and each relevant local government and CMA by Year 5.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
1.2c	Establish habitat phenology data collection in existing research and monitoring studies, analyse findings and incorporate into recovery program.	2	Consult with phenology experts on the most effective and economic way to collect useful habitat phenology data relevant to Swift Parrot habitat use by Year 3. Incorporate the collection of habitat phenology data in all relevant recovery program research and monitoring studies by Year 3. Analyse and incorporate findings into recovery program	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
1.3	Identify and map movement patterns throughout the range of the species.	2	GIS mapping on movement patterns throughout the range of the species, provided to DSEWPaC and each relevant local government and CMA by Year 5.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
Action 2	*Manage and protect Swift Parrot habitat at the landscape scale.*			
2.1	**Manage and protect nesting and foraging habitat.**			
2.1a	Encourage and support the protection, conservation management and restoration of Swift Parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects. Relevant on-ground actions include (but are not limited to): • Retaining and expanding mature and mixed age habitat and protecting and managing it by fencing and providing a buffer zone from disturbances. • Enabling natural regeneration by fencing off and managing remnant vegetation and buffer zones to control grazing and other impacts caused by uncontrolled access (such as in urban areas). Re-vegetating areas and connecting remnant habitats by planting feed and nest tree species, fencing them off and managing them, where natural regeneration is not possible. Ongoing management of all the above fenced off areas would also be required, including pest, weed and fire management.	1	At least 5 incentive projects established each year for the protection, restoration or conservation management of Swift Parrot habitat. At least 5 conservation/management agreements initiated on private properties with Swift Parrot habitat by Year 5. At least 5 community project applications submitted for funding each year for the protection, restoration or conservation management of Swift Parrot habitat. Reports on the protection, restoration and management of Swift Parrot habitat provided at recovery team meetings.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
2.1b	Provide recommendations for the revision and update of forestry prescriptions to reflect the most recent habitat information available in Victoria and New South Wales.	2	Provide recommendations for revision of prescriptions for Swift Parrots when forestry licence agreements are due for renewal in each state.	DSE, OEH
2.1c	Develop a strategic management plan for Swift Parrot breeding habitat in Tasmania. Strategic management plan for Swift Parrot to include landscape and operational level planning guidelines and prescriptions for protection of important breeding habitat. Review and update management prescriptions for Swift Parrots for use in the Forest Practices System and Local Government landuse planning and approvals processes in Tasmania.	1	Threatened Fauna Advisory reviewed and updated to reflect new information and recognised threats. Strategic management plan for Swift Parrot prepared and endorsed by stakeholders. A set of management prescriptions for landscape level planning and operation or development level application prepared and endorsed for use by stakeholders. Spatial data on the known and predicted occurrence of foraging and nesting resources, and important breeding areas prepared and disseminated to relevant stakeholders including Forest Practices Authority, Natural Resource Management regions and Local Governments.	DPIPWE
2.1d	Provide Swift Parrot conservation information for consideration during the New South Wales. Local Government Local Environmental Planning (LEP) review process.	2	Swift Parrot conservation information provided to at least three key Local Government Areas for consideration during the LEP review process.	OEH
2.2	**Monitor and manage for climate change**			
2.2a	Establish a climate change monitoring program to provide a basis for future adaptive conservation management.	3	Swift Parrot monitoring sites identified and established in association with climate monitoring stations throughout the range of the species to provide a basis for adaptive climate change conservation management plans.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
2.2b	Investigate the potential impact of climate change on the Swift Parrot and its habitat.	1	Spatial and temporal climate change models produced for the Swift Parrot based on species records, habitat mapping and bio-climatic models throughout the range of the species. Review the potential influence of climate change on the species and identify future management strategies to address this issue.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
Action 3	*Monitor and manage the incidence of collisions, competition and diseases.*			
3.1	**Monitor and manage the incidence of collisions**			
3.1a	Establish and maintain a database for all reported injuries and deaths.	2	Collision database established. Ongoing maintenance of collision database as a component of the Swift Parrot Recovery Program database. Report on number and type of collisions throughout the range of the species at recovery team meetings annually.	DPIPWE, DSE, OEH
3.1b	Continue to raise public awareness of the risks of collisions and how these can be minimised. Awareness campaigns to target known high risk areas such as the greater Hobart, Melbourne and Western Sydney areas, and the central coast region of New South Wales (Wyong, Gosford, Lake Macquarie and Penrith Local Government areas).	2	Produce and distribute a further 5000 copies of the collision prevention brochure. Produce at least two media releases per year on collision prevention for public awareness in high risk areas.	DPIPWE, DSE, OEH
3.1c	Develop and distribute guidelines on collision risk management to relevant planning authorities.	2	Guidelines on collision risk management distributed to relevant state/territory governments, as well as local governments, NRMs and CMAs in high risk areas by Year 3.	DPIPWE, DSE, OEH
3.2	**Monitor the incidence of competition from large aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources.**	2	Establishment of monitoring program to determine the extent of competition from larger aggressive honeyeaters as well as introduced birds and bees for nesting and foraging resources, to inform management.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
3.3	**Develop and implement a Psittacine Beak and Feather Disease management protocol.**	3	PBFD monitoring protocol developed based on the DSEWPaC PBFD Threat Abatement Plan and distributed to all fauna rescue and State conservation organisations by Year 4. Protocol to include rescue and quarantine housing requirements for rehabilitated birds. All rehabilitated birds tested for PBFD prior to release. Details of the number of rehabilitated birds and their disease tests reported annually at recovery team meetings. Test all deceased specimens of Swift Parrots for PBFD.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
Action 4	*Monitor population and habitat*			
4.1	**Develop and implement an effective population monitoring program during the breeding season.**			
4.1a	Develop an effective population monitoring program during the breeding season.	1	Effective population monitoring program developed and implemented.	DPIPWE
4.1b	Undertake monitoring of breeding distribution on an annual basis to develop a better understanding of the extent and number of important breeding areas in Tasmania and the relative importance of non-aggregated breeding behaviour to conservation of the Swift Parrot.	1	Breeding distribution maps produced following each breeding season. New and reviewed information published annually and included in the strategic management plan for the Swift Parrot	DPIPWE
4.2	**Collect and analyse information on population dynamics and viability**			
4.2a	Undertake research on breeding success, survival and mortality, as well as genetic structure to provide insight into currently unknown population regulation parameters.	1	Establishment of an ongoing research and monitoring program investigating nesting distribution and success by Year 3. Proportions of flocks containing juveniles throughout the winter range reported annually at recovery team meetings and on the web page.	DPIPWE, DSE, OEH, DERM, PCL, SADENR
4.2b	Conduct population viability analysis (PVA) using data obtained from above research to provide a greater understanding of the dynamics and long-term viability of the population.	2	PVA conducted by Year 5, following the acquisition of essential population data.	DPIPWE, OEH, DSE, ANU
4.3	**Establish and maintain coordination of volunteer surveys**			
4.3a	Establish coordination of volunteer surveys throughout breeding habitats to complement existing mainland monitoring program.	1	Volunteer coordinator position established by Year 3 and maintained on an ongoing basis. Annual volunteer surveys conducted, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	DPIPWE

	Description	Priority	Performance Criteria	Potential Contributors
4.3b	Maintain coordination of the existing long-term volunteer monitoring throughout mainland habitats.	1	Existing volunteer coordinator position maintained on an ongoing basis. Bi-annual volunteer surveys conducted across eastern Australia, survey results compiled and provided on web page, in newsletters and at recovery team meetings.	DSE, OEH, DERM, PCL, SADENR.

Objectives and actions are listed according to subject matter, not according to order of significance

Table 8: Supporting Actions for recovery plan objectives.

	Description	Priority	Performance Criteria	Potential Contributors
Supporting Actions				
Action 5	*Increase community involvement in, and awareness of, the recovery program.*			
5.1	Provide advice, education and support to volunteers, community members, landowners, local governments and regional NRM organisations (includes presentations and workshops).	2	Summary of community and landowner information and education program implementation across the range of the species provided at recovery team meetings. At least one full day community education and awareness workshop held each year. At least 5 presentations to interest groups each year. Information distributed to all relevant regional NRM organisations at least twice a year to keep them informed of the recovery program. Swift Parrot information produced and distributed to community groups, management agencies, schools and other education institutions on request.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
5.2	Assess the level of indigenous interest in the recovery program by consulting relevant indigenous people and organisations that occur within the species' range.	2	Indigenous representatives from throughout the species range consulted to gauge their level and type of interest in the recovery program. Consultation to commence in Year 4. Given the large number of potential indigenous groups and people to consult, this process would be incremental throughout the recovery program. Updates on consultation and interest to be provided at each recovery team meeting. Indigenous parties identified as having interest in the program are included in the recovery program mailing list. Interested indigenous parties consulted to determine what involvement they would like to have, and if there is any relevant traditional knowledge available on the species or its habitats, should it be appropriate to document this knowledge for recovery program purposes.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

	Description	Priority	Performance Criteria	Potential Contributors
5.3	Produce and distribute the annual recovery program newsletter *Swifts Across the Strait.*	2	Newsletters produced and distributed to recovery program volunteers, community groups and NRM organisations each year.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
5.4	Develop a Swift Parrot Recovery Program web page providing access to recovery plans, audio and visual identification information, survey forms, links with other conservation programs and on-line volunteer survey data entry.	3	Web page designed and established on the internet by Year 3. Web page reviewed, and if necessary, updated annually.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.
Action 6	*Coordinate, review and report on recovery process.*			
6.1	Maintain a recovery team that effectively organises, implements, reviews and reports on the recovery outcomes.	1	Volunteer program coordinators (Tasmania, Victoria, New South Wales), and breeding researchers (Tasmania) employed each year to implement recovery actions. Recovery team meetings held and minutes produced bi-annually, with the location allocated on a rotational basis between the range States. Recovery outcomes and resultant changes to recovery program reported bi-annually.	DSEWPaC, DPIPWE, DSE, OEH, DERM, PCL, SADENR.
6.2	Develop and manage a central database for all data collected as part of the recovery program.	1	Swift Parrot recovery database (SPRD) developed and made accessible for on-line data entry on recovery program web page by Year 3. SPRD maintained and updated annually. All Swift Parrot records from SPRD provided to relevant Commonwealth, state and territory government departments and Birds Australia on an annual basis for inclusion in their respective atlas databases.	DPIPWE, DSE, OEH, DERM, PCL, SADENR.

Objectives and actions are listed according to subject matter, not according to order of significance.

Management practices

Where forestry operations continue to occur within foraging habitats on the mainland, logging prescriptions should include the retention of all trees 60cm DBH or greater, together with at least 5 trees per hectare from a mixture of other age classes (30-40cm, 40-50cm and 50-60cm DBH) to ensure continuity of food resources over time.

In addition to the above and the recovery actions, management practices (activities, policies and/or guidelines) that are not specifically designed for recovery of the Swift Parrot, but may still make valuable contributions, include:

- Local Environment Plan biodiversity requirements
- Natural Resource Management biodiversity targets
- Firewood harvesting codes of practice
- Forestry management prescriptions, particularly in Tasmania, Victoria and New South Wales
- Native vegetation conservation initiatives
- Management plans for conservation reserves, travelling stock reserves and other crown land
- Conservation agreements, offsets and biodiversity incentives on private properties
- Local and regional habitat protection, enhancement and rehabilitation programs
- Removal of stock and/or modification of grazing practices to enable habitat regeneration
- Commonwealth, State and Local Government land use planning for biodiversity conservation
- Australian National Greenhouse Strategy
- Draft Burnett Mary Region ‘Back on Track’ Biodiversity Action Plan
- Draft Border Rivers Maranoa-Balonne Region ‘Back on Track’ Biodiversity Action Plan

Significant impact guidelines

Under Commonwealth, State and Territory government conservation legislation, the significance of potential impacts from proposed developments/activities on threatened species and vegetation communities needs to be assessed. For the Swift Parrot, the clearance of nesting, roosting or foraging habitat may have a significant impact on the population. Such impacts are most likely to be significant where a proposal or activity may result in loss of habitat in, or adjacent to priority foraging, nesting and roosting sites (as previously defined).

Such proposals for developments/activities need to be referred to DSEWPaC under the EPBC Act and specific advice should be sought from the recovery team. Further general information on determining the level of significance under Commonwealth legislation is available at: http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html .

Affected interests

The following list provides information on key affected interests, however it should not be considered exhaustive. There may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required.

Australian government

The Swift Parrot is known or predicted to occur on several properties owned or managed by the Australian Government. Priority foraging habitat within the overwintering range of the species is found in Booderee National Park (Jervis Bay Territory), and Department of Defence lands at Beecroft Peninsula (Jervis Bay, NSW), Puckapunyal (Vic), Bandiana (Vic), Longlea (Vic), Mangalore (Vic) and Amberley (Qld). Swift Parrot breeding habitat in Tasmania reportedly occurs on Defence lands at Buckland, Pontville, Fort Direction and Anglesea Barracks. Potential habitat also occurs on the following 14 properties (over five hectares) in Western Sydney: ADI St Marys, Airservices Castlereagh, Llandilo and Badgerys Creek, ADIS Eastern Creek, Defence Holsworthy, Ingleburn, Kingswood, Londonderry, Orchard Hills and Richmond, OTC Bringelly, Schofields Aerodrome and Telstra Doonside. There may also be other Commonwealth properties with suitable habitat for Swift Parrots that have not yet been identified.

State and Territory governments

The Swift Parrot is listed as a threatened species in five states and one territory. The following conservation and land management agencies for each state/territory are responsible for the protection and management of the Swift Parrot and its habitat:

- Tasmania – Department of Primary Industries, Parks, Water and Environment, Forest Practices Authority
- Victoria – Department of Sustainability and Environment, Parks Victoria
- New South Wales – Office of Environment and Heritage, Forests New South Wales
- Queensland – Department of Environment and Resource Management
- South Australia – Department of Environment and Natural Resources
- Australian Capital Territory – Parks, Conservation and Lands

Local governments

Local governments within each of the 30 NRM regions listed in Table 9 have a responsibility to protect and manage biodiversity within their jurisdiction. Therefore there are numerous Local Government Areas (LGAs) that should consider Swift Parrots in their local environmental planning schemes. For example, within New South Wales alone, there are 138 LGAs that contain potential or known habitat for the Swift Parrot.

Indigenous people

Indigenous people, groups and landowners from across south-eastern Australia may have a cultural, social or financial interest in the conservation of Swift Parrots. Consultation with a wide range of indigenous people is required to identify what interests the Aboriginal community have in regard to Swift Parrots, and to incorporate cultural values and management practices into the plan, if culturally acceptable. Details of Indigenous people and groups that have been consulted during the development of this plan, and that may be interested in future consultation are provided in (Table 10). This includes Aboriginal Land Councils, Cultural Heritage Officers, Indigenous Protected Area managers, individuals and threatened species indigenous liaison officers. This list should not be considered exhaustive, but rather a starting point in indigenous involvement and consultation. Therefore where further indigenous people or groups express an

interest in being involved in the implementation of this recovery plan, they will also be included. All activities will be undertaken in a manner that respects the cultural traditions of aboriginal nations throughout the species' range.

Natural resource management organisations

The Swift Parrot population is distributed across 30 Natural Resource Management regions, making management throughout the range of the species challenging (Saunders *et al.* 2007). A guide to recovery actions relevant for each region is provided in Table 9, with the highest priority regions for implementation indicated by an asterix (*).

Table 9: Natural Resource Management regions and relevant recovery actions at the regional level.

State/ Territory	NRM regions	1.1	1.2 a-c	1.3	2.1 a-d	2.2 a,b	3.1 a-c	3.2	3.3	4.1	4.2 a,b	4.3 a,b	5.1	5.2	5.3	5.4	6.1	6.2
Tasmania (3)	South*	✓	✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
	North*	✓	✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
	Cradle Coast		✓	✓	✓a,c	✓	✓	✓	✓	✓	✓	✓a	✓	✓	✓	✓	✓	✓
Victoria (9)	Port Phillip Westernport*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Goulburn Broken*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	East Gippsland*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	West Gippsland*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	North Central*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	North East*		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Glenelg Hopkins		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Corangamite		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Wimmera		✓	✓	✓a,b	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
New South Wales/Australian Capital Territory (11)	Southern Rivers		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Northern Rivers*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓

State/ Territory	NRM regions	1.1	1.2 a-c	1.3	2.1 a-d	2.2 a,b	3.1 a-c	3.2	3.3	4.1	4.2 a,b	4.3 a,b	5.1	5.2	5.3	5.4	6.1	6.2
	Hunter - Central Rivers*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Hawkesbury - Nepean*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Sydney Metro*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murray*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murrumbidgee*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Lachlan*		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Central West		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Namoi		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Border Rivers - Gwydir		✓	✓	✓a,d	✓	✓	✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
Queensland (4)	Border Rivers Maranoa-Balonne		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Condamine		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	South East Queensland		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Burnett Mary		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
South Australia (3)	South East		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Adelaide/Mount Lofty Ranges		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓
	Murray Darling Basin		✓	✓	✓a	✓		✓	✓		✓	✓b	✓	✓	✓	✓	✓	✓

Table 10. People and organisations consulted about indigenous interests and involvement during the drafting of this plan.

Name	Relevant country	Consultation
New South Wales/ Australian Capital Territory		
New South Wales Aboriginal Land Council	Within New South Wales there are 98 Local Aboriginal Land Council (LALC) areas within the range of the Swift Parrot	Recommended providing information directly to the relevant Local Aboriginal Land Councils (LALC).
New South Wales Local Aboriginal Land Councils	Of the 98 LALCs within the range of the Swift Parrot, 52 LALC areas have records of Swift Parrots and 17 contain key areas of habitat and numerous records of the species.	The following 17 key LALCs have been contacted and encouraged to share information on Swift Parrots and migratory birds for inclusion in this recovery plan. Albury And District, Awabakal, Bahtabah, Batemans Bay, Bathurst, Bega, Brungle/Tumut, Coffs Harbour, Cowra, Darkinjung, Deerubbin, Metropolitan, Mindaribba, Narrandera, Wagga Wagga, Worimi, Young.
Aboriginal Heritage Officers, New South Wales OEH	New South Wales	Liaison with Aboriginal Heritage Officers in New South Wales OEH to establish ways of generating interest and involvement in the recovery program by Aboriginal community members. All Aboriginal Heritage Officers included on the recovery program mailing list and provided with information about the recovery program including survey updates, newsletters and information about workshops that can be disseminated within their communities.
CMA Aboriginal Heritage Officers	New South Wales	All Aboriginal Heritage Officers will be included on the recovery program mailing list and provided with information about the recovery program including survey updates, newsletters and information about workshops that can be disseminated within their communities.
New South Wales threatened species recovery planning and Aboriginal community involvement pilot project	North-eastern New South Wales	The Swift Parrot has been included in a pilot project on Threatened Species consultation with Aboriginal Communities in North East New South Wales to establish the most mutually beneficial way for the Aboriginal community to be consulted in relation to threatened species recovery programs.

Name	Relevant country	Consultation
Aboriginal media	New South Wales	Articles and media releases to be provided to Indigenous media sources regarding Swift Parrot workshops and surveys. Article to encourage Aboriginal participation and awareness of the recovery program published in *Coastal Custodian* newsletter for the New South Wales South Coast Aboriginal Community.
Indigenous Protected Area managers	Proposed Gumma (Forresters Beach) IPA, New South Wales north coast (potential habitat – requires confirmation)	Consulted with Indigenous Protected Area manager
Victoria		
	Relevant Indigenous groups for Victoria need to be identified.	Relevant Indigenous groups identified need to be consulted.
Queensland		
Indigenous Protected Area managers	Guanaba Indigenous Protected Area, south-east Queensland (potential habitat – requires confirmation)	Consulted with Indigenous Protected Area manager
South Australia		
	South Australia – South-eastern and Eastern	Further consultation with the Aboriginal Partnerships Unit in SADENR needed.
Tasmania		
Tasmanian Aboriginal Land Council/ Indigenous Protected Area managers	Risdon Cove and Putalina (Oyster Cove) Indigenous Protected Areas	Indigenous Protected Area coordinators to be contacted.

Urban, rural residential and industrial developers

Swift Parrots use habitats across all land tenures, including areas proposed for urban, rural residential and industrial developments. Where such developments include clearing known or potential habitat for the Swift Parrot, threatened species impact assessments need to be undertaken in accordance with state/territory and Commonwealth legislation.

Agricultural land managers

Swift Parrots are known to occur in remnant vegetation on agricultural land. Grazing, trampling and other agricultural disturbances can impact on the health and regeneration of habitat at some sites. Exclusion of stock or changes to agricultural practices to improve the health and regeneration of habitats may affect some local interests.

Conservation land managers

There are numerous private landowners throughout the species range who manage their land for conservation purposes. These landowners are given support and encouragement to apply for funding to protect and enhance habitats suitable for the Swift Parrot and to participate in the national volunteer surveys. The Australian Bush Heritage Fund owns properties with Swift Parrot habitat and supports the

recovery program by conducting research into effective habitat rehabilitation techniques within their private reserve system and allowing property access for volunteers for the national volunteer surveys. Each state/territory government manages land for conservation, including reserves that contain habitat suitable for Swift Parrots.

Universities

The Australian National University and the University of Tasmania have ongoing involvement in research components of the recovery program and provide academic support and financial/in-kind assistance to researchers and students.

Non-government organisations

Two non-government conservation organisations have made significant contributions to the implementation of this plan. Birds Australia (BA) and the World Wildlife Fund (WWF Australia) Threatened Species Network have provided in-kind, technical and community support to ensure the effective involvement and education of community members and groups.

Community organisations

There are currently over 80 community organisations involved in the recovery program. These organisations include ornithology/bird and natural history groups as well as habitat rehabilitation (e.g. Landcare, Bushcare etc.) and wildlife care (e.g. WIRES) groups within the 30 regional catchment management areas. Such groups benefit from the implementation of this plan through support for habitat rehabilitation projects, active local involvement in a national program and the provision of information on results of surveys and other conservation activities undertaken for the species.

Biodiversity benefits

As a forest and woodland dependent bird the Swift Parrot is a high profile species associated with the conservation of such habitats in south-eastern Australia at a landscape scale. Being the only member of the genus *Lathamus*, the Swift Parrot is of high conservation significance. In addition, habitats used by Swift Parrots support a diversity of other wildlife including over 90 native bird species (Kennedy 2000; Kennedy and Overs 2001; Saunders *et al.* 2007; Saunders and Heinsohn 2008), 20 endangered ecological communities (Table 4), 38 other threatened fauna species (Table 11) and numerous threatened flora species. Many of these threatened species have been recorded as part of the Swift Parrot Recovery Program, with data collected often providing information not otherwise available (Saunders *et al.* 2007). Given this plan focuses on protecting habitat for the Swift Parrot, it is also likely to have positive implications for a diversity of non-target native species that occur within the same habitats and ecological communities that provide habitat for this species.

Social and economic considerations

The Swift Parrot is a charismatic species whose plight raises awareness of the conservation problems faced by a diversity of threatened species. A large network of community volunteers across eastern Australia actively participate in the program by conducting surveys in their local area, undertaking habitat restoration projects and attending educational workshops each year. Such involvement provides social benefits with over 750 community members and 80 community 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. Additional social benefits include encouraging passive recreation, appreciation of natural aesthetic values and increased awareness and appreciation of indigenous cultural values. The recovery program also enables future generations to experience our rich and diverse natural heritage as

it is enjoyed today.

The Swift Parrot utilises habitat across most tenure types and therefore is subject to the management practices of a diversity of stakeholders, which have the potential to impact on the species. Although some foraging and nesting sites are contained within conservation reserves, the majority of these sites are not formally protected. Therefore activities likely to result in the loss or degradation of Swift Parrot habitat need to be prevented or restricted in order to protect the species. As a result, there may be some economic costs associated with conserving the Swift Parrot. However there are also a range of economic benefits resulting from the collaborative efforts between recovery programs to share resources and minimise costs, extensive in-kind contributions from third parties and community members providing extensive skills, time and resources voluntarily as detailed in the *Background Document* (Saunders *et al.* 2010).

The total cost of implementing the recovery plan (Table 12) is relatively economical given the high value of third party contributions (which outweigh the financial support required for recovery plan implementation), the endangered status of the species, the multi-threatened species/communities benefits, the continuation of a well established long-term monitoring program, support for regional on-ground conservation action, inclusion of world-class research and collaborations, the benefits of increasing Australia's NRM research capacity and the potential of this species to be used as an indicator of climate change impacts on the natural environment.

Table 11: Other threatened fauna species found in Swift Parrot habitats

Threatened fauna species	
Barking Owl *Ninox connivens*	*Masked Owl (Tasmanian) *Tyto novaehollandiae castanops*
Black-chinned Honeyeater *Melithreptus gularis*	*Mt Mangana Stag Beetle *Lissotes menalcas*
*Blind Velvet Worm *Tasmanipatus anophthalmus*	Northwest Velvet Worm *Ooperipatellus cryptus*
*Broad-toothed Stag Beetle *Lissotes latidens*	Painted Honeyeater *Grantiella picta*
Brown Treecreeper *Climacteris picumnus*	Pink Robin *Petroica rodinogaster*
Brush-tailed Phascogale *Phascogale tapoatafa*	*Pink-tailed Worm-lizard *Aprasia parapulchella*
Burgundy Snail *Helicarion rubicundus*	Powerful Owl *Ninox strenua*
Bush Stone-curlew *Burhinus grallarius*	Purple-crowned Lorikeet *Glossopsitta porphyrocephala*
Chestnut-rumped Heathwren *Hylacola pyrrhopygia*	*Red-tailed Black-cockatoo *Calypthorhyncus banksii graptogyne*
Diamond Firetail *Stagonopleura guttata*	*Regent Honeyeater *Anthochaera phrygia*
*Eastern-barred Bandicoot *Perameles gunnii*	Rosenberg's Goanna *Varanus rosenbergi*
*Forty-spotted Pardalote *Pardalotus quadragintus*	Speckled warbler *Chthonicola sagittata*
Giant Velvet Worm *Tasmanipatus barretti*	*Spotted-tailed Quoll *Dasyurus maculatus*
Gilberts Whistler *Pachycephala inornata*	Squirrel Glider *Petaurus norfolcensis*
Grey Goshawk *Accipiter novaehollandiae*	*Superb Parrot *Polytelis swainsonii*
Grey-crowned Babbler *Pomatostomus temporalis*	*Tasmanian Devil *Sarcophilus harrisii*
*Grey-headed Flying-fox *Pteropus poliocephalus*	Turquoise Parrot *Neophema pulchella*
Hooded Robin *Melanodryas cucullata*	*Wedge-tailed Eagle (Tasmanian) *Aquila audax fleayi*
Koala *Phascolarctos cinereus*	Yellow-bellied Glider *Petaurus australis*

* species or subspecies listed under EPBC Act as nationally threatened

Efficient and effective use of resources

In order to maximise the conservation outcomes and cost effectiveness of this plan, the actions proposed complement those of other threatened species (Table 11) and ecological community (Table 4) recovery plans, threat abatement plans (Table 5) and regional Natural Resource Management (Table 9) strategies where possible. Partnerships have also been established with several conservation programs and networks as listed below. Such partnerships assist in the recovery of multiple species and ecological communities and aim to avoid significant negative impacts to non-target native species and ecological communities.

- National Regent Honeyeater recovery program – joint survey coordination and volunteer education programs
- Birds Australia (BA) Woodland Bird Conservation Project and Threatened Bird Network – recovery program coordination, logistic and volunteer support
- New South Wales Grassy Box Woodlands Conservation Management Network – information sharing and joint education programs
- National Flying Fox recovery plan, ACT Grassy Yellow Box/Red Gum Woodland action plan – collaboration and information sharing regarding nectar resources

Plan review and evaluation

The New South Wales OEH in consultation with the Victorian DSE, Tasmanian DPIPWE, ACT PCL, Queensland DERM, South Australian DENR and the Commonwealth DSEWPaC will evaluate the performance of the recovery plan for each of the recovery actions. The Plan will be formally reviewed within five years from the date of its publication.

Implementation schedule and costs

Full implementation of the recovery program throughout the range of the species over the five years of the plan requires total funding to the value of **$4,822,352**, including in-kind contributions from government, non-government and research organisations as well as community volunteers (Table 12).

Table 12: Summary of annual funding required for implementation of the National Swift Parrot Recovery Plan.

Costs	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Personnel	$738,714	$765,926	$781,244	$810,191	$805,682	$3,901,757
Travel	$113,450	$115,719	$118,033	$120,394	$122,802	$590,398
Equipment	$63,450	$64,719	$66,014	$67,334	$68,680	$330,197
Total (incl. GST)	$915,614	$946,364	$965,291	$997,918	$997,164	$4,822,352
Total (excl. GST)	$897,924	$928,321	$946,887	$979,146	$978,016	$4,730,293

References

Barrios, L. and Rodriguez, A. (2004). Behavioural and environmental correlates of soaring-bird mortality at on-shore wind turbines. *Journal of Applied Ecology* **41**, 72-81.

Bennett, S., Brereton, R., Mansergh, I., Berwick, S., Sandiford, K. and Wellington, C. (1991). 'The potential effect of enhanced greenhouse climate change on selected Victorian fauna.' (Department of Conservation and Environment: Melbourne).

Brereton, R. (1997). 'Management prescriptions for the Swift Parrot in production forests.' (Report to the Tasmanian Regional Forest Agreement Environment and Heritage Technical Committee: Hobart).

Brereton, R. (1998). 'Swift Parrot Recovery Plan, 1997-1999.' (Parks and Wildlife Service: Hobart).

Brereton, R., Bennett, S. and Mansergh, I. (1995). Enhanced greenhouse climate change and its potential effect on selected fauna of south-eastern Australia: a trend analysis. *Biological Conservation* **72**, 339-354.

Brereton, R., Mallick, S. and Kennedy, S. (2004). Foraging preferences of Swift Parrots on Tasmanian Blue-gum: tree size, flowering frequency and flowering intensity. *Emu* **104**, 377-383.

Brown, P. B. (1989). 'The Swift Parrot Lathamus discolor White: A report on its ecology, distribution and status, including management considerations. Technical Report.' (Department of Lands, Parks and Wildlife: Hobart).

Chambers, L. E., Hughes, L. and Weston, M. A. (2005). Climate change and its impact on Australia's avifauna. *Emu* **105**, 1-20.

Department of Environment and Heritage (2005a). 'Threat abatement plan for Beak and Feather Disease affecting endangered psittacine species.' (Department of Environment and Heritage (DEH): Canberra).

Department of Environment and Heritage (2005b). 'Wildlife trade and conservation.' (Department of Environment and Heritage: Canberra) Available at http://www.environment.gov.au/biodiversity/trade-use/cites/index.html, accessed 3 February 2007.

Environment Conservation Council (2001). 'Box-Ironbark Forests and Woodlands Investigation'. (Environment Conservation Council: Melbourne).

Ford, H., Davis, W. E., Debus, S., Ley, A., Recher, H. and Williams, B. (1993). Foraging and Aggressive Behaviour of the Regent Honeyeater *Xanthomyza phrygia* in Northern New South Wales. *Emu* **93**, 277-281.

Grey, M. J., Clarke, M. F. and Loyn, R. H. (1998). Influence of the Noisy Miner *Manorina melanocephala* on avian diversity and abundance in remnant Grey Box woodland. *Pacific Conservation Biology* **4**, 55-69.

Hingston, A. B., Gartrell, B. D. and Pinchbeck, G. (2004). How specialized is the plant-pollinator association between *Eucalyptus globulus ssp. globulus* and the swift parrot *Lathamus discolor*? *Austral Ecology* **29**, 624-630.

Hingston, A. B., Marsden-Smedley, J., *et al.* (2002). Extent of invasion of Tasmanian native vegetation by the exotic bumblebee Bombus terrestris (Apoidea: Apidae). *Austral Ecology* **27**, 162-172.

IUCN (2004). '2004 IUCN Red List of Threatened Species.') Available at www.iucnredlist.org, accessed Downloaded on 21 March 2006.

Kennedy, S. (2000). 'A winter survey of the Swift Parrot (*Lathamus discolor*) in northern New South Wales'. (New South Wales NPWS).

Kennedy, S. and Tzaros, C. (2005). Foraging ecology of the swift parrot *Lathamus discolor* in the Box-Ironbark forests and woodlands of Victoria. *Pacific Conservation Biology* **11**, 158-173.

Kennedy, S. J. and Overs, A. E. (2001). Foraging ecology and habitat use of the swift parrot on the south-western slopes of New South Wales. *Corella* **25**, 68-74.

Law, B., Mackowski, C., Schoer, L. and Tweedie, T. (2000). Flowering phenology of myrtaceous trees and their relation to climatic, environmental and disturbance variables in northern New South Wales. *Austral Ecology* **25**, 160-178.

Mac Nally, R. M. and Horrocks, G. (2000). Landscape-scale conservation of an endangered migrant: the Swift Parrot (Lathamus discolor) in its winter range. *Biological Conservation* **3**, 335-343.

Mallick, S., James, D., Brereton, R. and Plowright, S. (2004). Blue Gums Eucalyptus globulus in north-west Tasmania: an important food resource for the endangered Swift Parrot *Lathamus discolor*. *Victorian Naturalist* **121**, 36-46.

Natural Resource Management Ministerial Council (2003). 'Framework for a national cooperative approach to Integrated Coastal Zone Management.' (Natural Resource Management Ministerial Council: Canberra).

Pfennigwerth, S. (2008). Minimising the swift parrot collision threat. Guidelines and recommendations for parrot-safe building design. (WWF Australia, Sydney).

Prober, S. and Thiele, K. (1995). Conservation of the Grassy White Box Woodlands: relative contributions of size and disturbance to floristic composition and diversity of remnants. *Aust. J. Bot.*, 349-366.

Saunders, D. L. (2005). 'National Swift Parrot Recovery Program - Achievements 1995-2004'. (Commonwealth Department of Environment and Heritage: Canberra).

Saunders, D. (2008). *Ecology and conservation of the Swift Parrot – an endangered austral migrant*. PhD Thesis, Fenner School of Environment and Society, Australian National University.

Saunders, D, Tzaros, C., Thurstans, S. and Webb, M. (2010). *Background Document - Swift Parrot Recovery Plan*. Department of Environment, Climate Change and Water, Queanbeyan and Birds Australia.

Saunders, D. L., Brereton, R., Tzaros, C., Holdsworth, M. and Price, R. (2007). Conservation of the Swift Parrot *Lathamus discolor* - management lessons for a threatened migratory species. *Pacific Conservation Biology* **13**, 111-119.

Saunders, D. L. and Heinsohn, R. (2008). Winter habitat use by the endangered, migratory Swift Parrot (*Lathamus discolor*) in New South Wales. *Emu* **108**, 81-89.

Saunders, D. L., Heinsohn, R., Cunningham, R. and Wood, J. (*in prep*). Austral migration and dynamic winter habitat use in endangered swift parrots.

Swift Parrot Recovery Team (2001). 'National Swift Parrot Recovery Plan 2001-2005'. (Department of Primary Industries, Water and Environment: Hobart).

Tzaros, C. (2002). Living in suburbia - opportunities and dangers for Swift Parrots on mainland Australia in 2002. *Eclectus* **13**, 13-14.

Tzaros, C., Saunders, D., Webb, M. and Ingwersen, D (2009). Swift Parrots – dynamic migrants within a drought prone environment. *Wingspan* 19 (3), 14-15.

Villard, M., Merriam, G. and Maurer, B. A. (1995). Dynamics in subdivided populations of Neotropical migratory birds in a fragmented temperate forest. *Ecology* **76**, 27-40.

Voogdt, Y. (2006). 'Characteristics of Swift Parrot (*Lathamus discolor*) nesting habitat'. Honours thesis. Department of Biology, School of Zoology and Anthropology, Georg-August-University of Göttingen, Germany.

Webb, M. (2008). Swift Parrot Breeding Season Survey Report - 2007/08. Threatened Species Section, Biodiversity Conservation Branch, Department of Primary Industries, Parks, Water and the Environment, Hobart, Tasmania.

Webb, M.H., Holdsworth, M.C. and Webb, J. (in prep). Nesting requirements of the endangered Swift Parrot *Lathamus discolor*.

Wilson, J. and Bennett, A. F. (1999). Patchiness of a floral resource: flowering of Red Ironbark *Eucalyptus tricarpa* in a Box and Ironbark Forest. *Victorian Naturalist* **116**, 48-53.

Woinarski, J. C. and Recher, H. F. (1997). Impact and response: a review of the effects of fire on the Australian avifauna. *Pacific Conservation Biology* **3**, 183-205

Appendix 1: Evaluation of achievement against specific objectives of the 2001 Swift Parrot Recovery Plan

	Specific Objective 1	**To identify priority habitats and sites across the range of the Swift Parrot**	
	Recovery Criteria 1	**Priority habitats and sites have been identified and protected**	
Action 1	**Identify the extent and quality of foraging habitat.**	**Comments**	**Score**
1a	Identify the extent and quality of foraging habitat within the overwintering range	A significantly greater understanding of winter foraging habitat requirements has been achieved through detailed ecological research and widespread volunteer surveys. This includes the identification of 40 priority sites in Victoria, essential drought refuge habitats and hundreds of sites across New South Wales as well as unprecedented information on regularity of habitat use throughout the five mainland states/territories. Importantly, the repeated and cyclic nature of habitat use by this species has been clearly demonstrated in relation to variable climatic conditions. A number of scientific publications on winter habitat use are listed in the background document (Saunders *et al.* 2010).	**2**
1b	Identify the flowering patterns of blue gum	Data collected on blue gum flowering patterns during the population monitoring program 1999-2005 suggests flowering frequency is highly variable between sites and it may be several years between significant flowering events at any one site.	**2**
	Specific Objective 2	**To implement management strategies at the landscape scale to protect and improve priority habitats and sites resulting in a sustained improvement in carrying capacity**	
	Recovery Criteria 2	**Management strategies to protect breeding and foraging habitat have been implemented.**	
Action 2	**Manage Swift Parrot habitat at a landscape scale**	**Comments**	**Score**
2a	Mapping of foraging and breeding habitat	***Tasmania*** Significant progress in the breeding range with several "new" sites/regions and/or forest types identified as providing important breeding season foraging and nesting habitat. The identification of location of aggregations of nesting Swift Parrots has led to the protection of several key sites and assisted in the identification of other potential key nesting sites and their associated foraging	**2**

		habitats. The previous plan prioritised the identification of potential breeding habitat as land clearing and harvesting of this habitat posed the greatest immediate threat. Little new data have been obtained for post breeding habitat in Tasmania. ***Mainland*** Although winter foraging habitats throughout the species' winter range have been mapped at a coarse scale, the usefulness of these maps is significantly constrained until further detailed information is available and meaningful figures on the current extent of winter habitats can be derived. Such constraints include the large number of mapping projects (over 50 different mapping projects) that have used different mapping techniques at different scales with different types of habitat information. For example, much of the current vegetation mapping does not allow accurate separation of habitats based on canopy species resulting in errors (both over and underestimations) when attempting to quantify the extent of habitat. In addition, some areas currently have no vegetation maps available.	
2b	Management and protection of habitat	***Tasmania*** Since 2001 considerable areas of two threatened forest communities have been protected through several mechanisms, including covenants, land management agreements, and management prescriptions delivered through the forest practices system. Since 2005, a better understanding of the species' breeding ecology has been incorporated into management prescriptions in production forests resulting in the retention of additional areas of potential nesting and foraging habitats that were not recognised at the inception of the 2001 plan (e.g. wet forest nesting and foraging habitats, foraging habitats where blue gum occurs as a sub-dominant species). Many of these areas would have otherwise been harvested. Recent updating of blue gum mapping including mapping of sub-dominant and wet blue gum forest within the eastern breeding range has considerably increased the area of mapped potential foraging habitat. This data will be incorporated in habitat models and used to assist in the development of a Species Strategic Plan. The overall trend in available breeding habitat in Tasmania since 2001 was downwards and most areas excluded from timber harvesting as part of Forest Practices Plans do not have formal long-term security. In 2010 an interim habitat planning guideline was developed to assist planners within the forest industry with landscape scale and operational scale management decisions. The guideline incorporates up to date knowledge of the species ecology, habitat use and distribution during the breeding season. The development of landscape scale strategic plan (Species Strategic Plan) across all land tenures is in progress. ***Mainland*** The recovery team has had regular involvement in strategies to protect Swift Parrot habitats using a range of administrative avenues, such as changes to threatened species legislation, improving vegetation clearance controls, providing recommendations for forestry	**2**

		prescriptions and development applications, and promoting private-land conservation agreements. Of particular note is the protection of 77% of the recovery program's 40 priority Swift Parrot sites on public land in Victoria. There have also been numerous community and private property projects in key areas; however, significant habitat loss continues to occur, including from cumulative impacts, throughout the species' range due to socio-economic factors beyond the control of the recovery program. The quantification of habitat loss, degradation and protection is not currently possible given such information is not collated as part of existing planning and legislative procedures and the inadequate vegetation mapping currently available.	
2c	Develop a strategy to provide for a continued supply of suitable nest hollows	Current protection focuses on existing hollows rather than future supply. Improvements in the management of hollows for all forest dependent species has been ongoing through the forest practices system; however, the identification of locations of large aggregations of Swift Parrot nests since 2004 have highlighted the need for additional species specific prescriptions to be adopted to ensure an adequate supply of potential nesting hollows in close proximity to potential foraging habitat.	**2**
2d	Ecological thinning in mainland habitats	Early results from Arthur Rylah Institute's (ARI) long-term project examining ecological thinning within Victorian Box-Ironbark forests indicate some changes floristically, however further monitoring is required to reliably detect changes in fauna assemblages. The new plan has no specific action following on from this since the recovery team will generally keep in touch with research relevant to Swift Parrot habitat.	**2**
	Specific Objective 3	**To reduce the incidence of collisions with man-made structures**	
	Recovery Criteria 3	**The incidence of collisions is reduced**	
Action 3	**Reduce the incidence of collisions**	**Comments**	**Score**
3	Reduce the incidence of collisions	Greater public awareness of collision mortality has been achieved within both breeding and wintering areas through the preparation of building guidelines and management recommendations. However, quantifying the incidence/impact of collisions is problematic due to annual variations in the distribution of birds relative to the location of collision threats and the unknown reporting rates of collisions. Therefore this criterion is not measurable given the nature of collision information and lack of baseline data.	**0**
	Specific Objective 4	**To determine population trends within the breeding range**	
	Specific Objective 5	**To quantify improvements in carrying capacity by monitoring changes in extent and quality of habitat**	
	Recovery Criteria 4	**The population density and/or extent and quality of habitat is not reduced and ideally is enhanced**	

Action4	Population and habitat monitoring	Comments	Score
4a	Population monitoring	The Tasmanian population monitoring program in existence at the start of the 2001 recovery plan was terminated after the 2005 breeding season. The program produced valuable data on frequency use by Swift Parrots and flowering, however, in light of new findings on the species' breeding ecology the methodology was assessed to be insufficiently sensitive to reliably monitor population trends. The primary reason for this was an insufficient number of survey sites in known locations and the absence of sites in habitats/regions not previously thought to be suitable for breeding. A new population and habitat monitoring program was initiated in the 2009 breeding season and will be refined over the following two years. The methodology employed for this program takes account of new information on habitat use and annual changes in the relative abundance of Swift Parrots within different regions of the breeding range. Quantification of changes in extent and/or quality of habitat has been problematic due to inadequate mapping of some forest types and habitats and commercial in-confidence issues surrounding access to forest spatial data layers. Furthermore, there is no central digitised repository for recording cumulative habitat loss (or gain) from which this data could be extracted. However, the overall trend in available breeding habitat in Tasmania since 2001 was downwards based on the ongoing clearance and harvesting of foraging and nesting habitat. Prior to 2007 wet forest habitats received little protection whilst production forestry and conversion for plantation development in these areas has intensified. Similarly, foraging habitat in which blue gum occurs as a sub-dominant species was not considered in management prescriptions within the Forest Practices System until more recently.	**2**
4b	Winter surveys	The recovery team has coordinated one of the largest and longest-running community based threatened species surveys in Australia. Unprecedented information on the species' habitat use across south-eastern Australia has been collected with over 11,300 surveys conducted by volunteers as part of the national survey program since 1995. The volunteer network contains over 800 members, over 300 of which are actively involved in the survey program.	**2**
4c	Monitoring the effectiveness of management prescriptions in conserving habitat in production forests.	The effectiveness of management prescriptions in conserving habitat for the Swift Parrot in production forests of Tasmania have been assessed through the standard auditing process, as well as by Munks *et al* (2004). Although specialist prescriptions were generally incorporated in timber harvesting plans, implementation of prescriptions was often not effective in preserving habitat. General Victorian prescriptions have been revised to protect mature habitats for Swift Parrots and are supplemented by special management zones in areas regularly used by this species. Implementation of these prescriptions has recently commenced, however a monitoring program to measure the effectiveness of these prescriptions is yet to be developed. In NSW detailed recommendations for improving prescription measures for Swift Parrot habitat have been provided repeatedly for inclusion during threatened species license reviews. However this information, including published scientific information, has not been accounted for in any prescriptions to date. Limited compliance monitoring of prescriptions is likely to be undertaken as part of a general audit process, however this does not include identifying inadequacies of the prescriptions.	**0**

	Specific Objective 6	**To increase public awareness about the recovery program and to involve the community in recovery**	
	Recovery Criteria 5	**Community based networks are maintained and a newsletter is produced**	
Action5	**Community education and information**	**Comments**	**Score**
5a	Community and volunteer networks	***Tasmania*** In 2009 a volunteer network for breeding season surveys was established. Increased public awareness has been achieved through the production of breeding season survey reports (since 2007), a collision mitigation report, presentations at scientific conferences and training workshops as well as newsletters and news articles in magazines such as Wingspan and Forest Practices News. ***Mainland*** The recovery team has published over 50 documents, including over 25 reports and scientific papers as well as articles in journals, magazines, newspapers and newsletters, several TV appearances. There have been over 45 radio interviews and 35 volunteer training workshops in regional areas of Victoria and NSW, promoting the recovery effort and fostering public interest, involvement and conservation. Hundreds of audio recordings of Swift Parrot calls have been distributed to volunteers, community members and natural history/bird groups for education purposes and to enable training in call recognition. Two educational videos have also been developed and distributed both on DVD and YouTube. Recovery program updates were provided to the volunteer network twice a year prior to each of the national volunteer survey weekends. These updates provide the latest information from the volunteer surveys as well as providing support and encouragement for continued community involvement in the program.	**3**
5b	Newsletter	The annual recovery program newsletter "Swifts Across the Strait" was distributed to all volunteers and other stakeholders from 1995-2007. This newsletter is no longer produced due to the cessation of funding, however Swift Parrot information will be incorporated into the regent honeyeater recovery program newsletter in 2010.	**3**
Action6	**Manage the recovery process through a recovery team**	**Comments**	**Score**
6	Manage the recovery process through a recovery team	From 1995 to 2008 bi-annual recovery team meetings were held at various locations throughout the range of the Swift Parrot. This ensured all team representatives contributed to addressing relevant actions for each of the above recovery criteria. In 2009 the recovery team met only once due to funding and timing constraints however bi-annual meetings will again be held in 2010.	**3**