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Australian Government

Department of Sustainability, Environment, Water, Population and Communities

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Review of the Threat Abatement Plan for Psittacine Beak and Feather Disease Affecting Endangered Psittacine Species (2005)

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June 2012

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1. Executive summary

The *Threat Abatement Plan for Psittacine Beak and Feather Disease Affecting Endangered Psittacine Species* has been reviewed as required under the *Environment Protection and Biodiversity Conservation Act 1999*. The actions that have been undertaken to abate the threat from the disease as identified through the actions, goals and objectives of the threat abatement plan have been assessed.

The assessment has identified that there has been an improvement in coordination and the Australian Wildlife Health Network has the potential to capture relevant information. However, dedicated funding would be required to establish a good system to capture psittacine beak and feather disease information and disseminate this to stakeholders.

Appropriate hygiene and disinfection protocols have been developed for captive populations of parrots and cockatoos. A number of different research projects have studied the virus and started exploring the potential for the development of a vaccine but there are still gaps in the knowledge about the virus, apparent immunity of some psittacine species and transmission. The Psittacine Beak and Feather Disease Working Group identified in 2009 that the development of a vaccine is the highest priority research action needing to be undertaken.

The threat abatement plan identified the need to undertake surveillance of wild psittacine bird populations. This has not occurred to any extent, probably because of the high level of resources that would be required to undertake such a task. The threat abatement plan also identifies the need for identification and implementation of management actions for psittacine beak and feather disease in the listed threatened species. Action under this goal has been undertaken through recovery planning for each species, although the degree to which the disease is identified in the relevant recovery plans for each of the species ranges from the disease being a threat to specifically not a threat or unknown. The funding provided to the listed threatened species through the Caring for our Country program was assessed and it has been concluded that there is limited on-ground action being taken to directly abate the threat from psittacine beak and feather disease. None of the project summaries identified disease as an action to be addressed.

Therefore, it must be concluded that, while some action has been undertaken and there is now good information exchange occurring, the two goals of the threat abatement plan have not been met. That is, the likelihood of extinction or escalation of the threatened species status of psittacine birds has not diminished; and the likelihood of psittacine beak and feather disease becoming a key threatening process for other psittacine species is not diminished.

The threat abatement plan is at a stage where 12 of the 26 actions in the plan have been completed, and a further seven are partially complete. It is concluded that there are still actions outstanding that may be able to contribute to abating the threat but that the current threat abatement plan requires a new direction to refocus the threat abatement actions. Further, because the key threatening process of *Psittacine Circoviral (beak and feather) Disease Affecting Endangered Psittacine Species* is still valid, there remains a need for threat abatement.

A separate options paper will explore the options available to the Minister to assist in abating the key threatening process of psittacine beak and feather disease affecting endangered psittacine species.

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111

112 **2. Purpose of review**

113 Under section 279 of the *Environment Protection and Biodiversity Conservation Act 1999* the
114 Minister must review each threat abatement plan at intervals of not longer than five years.
115 The Threat Abatement Plan for Psittacine Beak and Feather Disease (Pbfd) Affecting
116 Endangered Psittacine Species was made by the Minister in 2005. Under section 279 this
117 plan is due for review.

118

119 Reviewing threat abatement plans, at least every five years, allows for an assessment of
120 whether the threat has been abated or, if not, what progress has been made towards abating
121 the threat. It is acknowledged that some key actions listed in threat abatement plans may take
122 longer than five years to achieve, such as the development of a new vaccine for a disease.
123 The review of a threat abatement plan assesses progress and effectiveness of progress across
124 all actions in the threat abatement plan. It also considers progress towards threat abatement in
125 associated ways, such as work related to Pbfd done through recovery plans for specific
126 species. Finally it also considers if the threatened species are still being threatened by the key
127 threatening process.

128

129 The review of a threat abatement plan provides an opinion on whether a new threat abatement
130 plan is still a feasible, effective and efficient means to abate a threat (s. 279A) and alternative
131 options for the Threatened Species Scientific Committee to consider and advise the Minister.

132

133 **2.1 Review**

134 The primary purpose of the review of the *Threat Abatement Plan for Psittacine Beak and*
135 *Feather Disease Affecting Endangered Psittacine Species* (the TAP) is to assess the progress
136 and effectiveness of the TAP in reducing the impact of Pbfd on nationally listed psittacine
137 birds and preventing further psittacine birds from becoming threatened.

138

139 The Department of Sustainability, Environment, Water, Population and Communities has
140 undertaken the review in consultation with the Psittacine Beak and Feather Disease Threat
141 Abatement Plan Working Group, established to advise on action to be undertaken under the
142 TAP.

143

144 **2.2 Approach**

145 A meeting of the Pbfd Threat Abatement Plan Working Group in June 2009 reviewed the
146 state of knowledge and research around Pbfd to that point in time. The Department has
147 drawn on this knowledge as well as published scientific literature, grey literature, and reports
148 to the Australian Government since this time to review each specific action in the threat
149 abatement plan.

150

151 The Pbfd Threat Abatement Plan Working Group was provided with an opportunity to
152 comment on the Departmental assessment of progress and to provide comment on potential
153 future work that might be required to help abate the threat.

154

155 **3. Background**

156 'Psittacine circoviral (beak and feather) disease affecting endangered psittacine species' was
157 listed in April 2001 as a key threatening species under the *Environment Protection and*
158 *Biodiversity Conservation Act 1999* (EPBC Act). The Minister determined under

159 section 270A of the EPBC Act that having a threat abatement plan was a feasible, effective
160 and efficient way to abate the impact of PBFD virus on threatened Australian parrots and
161 cockatoos.

162 PBFD (also known as psittacine circoviral disease) is a disease affecting parrots, cockatoos
163 and lorikeets (psittacine birds). It is often fatal to birds that contract it, and most species do
164 not respond to available treatment. The epizootiology (the study of epidemic disease in
165 animals) of PBFD is not fully understood. The beak and feather disease virus is one of the
166 smallest and most resistant viruses capable of causing disease, and likely remains viable for
167 many years in nest boxes and hollows, and may result in long-term contamination of nesting
168 sites.

169 Acute and chronic forms of PBFD are recognised. In the acute form depression, inappetance
170 diarrhoea and feather abnormalities occur, and death may occur suddenly within one to two
171 weeks of developing clinical signs. The chronic form results in feather, beak and skin
172 abnormalities, with most birds eventually dying. Complete or partial recovery from acute
173 PBFD has been recorded in some species (budgerigar, rainbow lorikeet, lovebird, king parrot
174 and eclectus parrot), perhaps related to antibody in the blood. Individuals within the majority
175 of psittacine species with chronic PBFD do not have antibodies, do not recover, and do not
176 respond to treatment.

177 The disease is endemic to Australia. It is believed to have evolved with wild psittacine birds
178 and is widespread amongst many common Australian species (e.g. sulphur-crested cockatoo,
179 galah). There is no evidence that the disease is a threat to psittacine bird species that are not
180 endangered but these common species harbour the infection. In circumstances where bird
181 populations have been dramatically reduced, such as in endangered species (especially those
182 with reduced fitness through stresses such as food shortages), the disease may have the
183 potential to cause catastrophic losses. It is possible that the movement of common psittacine
184 species may increase the level of threat to endangered species through bringing infected birds
185 into direct contact with the endangered species, or contamination of feeding or nesting sites.

186 When captive breeding is practiced as an option to increase numbers of threatened bird
187 species, there is potential for beak and feather disease virus to be spread much more readily,
188 causing high losses of nestlings. Captive breeding for re-introduction is underway for the
189 orange-bellied parrot, but is not currently occurring for the other listed endangered psittacine
190 species.

191 The orange-bellied parrot is listed as a critically endangered species under the EPBC Act and
192 recovery plans have been in place since 1984. The most recent recovery plan was published
193 in 2007 (DPIW, 2006). The recovery plan quotes disease, particularly from PBFD virus as
194 being one of the key factors in the survival of the orange-bellied parrot. The plan states:

195 *“Stochastic factors such as disease, loss of genetic variation, storms during migration, and*
196 *destruction of nest sites, eggs and chicks by wildfire have the potential to reduce the species’*
197 *long term survival.”* (DPIW, 2006. Page 9)

198
199 *“A significant cause of death among captive orange-bellied parrots during the [captive]*
200 *breeding program up to 1991 was Psittacine Circoviral Disease (PCD)”* (Brown 1988). *The*
201 *disease was detected in wild birds in 1993, however, while a significant number of individuals*
202 *are antibody positive to PCD, there has not been any detected outbreak of the disease. Sub-*
203 *clinical effects are unknown. Since 1991, mortality due to PBFD has continues to be a*

204 *significant problem despite movement of the Hobart facility to a warmer, more sheltered site.*
205 *Management of this disease will be consistent with the Threat Abatement Plan (Australian*
206 *Government Department of the Environment and Heritage, 2005) and associated hygiene*
207 *protocols (Australian Government Department of the Environment and Heritage 2006) which*
208 *have been made under the provisions of the EPBC Act 1999.” (DPIW, 2006. Page 10)*

209 The current prevalence of PBFD in wild orange-bellied parrots is not known because the wild
210 birds are only handled to band the chicks and not recaptured after this time.

211

212 **3.1 Purpose of the plan**

213 While eradication of a widespread and continuously present disease is not possible in wild
214 birds, an array of well targeted actions combined with well developed management plans
215 based on current knowledge can assist in reducing the impact of the disease on threatened
216 psittacine populations, particularly those presently in captive breeding programs and for any
217 future captive breeding of endangered species.

218

219 The threat abatement plan, therefore, had two goals:

- 220 1. To ensure that Beak and Feather Disease does not increase the likelihood of extinction
221 or escalate the threatened species status of psittacine birds; and
- 222 2. To minimise the likelihood of Beak and Feather Disease becoming a key threatening
223 process for other psittacine species.

224

225

226

227 **4. Assessment of actions undertaken against objectives**

228 The threat abatement plan’s objectives were:

- 229 1. To coordinate a national approach to managing Beak and Feather Disease;
- 230 2. To promote and conduct activities that lead to increased knowledge of the disease and to
231 support research that addresses gaps in current knowledge about Beak and Feather
232 Disease;
- 233 3. To monitor Beak and Feather Disease and psittacine populations and to analyse the
234 resultant data to inform better management strategies;
- 235 4. To identify and implement management actions and strategies to reduce the impacts of
236 Beak and Feather Disease; and
- 237 5. To share information with Australian, state and territory government management
238 agencies, recovery teams, field workers, veterinarians, and wildlife carers, so as to achieve
239 better Beak and Feather Disease management outcomes.

240

241 The implementation of the threat abatement plan was seeking to consolidate and coordinate
242 the process of managing PBFD impacts on native parrots, and acknowledged that control
243 programs will have to be ongoing and the costs of these could be considerable. As such, the
244 threat abatement plan established a framework to allow for the best possible use of available
245 resources.

246

247

248 Below is the assessment of progress against each of the specified actions.

249

250 **4.1 Objective 1: National Coordination**

251 **Coordinate a national approach to managing Beak and Feather Disease**

252 The success of this TAP is dependent on a high level of cooperation and communication between everyone involved in PBF D including
 253 governments, researchers, recovery teams and community groups. The monitoring of progress with the ability to adapt activities and priorities
 254 defined in the TAP is seen as essential so that ongoing field experience and research results can be applied to improve PBF D threat abatement.
 255

256 **4.1.1 Specified actions**

257 Table 4.1 shows the actions under objective 1, the predetermined performance indicators and a summary of the activities that have occurred under
 258 the actions. At the end of the table an assessment has been made of the contribution of achievements to the abatement of the threat posed by PBF D
 259 to the species under threat. This assessment, together with those for the following objectives, has subsequently been used to provide the overarching
 260 conclusions to this review in section six.
 261

262 Table 4.1 Assessment of national coordination actions.

Actions	Performance indicators and indicative timelines	Achievement
A1.1 Convene an implementation team with skilled personnel and effective lines of communication.	PBF D Threat Abatement Plan Implementation Team established. Within 6 months of the plan being adopted.	A PBF D Threat Abatement Plan Implementation Team was established in October 2005 and met twice to inform action under the TAP. Further advice was sought to inform the Department on actions that had been undertaken and further action required in 2009 and a PBF D Working Group was put in place under the Natural Resource Management Ministerial Council’s Environmental Biosecurity Committee. The Working Group included experts Associate Professor Shane Raidal, Dr James Harris and representatives from the Victorian, Australian Capital Territory, South Australian, Western Australian, New South Wales, Queensland Governments, Australian Government Department of Agriculture, Fisheries and Forestry, and the Australian Wildlife Health Network The group met formally on 26 June 2009 and occasional email contact as necessary since this meeting. There were no further formal meetings between 2009 and 2012. The orange-bellied parrot recovery team has met regularly since 1984.
A1.2 Establish a communication network to update stakeholders	Communication network established between all	The PBF D Working Group considered this action item in 2009 and the Working Group agreed that the current information available through the various jurisdiction web sites is significant and sufficiently linked.

<p>on the plan's implementation and to promote exchange of information on PBF.D.</p>	<p>stakeholders. 12 months.</p>	<p>In reconsidering the action item in 2009, the PBF.D Working Group felt that existing methods of communication via the Australian Wildlife Health Network were providing sufficient communication on beak and feather disease.</p> <p>The relevant Chief Veterinary Officer in each state or territory is informed of particular outbreaks of PBF.D in their jurisdiction where these are of major significance. Otherwise investigation into specific events tends to be undertaken by universities with the ability to conduct PBF.D testing.</p> <p>The orange-bellied parrot recovery team has their own communication networks.</p> <p>There are also a number of websites and wildlife carer groups that have their own networks to communicate about PBF.D and other diseases of birds. See Attachment A for examples.</p>
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264 PBF.D Threat Abatement Plan Implementation Team (2005-2006)

265 The team consisted of: Dr Chris Tidemann (Australian National University); Dr Karrie Rose (Taronga Zoo, NSW); Mr Ross Perry (Homebush
266 Animal Hospital, NSW); Dr Michael Pyne (Currumbin Sanctuary, Qld); Dr Adrian Stokes (SA); Dr Peter Copley (Department of Environment and
267 Heritage, SA); Dr Michael Weston (Birds Australia); Mr Peter Mawson (Department of Conservation and Land Management, WA); Mr Garry Cross
268 (observer – author of the hygiene protocols), and various secretariat staff from the Department of Sustainability, Environment, Water, Population
269 and Communities.

270

271 Meeting 1 in October 2005 consisted of a briefing on the Australian Government funded project for the development of a vaccine, standardised
272 diagnostic tests, and hygiene protocols. The Threat Abatement Plan Implementation Team considered the threat abatement plan actions and
273 identified the highest priority areas being those of diagnostic techniques (especially low cost techniques); hygiene protocols to educate carers;
274 emergency response plans; and disease management issues with captive breeding of parrots such as the orange bellied parrot.

275

276 Meeting 2 in 8 Feb 2006 consisted of further briefing on the development of new diagnostic tests; investigation of virus infection; presence of
277 circoviruses in other bird species; epidemiology in psittacines; recombinant protein development.

278

279 PBF.D Working Group (2009)

280 The Working Group consisted of: Dr Chris Bunn (Office of the Chief Veterinary Officer), Dr Tiggy Grillo (Australian Wildlife Health Network),
281 Dr Will Andrew (ACT), Dr Helen Crabb (Vic.), Dr Stephen Pyecroft (Tas.), Mr Scott Jennings (SA), Mr Tony Zidarich (SA), Mr Peter Mawson
282 (WA), Ms Linda Bell (NSW), Alison Crook (Qld), Dr Shane Raidal (Charles Sturt University), Dr James Harris (Vet, Tasmania), and various
283 secretariat staff from the Department of Sustainability, Environment, Water, Population and Communities.

284

285 A meeting in June 2009 considered maps of the current known locations of species threatened by Pbfd. It was noted that because the disease is
286 ubiquitous and long-standing, it is more fruitful to concentrate on preventing the impact on endangered species rather than the distribution of all
287 potentially affected species. Discussion was held on a vaccine and the Group agreed that extension of the vaccination development program at
288 Charles Sturt University under Dr Raidal was most likely to produce an effective option that could initially be used to protect captive breeding
289 programs. The Group also supported the development of central data collection and agreed that the Australian Wildlife Health Network was the
290 logical collection point.

291

292 Australian Wildlife Health Network (AWHN)

293 Australian Wildlife Health Network's core business is collaboration with key stakeholders to coordinate wildlife health surveillance and information
294 systems across Australia with emphasis on supporting Australia's agriculture and trade, human health and biodiversity.

295

296 In 2010, the AWHN and the Zoo and Aquarium Association established a pilot project to investigate the usefulness of zoo-based wildlife data to
297 national surveillance. During the pilot, zoo veterinarians (Zoo Coordinators) from the six participating zoos selected events in free-ranging and
298 rehabilitation wildlife and reported directly into the National Wildlife Health Information System (eWHIS). Some of these data were of animals
299 affected by Pbfd. An independent review recommended that the project be continued and expanded.

300

301 Although AWHN encourages Wildlife and Zoo Coordinators to report on disease listed as Key Threatening Processes in Australia there has been no
302 formal request or funding support for the structured capture of these data and as a result data captured on Pbfd in the national system occurs largely
303 on an ad hoc basis and is unrepresentative of the current situation in Australia. Events available in eWHIS mainly include rainbow lorikeet (eastern)
304 and sulphur-crested cockatoo, with some reporting of scaly-breasted lorikeet, little corella, galah, crimson rosella and swift parrot.

305

306 Informal network information and 'grey' literature – see Attachment A.

307 General and specialist information on Pbfd is available on some state and territory government websites, bird organisations, universities and
308 commercial pet websites.

309

310

311 **4.1.2 Contribution to change of threat**

312

313 There is a good level of awareness of beak and feather disease around Australia, not only by the specialists in the field such as the people who sat on
314 the advisory groups, but more broadly through the community. Appropriate public information is easily accessible through factsheets and internet

315 websites (examples at Attachment A). Through these websites it is also clear that some aspects of the disease are still poorly understood by
316 members of the public. This includes the fact that birds, especially rainbow lorikeets, can appear to recover but still be carriers spreading the disease
317 to other birds. Therefore, continuing education is important.

318
319 The Psittacine Beak and Feather Disease Working Group, which met in 2009, indicated there is a sufficient level of cooperation and communication
320 between the range of interested groups. There is agreement on the best national approach to managing beak and feather disease. In this sense the
321 objective of the TAP to coordinate a national approach has been met.

322

323

324 **4.2 Objective 2: Research**

325 **To promote and conduct activities that lead to increased knowledge of the disease and to support research that addresses gaps in current**
 326 **knowledge about Beak and Feather Disease.**

327
 328 Eleven research actions were identified in the TAP as priorities including the birds affected, vaccine development, management of the disease and
 329 specific details on the disease and its transmission. Each of these actions and the work done on each is listed in Table 4.2.
 330

331 **4.2.1 Specified actions**

332
 333 Table 4.2 shows the actions under objective 2, the predetermined performance indicators, and a summary of the activities that have occurred under
 334 the actions.

335
 336 Table 4.2 Assessment of research actions.

Actions	Performance indicators	Achievement
<p>A2.1 Add to or delete from the priority species list.</p> <p>In 2005, the priority species that met the criteria of most likely to be at risk from the disease were the Orange-bellied parrot, Norfolk Island Green Parrot, and Swift Parrot.</p>	<p>Parameters for reviewing priority species list established. Priority species list reviewed at regular intervals to be agreed. Priority list keeps pace with increased knowledge and changes in status of national listed species.</p> <p>12 months.</p>	<p>Parameters to determine which species are at risk from PBFD have not been established. However, of the 15 threatened species identified in the EPBC Act, there has been identification in the listing advice or recovery plan where PBFD is a threat. In identifying PBFD there has not been a differentiation between the degree of threat from PBFD and other threats.</p> <p>There were 15 threatened species identified in the 2005 TAP. Six of these species have identified PBFD as a threat in the listing advice, conservation advice or recovery plan. These species are:</p> <ol style="list-style-type: none"> 1. Orange-bellied parrot (critically endangered) 2. Carnaby’s cockatoo (endangered) 3. Swift parrot (endangered) 4. Norfolk Island green parrot (endangered) 5. Regent parrot (eastern) (vulnerable) 6. Princess parrot (vulnerable). <p>A further three species have disease identified as a generic threat. These species are:</p> <ol style="list-style-type: none"> 1. Coxen’s fig parrot (endangered) 2. Glossy black cockatoo (Kangaroo Is) (endangered) 3. Golden-shouldered parrot (endangered)

		<p>Bonne (2009) tested a recombinant PBF virus capsid protein as a vaccine on long-billed corellas and galahs and determined there was an adaptive immune response in the vaccinated birds.</p> <p>Bonne (2009): http://researchrepository.murdoch.edu.au/1658/ Shearer (2008): http://researchrepository.murdoch.edu.au/691/</p> <p>Raidal (pers. com. July 2011) indicated that vaccine development research has ceased due to a lack of funding.</p>
A2.4 Clarify the quarantine period necessary to avoid spread of the disease between populations	<p>PBFD virus incubation period established. Viremic period established. From this information, quarantine period established.</p> <p>1-3 years.</p>	<p>The publication <i>Hygiene protocols for prevention and control of diseases (particularly beak and feather disease) in Australian Birds</i> was published in late 2006. Covered in Chapter 2: Recommendation for a Quarantine Period to Avoid Spread of PBF virus between Populations. http://www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-protocols/chapter2.html</p> <p>The report concludes that the minimum quarantine period is 63 days with testing at day 0, day 28 and day 56. This report also meets Actions 5.2 and 2.5.</p>
A2.5 Test effectiveness of disinfectants used on closely related viruses	<p>Disinfectants tested by bioassay. Disinfectants effective on related viruses trialled on PBF virus. Procedures established for disinfecting nests and transport boxes.</p> <p>1-5 years.</p>	<p>The publication <i>Hygiene protocols for prevention and control of diseases (particularly beak and feather disease) in Australian Birds</i> was published in late 2006. Covered in Chapter 3: Test Effectiveness of Disinfectants on Closely Related Viruses. http://www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-protocols/chapter3.html</p> <p>The disinfectant Virkon S has been recommended for use at a concentration of 2 % with a contact time of 10 minutes. This work has been done on related viruses.</p>
A2.6 Evaluate PBF prevalence in common parrot species	<p>Common parrot species that share habitat or may come into contact with threatened parrot species identified. PBF prevalence in these common parrot species evaluated.</p> <p>1-5 years.</p>	<p>Mapping has been undertaken to show the distribution of non-threatened parrot species which may be affected by PBF and the distribution of identified threatened species. This identifies that potentially quite a number of non-threatened parrot species carrying the virus will come into contact with the threatened species where their distributions overlap.</p> <p>In many common parrot species PBF is endemic in the populations with both carriers and those with chronic PBF. Given there is no capacity to control interactions between species in the wild this action has been fulfilled as far as possible.</p>
A2.7 Identify PBF hot	Distribution of PBF	Reporting of the occurrence of species which may be affected by PBF across Australia has been mapped from data

spots	<p>across Australia mapped. PBF D hot spots identified.</p> <p>Factors that allow PBF D to thrive in these areas identified and assessed. Effective management responses identified and trialled in these areas.</p> <p>1-5 years.</p>	<p>provided to the Australian Government by Birdlife Australia, Bird and Bat Banding RETURN data, state governments and state museums. The reporting of cases reflects the distribution and visitation of people rather than possible hot spots of PBF D (i.e. occurrence aligns with roads).</p> <p>Given the inability to accurately identify hot spots, effective management responses have not been trialled.</p>
A2.8 Undertake research to confirm that only one strain exists	<p>Existence of only one strain¹ of PBF D confirmed through further research.</p>	<p>Further research has indicated that there are many genotypes of beak and feather virus. There appears to be isolates clustering with viruses from a <i>Lorridae</i> genotype and another with isolates clustering with viruses from <i>Cacatuidae</i> and <i>Psittacidae</i> (Khalesi, 2007).</p> <p>PBF D virus isolates may not be confined to the species that they are adapted to and may possibly be transmitted to other psittacine species. (Bonne, 2009).</p> <p>Disease progression seems to be associated, at least in cockatoos and African grey parrots, with the species of infected psittacine species rather than the PBF D virus isolate infecting the species. (Bonne, 2009 after de Kloet and de Kloet 2004).</p>
A2.9 Identify the minimum antibody titre associated with immunity	<p>Minimum antibody titre needed to give immunity established.</p> <p>Antibody titre in breeding hens needed to give immunity to young established.</p> <p>Relationship of maternal immunity on active immunity by vaccination established</p>	<p>Initial work has been undertaken on a vaccine (using a recombinant beak and feather disease virus capsid protein) by Bonne et al (2008). This work displayed that the use of a recombinant beak and feather disease virus capsid protein is a potentially viable option for vaccination to promote an adaptive immune response.</p> <p>This work has not reached a point where a minimum antibody titre can be identified. Safety and efficacy trials have not been conducted.</p> <p>There has been no work on the relationship of maternal immunity and if this can interfere with active immunity produced by vaccination.</p>
A2.10 Determine whether vertical transmission occurs	<p>Possibility of vertical transmission established.</p>	<p>Vertical transmission has yet to be proven but studies have shown chicks raised from artificially incubated eggs consistently develop PBF D (where the adult has been exposed). (Bonne, 2009). Rahaus et al (2008 – quoted in Bonne, 2009) have detected DNA of PBF D virus in eggs.</p>
A2.11 Determine which	<p>Currently available</p>	<p>The publication <i>Standardised Diagnostic Tests for Beak and Feather Disease Virus (BFDV)</i> was completed in 2009</p>

¹ Strain is the term used in the threat abatement plan. Species of virus is a better description.

<p>diagnostic tests are most appropriate</p>	<p>diagnostic tests evaluated. Most effective tests chosen. Protocols established for deciding which test(s) to use according to circumstances. Minimum testing standards established for producing a reliable diagnosis.</p>	<p>http://www.environment.gov.au/biodiversity/invasive/publications/49540.html These have not been adopted by any diagnostic laboratory due to the expense of carrying out the tests.</p> <p>PhD in 2007 by Khalesi and a PhD by Shearer in 2008 at Murdoch University both optimised methods of detection of Pbfd.</p> <p>Khalesi 2007:http://researchrepository.murdoch.edu.au/126/</p> <p>Shearer 2008: http://researchrepository.murdoch.edu.au/691/</p>
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337

338 **4.2.2 Contribution to change of threat**

339

340 Significant progress has been made in the research of beak and feather disease, particularly through the laboratories run by Associate Professor
341 Shane Raidal, initially at Murdoch University, Western Australia and then through Charles Sturt University, Wagga Wagga, New South Wales.

342

343 A major challenge in the development of a vaccine was that the production of a vaccine by more traditional methods of antigen production is
344 ethically unacceptable and cell culture systems for amplification of the virus were unsuccessful. A different technique of using a recombinant beak
345 and feather disease virus capsid protein was developed and trialled on a limited number of long-billed corellas and galahs. This appeared to be
346 successful with only transient PCR-detectable viraemia and no evidence of persistent infection 270 days post infection challenge using PCR
347 (polymerase chain reaction), histopathology and immunohistochemistry detection techniques. This is promising work but a large amount of further
348 work needs to occur before there is a vaccine that could be considered for use in a captive breeding program for a threatened species. This work is
349 currently unfunded and not underway.

350

351 In addition, a vaccine would require registration in Australia with the Australian Pesticides and Veterinary Medicines Authority which is a
352 significant undertaking in itself because of the requirement to supply sufficient information to establish that the product meets the criteria of product
353 quality, human and animal health and safety, efficacy, environmental safety and that it will not affect international trade. It is also likely that the
354 production of a vaccine would not be economically viable.

355

356 To be fully successful, a method of delivery to the wild populations of threatened species would need to be developed. The vaccine would need to
357 be capable of passing on the antibodies to offspring or to be able to be delivered regularly to the threatened species so that new hatchlings are also
358 vaccinated. This is because there will always be a reservoir of the virus in other psittacine species.
359

360 There are still some gaps in the knowledge about the PBFDF including some of the characteristics of the virus and how it infects birds, the apparent
361 immunity that some species have, the transmission host factors, how population dynamics are affected, and other species as reservoirs to infect the
362 threatened species that are the subject of this TAP. Attachment C outlines the critical gaps in knowledge about PBFDF as identified by the PBFDF
363 Working Group in 2009.
364

365 It would be a fair evaluation to note that there has been important research undertaken to better understand the disease and the management of the
366 disease but there is still much to be done. The majority of this work has been supported by funding from independent sources and its completion and
367 implementation of a vaccine requires further commitment of funds.
368
369
370

371 **4.3 Objective 3: Monitoring the disease**

372 **To monitor Beak and Feather Disease and psittacine populations and to analyse the resultant data to inform better management strategies.**

373

374 Four actions are identified in the threat abatement plan to try to understand beak and feather disease in the wild populations of threatened species,
375 and to set up regular surveillance in order to evaluate the mortality or survival from the disease at a population level and to know if an epidemic is
376 occurring.

377

378

379 **4.3.1 Specified actions**

380

381 Table 4.3 shows the actions under objective 3, the predetermined performance indicators and a summary of the activities that have occurred under
382 the actions.

383

384 Table 4,3 Assessment of disease monitoring actions

Actions	Performance indicators	Achievement
A3.1 Initiate wild parrot surveillance	A national monitoring program established to evaluate the ongoing impact of the disease on threatened parrots. Ongoing surveillance results established. Data made available to on-ground managers Long-term wild parrot surveillance programs established.	A formalised national monitoring program has not been set up across the identified threatened species. Where there is monitoring of a particular species, such as the orange bellied parrot, surveillance for disease is incorporated into this monitoring. Otherwise, beak and feather disease is reported on an ad hoc basis to the Australian Wildlife Health Network. The database currently only has two records of beak and feather disease diagnosed in a threatened psittacine, the swift parrot.
A3.2 Evaluate mortality and survival rates.	Data available on the number of sick and dead birds affected by PBFD, and where applicable, antibody titres known for breeding	As part of the national wildlife disease surveillance program administered by the AWHN, AWHN Wildlife Coordinators and Zoo Coordinators report on wild bird mortality / morbidity events. A very small portion of the birds submitted for diagnostic evaluation are tested for PBFD. However, there are a number of active research projects collecting specimens for PBFD testing (which may come from

	females for priority species.	both healthy and sick birds) Wild bird mortality and morbidity event data are also held by the Australian Registry of Wildlife Health (ARWH). The ARWH has produced an online document that provides guidelines for the collection of samples that will lead to a diagnosis being reached in sick and dead wild birds collected in Australia. http://www.arwh.org/sites/default/files/files-uploads/SickDead%20Bird%20Surveillance_with%20images_0.pdf However, there is no systematic evaluation of mortality and survival rates for the threatened psittacine species.
A3.3 Determine and monitor PBFD extent and pattern	Prevalence data exists for common parrot species in proximity to threatened parrots. Patterns of changes in prevalence analysed and reported to relevant managers.	Mapping of the prevalence of bird species that are affected by beak and feather virus was undertaken for data available since 1977 (Birdlife Australia, Bird and Banding RETURN data, state governments and state museums). See Attachment B for the maps. Mapping has been overlaid with the likely and known habitat and breeding areas for the threatened psittacines. The key point to note is that the density of observations of non-threatened species that are affected by psittacine beak and feather disease was estimated by calculating the number of observations per 25km ² using known observation points. The densities shown on the map may vary depending on survey effort and the detectability of individual species (e.g. through central Australia it is possible to see the road network through the density distribution).
A3.4 Determine early signs of epidemics	Possible early signs of epidemics determined. Monitoring of wild populations established to test usefulness of these signs. Level of disease that constitutes an epidemic determined.	This action has not been undertaken. Specific species that have dedicated recovery teams, such as the orange bellied parrot, are likely to pick up general increases in the level of the disease (at least chronic cases) in the population.

385

386 4.3.2 Contribution to change of threat

387

388 The Australian Wildlife Health Network has a system to capture data on wildlife surveillance. At present there is no requirement to report PBFD but
389 there is encouragement of Wildlife Coordinators and Zoo Coordinators to report diseases listed as Key Threatening Processes in Australia.

390 However, with appropriate resourcing the framework provided by the Australian Wildlife Health Network could be utilised to manage PBFD event
391 data. The data currently contained in the National Wildlife Health Information System is not representative of the situation in the wild, especially
392 with threatened psittacine birds and will be of limited use to programs for the management of specific species unless targeted surveillance is
393 undertaken.

394

395 The analysis of beak and feather disease in the populations of threatened species with the aim of specifically identifying patterns, extent and early
396 signs of epidemics has not been undertaken. This is an action that would need to be incorporated into intensive species management programs where
397 the majority of the population is monitored closely. The orange-bellied parrot, western ground parrot and Kangaroo Island glossy black cockatoo are
398 the only species where there is an active team involved in management. As mentioned above, it is likely that these management teams would notice
399 individual birds with acute or chronic disease in the population and also pick up gross changes in the prevalence of beak and feather disease within
400 the population.

401

402 Therefore, it is concluded that there has been limited contribution to the change of threat through monitoring of the disease.

403

404 **4.4 Objective 4: To identify and implement management actions and strategies to reduce the impacts of Beak and**
 405 **Feather Disease.**

406
 407 Ensuring that field experience and research is used to improve management programs is an important element of the TAP. Identifying critical
 408 factors in disease resistance in the wild as well as in captive populations was the objective of these specified actions.
 409

410 **4.4.1 Specified actions**

411
 412 Table 4.4 shows the actions under objective 4, the predetermined performance indicators and a summary of the activities that have occurred under
 413 the actions.

414
 415 Table 4.4 Assessment of management actions

Actions	Performance indicators	Achievement
A4.1 Assess the threat	Seriousness of threat and required level of management determined for priority species.	<p>The seriousness of the threat and required level of management is dependent on the species. Where the birds are under significant pressure from other threats (e.g. habitat loss) the level of management required will increase because the individual birds become increasingly important.</p> <p>Orange bellied parrot: PCR (polymerase chain reaction) analyses of captive flocks of orange bellied parrot indicate all three flocks have experienced outbreaks of PBF D in the past. The percentage of birds affected at each site: Tarooma 53.8%; Healesville 12.7%; and Adelaide Zoo 10% (Raidal 2010).</p> <p>Glossy black cockatoo (Kangaroo Island): To date there is no indication that Kangaroo Island glossy black cockatoos have been affected by PBF D but the disease is present in wild galahs and parrots on the island. This population is being monitored closely and individual birds are often observed at close range. No signs of PBF D have been noted and no mortalities have been attributed to the disease to date. In August 2009 small samples of nest material from nest hollows were tested for the presence of PBF D and all 22 samples were negative. Researchers are currently uncertain whether the Kangaroo Island glossy black cockatoos have been exposed to PBF D and if so, what level of resistance they may have. It seems likely that Kangaroo Island glossy black cockatoos would have been exposed to PBF D at some point with the influxes of other cockatoo species (e.g. galahs, little corellas) from mainland South Australia. (Pers. Comm. SA Department of Environment and Natural Resources Glossy Black Cockatoo Project Officer, October 2011)</p>

		<p>Swift parrot: The <i>National recovery plan for the swift parrot</i> states: “while PBF D 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 PBF D.” Saunders and Tzaros 2011.</p> <p>Regent parrot: The draft (as at February 2012) recovery plan contains an action to determine whether or not PBF D is a threat.</p>
A4.2 Establish trial management programs	Experimental management programs in place for key species in habitat critical areas.	<p>Under the Caring for our Country program regional groups have received funding to improve habitat critical to threatened psittacines. A summary of projects is at Attachment C and typically involve habitat restoration to assist the species to find food, nest hollows, and creating habitat corridors. While none of this work is directly focused on increasing the resilience of the birds to disease it will assist in this.</p> <p>There have been no experimental management programs in place during the life of the threat abatement plan.</p>
A4.3 Consider management of PBF D in recovery plans adopted under the EPBC Act	<p>Implementation under way of recovery plans already prepared for listed species threatened by PBF D.</p> <p>Recovery plans developed and implemented for other PBF D affected species.</p> <p>Actions on PBF D incorporated in relevant natural resource management plans and investment strategies.</p>	<p><u>Recovery plans</u> Recovery plans exist for 12 of the 15 listed threatened species. They are:</p> <ol style="list-style-type: none"> 7. Coxen’s fig parrot 8. Orange bellied parrot 9. Red-tailed black cockatoo 10. Glossy black cockatoo 11. Carnaby’s black cockatoo (in preparation) 12. Swift parrot 13. Norfolk Island green parrot 14. Golden shouldered parrot 15. Superb parrot 16. Muir’s corella 17. Regent parrot (in preparation) 18. Baudin’s black cockatoo <p>The following eight recovery plans mention PBF D or disease more broadly as a threat:</p> <ul style="list-style-type: none"> • Coxen’s fig parrot: mentions disease management in relation to the potential captive rearing of Coxen’s fig parrot but no specific mention of beak and feather disease. • Orange bellied parrot: mentions that PBF D is no longer a significant cause of death in captive populations. The action is to implement research, monitoring and/or management actions as required under a TAP. • Glossy black cockatoo: mentions disease broadly but no specific mention of beak and feather disease. • Carnaby’s black cockatoo: the draft of the recovery plan identifies disease, and PBF D, as potentially posing a threat. A study is being undertaken to provide a baseline blood profile for the birds that includes the prevalence of PBF D. • Swift parrot: The recovery plan has the action “<i>Develop and implement a Psittacine Beak and Feather Disease</i>

		<p><i>management protocol.</i>” The performance criteria are: (1) PBFD monitoring protocol developed based on the PBFD Threat Abatement Plan and distributed to all fauna rescue and State conservation organisations by Year 4; (2) Protocol to include rescue and quarantine housing requirements for rehabilitated birds; (3) All rehabilitated birds tested for PBFD prior to release; (4) Details of the number of rehabilitated birds and their disease tests reported annually at recovery team meetings; (5) Test all deceased specimens of swift parrots for PBFD.</p> <ul style="list-style-type: none"> • Norfolk Island green parrot: mentions PBFD was probably responsible for the deaths of many green parrots in the 1970s and suggests disease may be a significant cause of mortality in certain circumstances. • Golden shouldered parrot: to the generic threat of disease “action will be taken only if there is evidence that disease is affecting the population. Such actions may include quarantine and limitations to keeping birds in the vicinity’. • Regent parrot: The recovery plan has an action to “Assess if eastern Regent Parrot populations are exposed to Psittacine Beak and Feather Disease (PBFD) and, if required, manage any outbreaks through the national Threat Abatement Plan – PBFD affecting endangered Psittacine species” <p>The other four recovery plans for the following species do not mention PBFD:</p> <ul style="list-style-type: none"> • Superb parrot. • Muir’s corella. • Baudin’s black cockatoo. • Red-tailed black cockatoo. <p><u>Conservation advice</u></p> <p>A conservation advice exists for three of the 15 listed threatened species. They are:</p> <ul style="list-style-type: none"> • Orange bellied parrot • Princess parrot • Night parrot <p>Orange bellied parrot: the advice briefly mentions that disease may also threaten the species. (see recovery planning notes above).</p> <p>Princess parrot: The main potential threats are competition for resources with other species of parrot; infection with Psittacine Beak and Feather Disease; and collection of eggs or young by humans (Carter, 1993; Higgins, 1999; Garnett & Crowley, 2000; DEH, 2005). Actions are (1) Collect biological samples to determine the presence/absence or prevalence of Psittacine Beak and Feather Disease in the Princess Parrot population; (2) Implement appropriate management recommendations outlined in the <i>Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species</i> (DEH, 2005).</p> <p>Night parrot: There is no mention of disease in the conservation advice.</p>
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		<p><u>State and territory recovery plans or equivalent</u></p> <p>Six of the 15 threatened species have some form of state or territory recovery plan or equivalent. They are:</p> <p>Coxen’s fig-parrot: (NSW) mentions the need to manage for disease in any captive breeding program.</p> <p>Orange bellied parrot: (Vic.) Has an approved action statement.</p> <p>Night parrot: no current state plan.</p> <p>Red-tailed black cockatoo: (Vic.) Approved Action Statement does not include any reference to disease.</p> <p>Glossy black cockatoo: no current state plan.</p> <p>Carnaby’s black cockatoo: no current state plan.</p> <p>Swift parrot: (Vic.) Approved Action Statement does not include any reference to disease.</p> <p>Golden shouldered parrot: (Qld) Management plan states: “While disease has been raised as a potential threat, there are no indications of disease threatening wild populations of golden-shouldered parrots”</p> <p>Norfolk Island green parrot: not applicable.</p> <p>Western ground parrot: - (WA) not identified as a threat in the state recovery plan.</p> <p>Superb parrot: (Vic.) Approved Action Statement does not include any reference to disease.</p> <p>Muir’s corella: (WA) not identified in the recovery plan.</p> <p>Regent parrot: no disease specific information in state/territory plans.</p> <p>Baudin’s black cockatoo: no state/territory plans.</p> <p>Princess parrot: no disease specific information in state/territory plans.</p> <p>A tabular summary of the above information is at Attachment D.</p>
A4.4 Investigate ex situ conservation of species threatened by PBF	Species and organisations identified for ex situ effort, plans in place.	<p>The orange bellied parrot has an <i>ex situ</i> breeding program in three locations.</p> <p>None of the other threatened psittacine species have breeding programs.</p>
A4.5 Perform population viability analyses	Population viability analysis model exists for different rates of disease and different management strategies as determined by the team.	<p>Orange bellied parrot: Population viability analyses have been prepared for the parrot since 1993 with regular updates.</p> <p>Glossy black cockatoo has population viability analysis mentioned in recovery plan.</p> <p>None of the other recovery plans mention a population viability analysis.</p>
A4.6 Develop emergency response planning	An emergency response plan available.	<p>Emergency response planning needs to be incorporated into the broader responses required for any threat to psittacines.</p> <p>The orange bellied parrot is the only species with a captive population for breeding. The background and implementation information for the orange-bellied parrot recovery plan (Action 6.1) related to this states: “contingency plans for emergency evacuation or control of disease outbreaks (e.g. PBF) at each facility need to be produced.”</p>

417 **4.4.2 Contribution to change of threat**

418

419 The objective of identifying and implementing management strategies to reduce the impacts of beak and feather disease has been undertaken through
420 a focus on specific species rather than trying to implement management across all of the threatened parrots or cockatoos. Therefore, this review
421 considered what actions and outcomes have been achieved through recovery planning processes associated with the 15 species identified in the threat
422 abatement plan as threatened under the EPBC Act. Of the 15 threatened species, only 12 of the threatened species have recovery plans. In these
423 recovery plans, disease or PBF, is only identified in eight of the 12 recovery plans. Within these eight plans, five plans mention PBF and three
424 plans mention the need to address disease issues, but not specifically PBF. The reason for the variability in the mention of PBF within recovery
425 plans has several explanations. Firstly, if the recovery plans have been updated since 2005, then the authors may well have updated information
426 which suggests a lower threat than previously identified in the threat abatement plan. Secondly, until recently, there was no specific requirement to
427 consider threats identified in threat abatement plans. Thirdly, other threats could be considered significantly more important and the recovery plan
428 has focused on those threats.

429

430 The four species that have recovery plans mentioning the threat from PBF are the orange-bellied parrot, the Carnaby's black cockatoo, swift parrot,
431 Norfolk Island green parrot. Recovery plans for a further three species (Coxen's fig-parrot, the glossy black cockatoo and the golden-shouldered
432 parrot) identify disease more broadly as a threat. In recovery plans, or the equivalent, only the orange-bellied parrot, the Coxen's fig-parrot and
433 swift parrot identify the need for specific husbandry or contingency plans in captive populations. In part this is due to very few of these species
434 being kept in captivity (only the orange-bellied parrot is bred for species recovery purposes).

435

436 Assessment of the species affected by PBF to determine the seriousness of the threat and the degree to which it affects that particular species has
437 only been done in detail with the captive population of the orange-bellied parrot. Concern over the potential for the glossy black cockatoo on
438 Kangaroo Island lead to sampling of that sub-species. Two other recovery plans (swift and regent parrots) identify the need to determine the degree
439 of threat. As mentioned above, the seriousness of the threat and required level of management is dependent on the species. Where the birds are
440 under significant pressure from other threats (e.g. habitat loss) the level of management required will increase because individual birds become
441 increasingly important.

442

443 Determining the degree of threat from PBF has been identified as an action item for the Carnaby's black cockatoo, swift parrot and princess parrot,
444 where it is not clear what the potential impact is on these birds. It is also useful to know for what species PBF is *not* having a threatening impact.
445 For example, the Queensland management plan for the golden-shouldered parrot states that there are no indications that disease is causing a decline
446 in this parrot population.

447

448 While this review has been able to identify where researchers are concerned about the threat of PBFD to the threatened species through actions
449 identified in recovery plans, the actual action on the ground and abatement of the threat is much more difficult to identify. This may be in part due to
450 a lack of resources to undertake sufficient surveillance of all of the threatened species or a focus of recovery teams on other priorities (e.g. habitat
451 loss). It should be noted that the resources required to undertake comprehensive surveillance would be very expensive. However, the cost of
452 comprehensive surveillance should not discourage testing of individuals or small populations where required.

453
454 Recovery plans can provide a focus for recovery teams or community groups to seek funding for actions through government funding. Appendix C
455 provides details on funding provided through the Australian Government Caring for our Country program for the management of the 15 threatened
456 psittacine species identified in the TAP. None of the project summaries identify specific actions targeting the problem of PBFD in the species.

457
458 *Ex situ* conservation has only been attempted with the orange bellied parrot with a captive breeding program established for this species. The
459 recovery plans for other species mention this as an option but *ex situ* breeding programs have not been established. The orange bellied parrot captive
460 breeding program no longer has problems with outbreaks of PBFD but the virus is latent in the captive populations.

461
462 Population viability analyses have only been undertaken for the orange bellied parrot and the glossy black cockatoo. However, these consider all the
463 threats to the species and are not limited to PBFD. In order to write the recovery plans some form of population viability analysis, formal or not, are
464 likely to have been undertaken for the threatened psittacines.

465
466 Emergency response plans have been written for the orange bellied parrot captive populations for the event of disease, fire or other calamity at the
467 captive breeding facilities. Other recovery plans that mention the potential for captive breeding recognise that within any proposal to build a
468 breeding facility, there must also be an emergency plan.

469
470 In conclusion, the objective of identifying and implementing management actions and strategies to reduce the impacts of beak and feather disease
471 has only been partially met. Implementation of appropriate laboratory techniques is required and the other actions required to fulfil this objective
472 need to be taken on a species by species basis. Where PBFD has been identified as a significant problem for a species at a population level, actions
473 have been incorporated into recovery plans for that species. However, it has not been possible to measure whether there has been any change in the
474 status of the species because of the recovery plans. The area of improvement in terms of PBFD is the captive breeding program for the orange
475 bellied parrot where, despite the virus being latent in the flocks, the effects of the disease are now controlled.

476
477
478

479 **4.5 Objective 5: To share information**

480 **with Australian, State and Territory Government management agencies, recovery teams, field workers, veterinarians and wildlife carers, so**
 481 **as to achieve better Beak and Feather Disease management outcomes.**

482
 483 Because of the highly transmissible nature of Pbfd and the ability for the virus to survive in the environment for such a long time, education of field
 484 workers, veterinarians and wildlife carers who may occasionally come into contact with infected psittacine species is important in minimising
 485 spread. Successful assessment and control of Pbfd impact on threatened species depends on detection, clinical evaluation, and the appropriate
 486 reporting and collation of results in a centralised database. These actions address these two points.
 487

488 **4.5.1 Specified actions**

489
 490 Table 4.5 shows the actions under objective 5, the predetermined performance indicators and a summary of the activities that have occurred under
 491 the actions.

492
 493 Table 4.5 Assessment of education and extension actions

Actions	Performance indicators	Achievement
A5.1 Educate for disease detection	Information distributed to wildlife managers, veterinarians and wildlife carers	The Australian Wildlife Health Network and the Australian Registry of Wildlife Health have materials prepared and available. This includes distributing information periodically on Pbfd via their weekly digest to over 450 subscribers (this includes researchers, vets, wildlife carers and government personnel).
A5.2 Develop and distribute protocols	Materials prepared and distributed to field workers to assist in field detection of the disease in priority species	<i>Hygiene Protocols for the Prevention and Control of Diseases (particularly Beak and Feather Disease) in Australian Birds</i> was published on the environment.gov.au website in 2006. www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-protocols/index.html This provides protocols for hygiene and quarantine of wild birds. In addition, there is the publication <i>Standardised Diagnostic Tests for Beak and Feather Disease Virus (BFDV)</i> http://www.environment.gov.au/biodiversity/invasive/publications/49540.html .
A5.3 Provide access to web-based information	Web site developed and maintained.	The Australian Wildlife Health Network provides links on its website. There are several other websites that provide information on Pbfd (for example, the specialists breeding the orange bellied parrot also have their own information networks). As such, the Pbfd Working Group agreed that an Australian Government website dedicated to Pbfd would not be an efficient use of resources. Many state governments have information sheets available for Pbfd where they have common species affected by Pbfd. For example the ACT Government has a fact sheet on Pbfd because it affects the sulphur crested cockatoo which is a common species in the territory. Further information is listed in Appendix A.

		<p>Birdlife Australia provide information on PBFD through newsletters, journal articles and web links for their members.</p> <p>Hobbyists, veterinary clinics and interested people regularly post articles on PBFD in journals and on websites.</p> <p>Examples of some of these websites are at Appendix A.</p>
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494

495 **4.5.2 Contribution to change of threat**

496

497 The Australian Wildlife Health Network provides a way of reporting diseases listed as key threatening processes including PBFD and a way of
 498 circulating relevant information to stakeholders. However, the reporting and information sharing is not undertaken in any formal or structured way
 499 and therefore does not provide a full picture of the current situation. It will be beneficial if, in the future, disseminated material is up to date and
 500 relevant. This will rely on all contributors to the network posting information as it is produced.

501

502 Recovery teams can also tap into these resources to help inform their specific species recovery work. Information on options for managing birds
 503 infected with PBFD is also readily available.

504

505 The review concludes that this objective has been partially met.

506

507

508 **5. Funding and implementation of TAP**

509

510 The Australian Government funded, through EPBC Act appropriation, the following three
511 projects targeted specifically to key TAP actions:

512

513 1. Standardised diagnostic tests for beak and feather disease virus. MurdochLink Pty Ltd
514 \$158,348 (2004-05).

515 2. Hygiene protocols for the prevention and control of diseases (particularly beak and feather
516 disease) in Australian birds. Cross-Examination Pty Ltd \$46,363 (2004-05).

517 3. The commissioning and maintenance of a Psittacine Beak and Feather Disease diagnostic
518 laboratory at Charles Sturt University. \$39,400 (2008-09).

519

520 Limited funding has prevented further projects specifically targeted at TAP actions being
521 undertaken during the life of this TAP.

522

523 However, the Australian Government Caring for our Country program has funded 34 projects
524 targeting the recovery of threatened psittacines. These projects total \$4,295,205. A summary
525 of these projects is at Attachment E. None of these projects specifically identify PBFD in
526 their project summaries but include general actions to assist in the recovery of the threatened
527 species. This includes planting, fencing, weeding, provision of nest boxes etc.

528

529 A workshop of experts in 2009 considered the issue of PBFD and the actions identified in the
530 threat abatement plan. At that stage the development of a vaccine that could be used in
531 captive breeding was identified as the most important action to be undertaken. This was
532 estimated to cost at least \$300,000 over three years for the laboratory stage, with further costs
533 later for laboratory and field trials.

534

535 The majority of funding specially directed toward PBFD research and development has been
536 successfully obtained by universities through external grant such as those provided by the
537 Australian Research Council.

538

539 **6. Conclusions**

540

541 **6.1 Completion of TAP actions**

542 This TAP comprises 26 actions listed under five objectives. Of these it is considered that 12
543 actions have been completed, seven actions have been completed in part, and seven actions
544 not completed. Where the actions have been identified as being completed in part, this is
545 typically because the action relates to something that needs to be done across all the
546 threatened species or because only a portion of the research has been undertaken to date.
547 Under objective 4 (identify and implement management strategies), the majority of the
548 actions have been directed at the orange-bellied parrot.

549

550 **6.2 TAP action contribution to goals and objectives**

551 The implementation of actions in this TAP has occurred across all of the objectives.

552

553 The first objective focuses on the coordination of a national approach. This has occurred with
554 the establishment of groups to advise on action required under the TAP. A reporting and
555 contact network is available through the Australian Wildlife Health Network but at present
556 only collects data on an *ad hoc* basis. This has potential to provide the essential conduit for
557 information between government, scientists, practicing vets and non-government
558 organisations with an interest in threatened psittacines.

559

560 The second objective focuses on the research required to further increase our knowledge of
561 PBFD. The majority of the research into PBFD during the life of this TAP has been
562 undertaken at Murdoch University, Charles Sturt University and University of Sydney.
563 Associate Professor Shane Raidal has been a key researcher with a number of other PhD
564 students and post-doctoral researchers. Overall the review concludes that we now understand
565 more about the disease, including how to manage the disease in psittacines through
566 diagnostics; hygiene, including appropriate disinfectants and quarantine of captive birds; and
567 a bit more about the prevalence of the PBFD in wild parrot and cockatoo populations. Some
568 progress has been made into understanding the strains and vertical transmission of the virus
569 but further work is needed. Finally, the key piece of research into a vaccine is still needed.
570 The conclusion for this objective is that progress has been made during the life of the TAP but
571 further action is warranted.

572

573 The third objective focuses on surveillance of wild populations to better inform management
574 strategies. With appropriate resourcing the framework provided by the Australian Wildlife
575 Health Network could be utilised to manage PBFD event data. However, targeted
576 surveillance for PBFD has been beyond the resources of any group working in the area of
577 threatened species and it must be concluded that there has been limited contribution to the
578 change of threat through monitoring of the disease.

579

580 The fourth objective focuses on identifying and implementing management actions and
581 strategies to reduce the impacts of PBFD. The actions under this objective have been
582 undertaken on a species by species basis rather than taking the approach of trying to establish
583 a management action or strategy for PBFD across all species. Typically the actions are
584 intertwined with other recovery actions identified in recovery plans for the threatened species.
585 The outstanding example, although unfortunately this has not led to a reduction in threatened
586 status, is the recovery plan implementation for the orange-bellied parrot which faces
587 imminent extinction in the wild. Many of the actions under this objective have been

588 undertaken for the orange-bellied parrot. This is also the only species that currently has an
589 active captive breeding program and PBFV virus is present as an ongoing disease problem.
590 Current management practices have not minimised the impacts of the disease on these parrots.
591 Of the other bird species listed in the TAP, there is a range in management actions from some
592 having recovery plans that identify PBFV as a threat through to state management plans that
593 state PBFV is not currently a threat. The review concludes that the approach of identifying
594 PBFV in recovery plans for each species and the appropriate management techniques for that
595 species in conjunction with other recovery actions is the right approach. However, when
596 assessing actions taken under this objective the conclusion is that the actions have made a
597 very limited contribution to threat abatement. There have not been any changes in status of
598 any of the listed threatened species and for many of them the magnitude of threat from PBFV
599 to the population is still unknown.

600
601 The fifth objective of sharing information between all parties interested in PBFV has been
602 partially met. To reiterate the point made earlier, it will be important in the future to ensure
603 that disseminated material is up to date and relevant.
604

605 **6.3 TAP goals**

606 The TAP has two goals of *ensuring that Beak and Feather Disease does not increase the*
607 *likelihood of extinction or escalate the threatened species status of psittacine birds;* and
608 *minimising the likelihood of Beak and Feather Disease becoming a key threatening process*
609 *for other psittacine species.* While there has been better coordination of people working on
610 PBFV, some research undertaken into the disease, and some recovery actions, it cannot be
611 concluded that either of the two goals have been met. There has been no formal change in
612 status of any of the identified threatened psittacines or any available evidence to suggest an
613 improvement in their status. In many cases this is because either there is insufficient
614 monitoring and evaluation of the species to understand the population dynamics or there are
615 also other significant threats to those species, such as habitat loss, meaning that the species
616 has not had a chance to recover. For other psittacine species, the reported cases of PBFV are
617 of currently common species such as rainbow lorikeets and sulphur-crested cockatoos.
618 However, this may be a function of bias in the reporting to more common urban species or
619 species that are presented as cases to vets. It is also not possible to determine whether PBFV
620 is likely to become a key threatening process to psittacines that are currently not threatened.

621
622 In conclusion, the assessment of the review, as to whether the TAP has abated the threat from
623 PBFV to endangered psittacine species, is that the threat is still current and has not abated.
624

625 **6.4 Outstanding issues**

626 The key outstanding action required under the TAP is the development of a vaccine that can
627 be used in captive populations of threatened psittacine species, with the long-term view of
628 release of these birds into wild populations or, ultimately, to be able to administer the vaccine
629 in a field situation. While this action was identified by the PBFV Working Group as the key
630 action that still needed to be undertaken with the TAP, there are other actions that also
631 warrant attention.
632

633 On the research side there are still significant gaps in our knowledge about the virus
634 characteristics, apparent immunity by some birds, and transmission factors including host
635 factors, environment factors, population dynamics and other species as reservoirs of the virus.
636

637 A lack of funding is severely limiting the implementation of many threat abatement actions
638 required under the TAP.

639
640 As for recovery planning there are still gaps for some species in knowing whether PBFD is a
641 significant threat and, for other species, what the impact is on a population level relative to
642 other threats. Even for those species where PBFD has been identified as a threat, there is little
643 on-ground action to counter the threat.

644
645 There is good communication and information exchange occurring on PBFD. However this
646 could be better coordinated nationally and needs to be considered in the future management of
647 PBFD. There will be an ongoing challenge to ensure good communication continues with
648 many other issues demanding the time of those people interested in abating the threat of
649 PBFD.
650

651

652 **Reference list – cited and considered**

653

654 Baker-Gabb D 2011. National Recovery Plan for the Superb Parrot *Polytelis swainsonii*.
655 Department of Sustainability and Environment. Melbourne.

656

657 Baker-Gabb D and Hurley VG In prep. National Recovery Plan for the Regent Parrot (eastern
658 subspecies) *Polytelis anthopeplus monarchoides*. Department of Sustainability and
659 Environment. Melbourne.

660

661 Bonne N, Shearer P, Sharp M, Clark P and Raidal S 2008. Assessment of recombinant beak
662 and feather disease virus capsid protein as a vaccine for psittacine beak and feather
663 disease. *Journal of General Virology* 90 pp. 640-647.

664

665 Bonne NJ 2009. Psittacine beak and feather disease: vaccination, haematological response
666 and PCR methodology. PhD thesis. Murdoch University.

667

668 Bonne N, Clark P, Shearer P, Sharp M and Raidal S 2009. Hematology of vaccinated and
669 non-vaccinated corellas following infection with beak and feather disease virus
670 (BFDV). *Comparative Clinical Pathology* 18 (4) pp. 353-359.

671

672 Chapman T 2008. Forest black cockatoo (Baudin's cockatoo *Calyptorhynchus baudinii* and
673 forest red-tailed black cockatoo *Calyptorhynchus banksii naso*) recovery plan.
674 Department of Environment and Conservation. Western Australia.

675

676 Chapman T and Cale B 2008. Muir's corella (*Cacatua pastinator pastinator*) recovery plan.
677 Department of Environment and Conservation. Western Australia.

678

679 Coxen's Fig-Parrot Recovery Team. 2001. Coxen's fig-parrot *Cyclopsitta diophthalma coxeni*
680 recovery plan 2001-2005. Report to Environment Australia. Canberra. Queensland
681 Parks and Wildlife Service. Brisbane.

682

683 Director of National Parks. 2010. Norfolk Island Region Threatened Species Recovery Plan.
684 Department of the Environment, Water, Heritage and the Arts. Canberra.

685

686 DPIW 2006. Orange-bellied Parrot Recovery Team, Department of Primary Industries and
687 Water (DPIW). Hobart.

688

689 Garnett ST and Crowley GM 2002. Recovery Plan for the golden-shouldered parrot
690 *Psephotus chrysopterygius* 2003-2007. Report to Environment Australia. Canberra.
691 Queensland Parks and Wildlife Service. Brisbane.

692

693 Goldberg J, Bleby K and Mawson PR In prep. National Recovery Plan for Carnaby's
694 Cockatoo *Calyptorhynchus latirostris*. Wildlife Management Program No. 52.
695 Department of Environment and Conservation. Western Australia.

696

697 Khalesi B 2007. Studies of beak and feather disease virus infection. PhD thesis. Murdoch
698 University (abstract only).

699

700 Mooney PA and Pedler LP 2005. Recovery Plan for the South Australian subspecies of the
701 Glossy Black-Cockatoo (*Calyptorhynchus lathami halmaturinus*): 2005-2010.
702 Department for the Environment and Heritage. South Australia.
703

704 Ortiz-Catedral L, Kurenbach B, Massaro M, McInnes K, Brunton DH, Hauber ME, Martin
705 DP and Varsani A 2010. A new isolate of beak and feather disease virus from endemic
706 wild red-fronted parakeets (*Cyanoramphus novaezealandiae*) in New Zealand.
707 Archives of Virology 155 pp. 613-620.
708

709 Raidal SR and Cross GM 1995. Acute necrotizing hepatitis caused by experimental infection
710 with psittacine beak and feather disease virus. Journal of Avian Medicine and Surgery
711 9 pp. 36-40.
712

713 Raidal SR and Riddoch PA 1997. A feather disease in Senegal doves (*Streptopelia*
714 *senegalensis*) morphologically similar to psittacine beak and feather disease. Avian
715 Pathology 26, pp. 829-836.
716

717 Raidal SR, Harris J, Patterson E, Baker R, Bonne N, Sharp M, Boardman W, Twitchett M
718 2010. Psittacine beak and feather disease in orange-bellied parrots (*Neophema*
719 *chrysogaster*). Association of Avian Veterinarians Australian Committee Annual
720 Conference. Hobart.
721

722 Saunders DL, and Tzaros CL 2011. National Recovery Plan for the Swift Parrot *Lathamus*
723 *discolour*. Birds Australia. Melbourne.
724

725 Shearer P L, Bonne N, Clark P, Sharp M and Raidal SR 2008. Development and applications
726 of a monoclonal antibody to a recombinant beak and feather disease virus (BFDV)
727 capsid protein. Journal of Virological Methods 147 pp. 206-212.
728

729 Shearer PL 2008. Development of novel diagnostic and vaccine options for beak and feather
730 disease virus. PhD thesis. Murdoch University.
731

732 Shearer PL, Sharp M, Bonne N, Clark P and Raidal SR 2009a. A blocking ELISA for the
733 detection of antibodies to psittacine beak and feather disease virus (BFDV). Journal of
734 Virological Methods 158 pp. 136-140.
735

736 Shearer PL, Sharp M, Bonne N, Clark P and Raidal SR 2009b. A quantitative, real-time
737 polymerase chain reaction assay for beak and feather disease virus. Journal of
738 Virological Methods 159 pp. 98-104.
739

740 Stewart ME, Bonne N, Shearer P, Khalesi B, Sharp M, Raidal S 2006. Baculovirus
741 expression of beak and feather disease virus (BFDV) capsid protein capable of self-
742 assembly and haemagglutination. Journal of Virological Methods 141 pp. 181-187.
743
744

745 **Attachment A: Psittacine beak and feather disease websites**

746

747 Australian Government website resources:

748

- 749 • Threat Abatement Plan:

750 [http://www.environment.gov.au/biodiversity/threatened/publications/tap/beak-](http://www.environment.gov.au/biodiversity/threatened/publications/tap/beak-feather.html)
 751 [feather.html](http://www.environment.gov.au/biodiversity/threatened/publications/tap/beak-feather.html)

752

- 753 • Hygiene Protocols for the Prevention and Control of Diseases (Particularly Beak and
 754 Feather Disease) in Australian Birds:

755 [http://www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-](http://www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-protocols/index.html)
 756 [protocols/index.html](http://www.environment.gov.au/biodiversity/threatened/publications/tap/hygiene-protocols/index.html)

757

- 758 • The publication *Standardised Diagnostic Tests for Beak and Feather Disease Virus*
 759 (*BFDV*):

760 <http://www.environment.gov.au/biodiversity/invasive/publications/49540.html>

761

- 762 • Further information on Psittacine Circoviral (beak and feather) disease:

763 <http://www.environment.gov.au/biodiversity/threatened/ktp/pcd.html>

764

- 765 • Fact sheet: [http://www.environment.gov.au/biodiversity/invasive/publications/p-c-](http://www.environment.gov.au/biodiversity/invasive/publications/p-c-disease.html)
 766 [disease.html](http://www.environment.gov.au/biodiversity/invasive/publications/p-c-disease.html)

767

- 768 • Poster: [http://www.environment.gov.au/biodiversity/invasive/publications/feather-](http://www.environment.gov.au/biodiversity/invasive/publications/feather-disease.html)
 769 [disease.html](http://www.environment.gov.au/biodiversity/invasive/publications/feather-disease.html)

770

- 771 • The publication *Development of Recombinant Proteins as a Candidate Vaccine for*
 772 *Psittacine Beak and Feather Disease*:

773 [http://www.environment.gov.au/biodiversity/invasive/publications/p-c-disease-](http://www.environment.gov.au/biodiversity/invasive/publications/p-c-disease-vaccine.html)
 774 [vaccine.html](http://www.environment.gov.au/biodiversity/invasive/publications/p-c-disease-vaccine.html)

775

776 State and territory government website information:

Government	Information available	Website link
ACT	Factsheet	www.tams.act.gov.au/play/pcl/domestic_animals_and_stock/exotic_and_endemic_disease/parrot_beak_and_feather_disease (accessed 1/3/2012)
NSW	Key threatening process listing; factsheet on feeding lorikeets, Factsheet	www.environment.nsw.gov.au/determinations/BeakAndFeatherDiseaseKTPListing.htm (accessed 3/1/2012) pandora.nla.gov.au/pan/24203/20020319-0000/www.npws.nsw.gov.au/wildlife/factsheets/feedlorikeets.html (accessed 1/3/2012)
NT	No info	
Qld	Listed as a threat to wildlife on website	www.derm.qld.gov.au/wildlife-ecosystems/wildlife/threats_to_wildlife/index.html (accessed 1/3/2012)
SA	No info	

Tas.	Identified as a key disease in the Tasmanian Wilderness World Heritage areas. Listed as a threat to wildlife on website.	www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-7EL7AS/\$FILE/Strategy%20for%20Managing%20Wildlife%20Disease.pdf (accessed 1/3/2012) soer.justice.tas.gov.au/2009/nat/4/issue/85/index.php (accessed 3/1/2012)
Vic.	Mentioned by the Melbourne Museum	www.museumvictoria.com.au/melbournmuseum/ (accessed 3/1/2012)
WA	Mention in a pest note for Rainbow Lorikeets	

777

778 Other websites with information about Pbfd. Note that this list is not exhaustive but is
779 illustrative of the interested parties in Australia.

780

781 Australian Wildlife Health Network:

782 Pbfd factsheet:

783 [www.wildlifehealth.org.au/AWHN_Admin/ManageWebsite/FactSheets/UploadedFiles/118/Psittacine%20Circovirus%20Disease%20\(PCD%20-%20Pbfd\)%2026%20Mar%202009%20\(1.0\).pdf](http://www.wildlifehealth.org.au/AWHN_Admin/ManageWebsite/FactSheets/UploadedFiles/118/Psittacine%20Circovirus%20Disease%20(PCD%20-%20Pbfd)%2026%20Mar%202009%20(1.0).pdf) (accessed 1/3/2012).

786

787 Bulletin Board:

788 <http://www.wildlifehealth.org.au/AWHN/Forum/ListPosting.aspx?TopicID=75>

789

790 Australian Registry of Wildlife Health:

791 Document titled Common Diseases of Urban Wildlife: Birds. Karrie Rose, Australian
792 Registry of Wildlife Health. June 2005: www.arwh.org/common-diseases (accessed
793 3/1/2012).

794

795 Parrot Society of Australia:

796 1997 article by Dr Garry Cross, Senior Lecturer in Animal Health, University of Sydney:
797 www.parrotsociety.org.au/articles/art_007.htm (accessed 1/3/2012).

798

799 Currumbin Wildlife Sanctuary:

800 Short article by Dr Michael Pyne, Currumbin Wildlife Sanctuary, Currumbin, Gold Coast.
801 National Wildlife Rehabilitation Conference 2005:
802 www.awrc.org.au/uploads/5/8/6/6/5866843/awrc_michael_pyne.pdf

803

804 Birdlife Australia:

805 Links to papers and other information:

806 www.birdsaustralia.org.au (accessed 1/3/2012).

807

808 University of Queensland Veterinary school:

809 www.uq.edu.au/vetschool/beak-and-feather-disease (accessed 1/3/2012)

810

811 Murdoch University:

812 PhD Thesis *Studies of beak and feather disease virus infection* – PhD thesis submitted to
813 Murdoch University by Bahman Khalesi, 2007.

814 <http://researchrepository.murdoch.edu.au/126/2/02Whole.pdf> (accessed 1/3/2012)
815
816 PhD Thesis *Development of novel diagnostic and vaccine options for beak and feather*
817 *disease virus* – PhD thesis submitted to Murdoch University by Patrick Shearer, 2008.
818 <http://researchrepository.murdoch.edu.au/691/>
819
820 PhD Thesis *Psittacine beak and feather disease : vaccination, haematological response and*
821 *pcr methodology* - PhD thesis submitted to Murdoch University by Nicolai Johnsen Bonne,
822 2009. <http://researchrepository.murdoch.edu.au/1658/>
823
824 Petalia company:
825 General information by Dr Cam Day:
826 www.petalia.com.au/templates/storytemplate_process.cfm?story_no=281 (accessed
827 1/3/2012).
828
829

830 **Attachment B: Maps of Psittacine Beak and Feather Disease reports**

831

832

833

834

836 **Attachment C – Critical gaps in knowledge about pittacine beak and**
837 **feather disease**

838

839 Virus Characteristics/infection

- 840 • Infectious dose required to establish infection and or cause disease
- 841 • Virus Evolution rates and recombination's
- 842 • Dynamics of viral replication in naturally infected birds
- 843 • Primary, secondary and tertiary targets of viral replication and determinates that control
- 844 gateways between these.
- 845 • Biological significance of loriid, cockatoo and psittacine genotype "lineages".

846

847 Immunity

- 848 • Antibody concentration that is protective
- 849 • Persistence and rate of decay of antibody titres in adults.
- 850 • Protective effects of passive transfer of maternal antibody, rate of decay in nestlings.
- 851 • Immunosuppressive effects of infection - predisposition to other infectious disease and
- 852 parasites
- 853 • Extent of any host-specific protective co-evolution / attenuation effect.
- 854 • Why do some individual birds (and species) succumb to infection yet others recover and
- 855 seroconvert - genetic and immunological determinants of susceptibility
- 856 • Significance of different red blood cell types - protective / susceptibility effects of type A and
- 857 Type B blood types.

858

859 Transmission

860 Host factors

- 861 • Vertical transmission - does it occur? We know viral DNA is present in eggs but not if it is
- 862 infectious. Is it an important element of maintenance within populations.
- 863 • Virus excretion rates from diseased and carrier birds - quantification of environmental
- 864 contamination
- 865 • Horizontal infection methods - the roles of faecal-oral, feather-oral and cloacal ingestion.
- 866 • Presence of clinically normal carriers and their role in disseminating the virus

867

868 Environment

- 869 • Role of nest hollows as sources of infection.
- 870 • Rates of persistence of virus in nest hollows and other environments.
- 871 • Roles of man-made feeding / watering stations in disseminating infection.

872

873 Population Dynamics

- 874 • Effects of endemic PBFV virus infection on population viability analyses.
- 875 • Effects of endemic infection on survivorship in common species and how this might change in
- 876 fragmented populations or endangered species
- 877 • Spatial and landscape dynamics of infection.
- 878 • Minimum population size required to maintain infection - influence of spatial, temporal and
- 879 landscape effects

880

881 Reservoir Species/Other species

- 882 • Reservoir species - do they exist naturally and what is the effect?
- 883 • Can non-psittacine species carry/disseminate infection?
- 884 • Cross-species transmission - rates, virulence, dynamics of infection, The interplay between
- 885 different populations
- 886 • Serological responses & seroepidemiology in non-cockatoo species

887 **Attachment D: Recovery plans and other advices**

888

TAP Species	Listing advice exists	Listing advice mentions	Conservation advice exists	Conservation advice mentions	Recovery plan exists	Recovery plan mentions	State or territory plan exists	State or territory plan mentions
Coxen's fig parrot	✓	PBFD	✓	Disease only	✓	Disease only	NSW	Disease only
Orange-bellied parrot					✓	PBFD	Vic.	Disease only
Night parrot			✓	No				
Red-tailed black cockatoo					✓	No	Vic.	No mention
Glossy black cockatoo					✓	Disease only		
Carnaby's black cockatoo					✓	PBFD		
Swift parrot	✓	PBFD			(in prep.)	PBFD	Yes	No mention
Golden shouldered parrot					✓	Disease only	Qld	PBFD not a threat
Norfolk Island green parrot					✓	PBFD		
Western ground parrot							WA	No mention
Superb parrot					✓	No	Vic.	No mention
Muir's corella					✓	No	WA	No mention
Regent parrot					✓	PBFD	Yes	No mention
Baudin's black cockatoo					(in prep.)	No		
Princess parrot			✓	PBFD	✓		Yes	No mention

889

Attachment E: Caring for our Country projects targeting threatened psittacine species identified in the TAP.

Grant	Proponent	State	Title	Project description	Value
CC083152	Goolwa To Wellington Local Action Planning Association Incorporated	SA	Restoration of key coastal vegetation communities across the Goolwa area	The area within the Coorong and Lower Lakes Regional Ecological Area, South Australia has been identified as high priority for ongoing management in the recently completed Southern Fleurieu Coastal Action Plan 2007 (Caton 2006) and the Biodiversity Plan for the South Australian Murray-Darling Basin. There are several regionally threatened and EPBC-listed vegetation communities and suitable EPBC listed Orange-Bellied parrot habitat areas across 11 adjoining sites which include three landowners. Project works will involve removal of environmental weeds, revegetation, fencing and monitoring over 250 hectares. Anticipated outcomes will be the subsequent improvement in vegetation structure, habitat value for wildlife, increased resilience to climate change, improved dune health and greater opportunities for the natural regeneration of native vegetation. Additional project benefits will be increased involvement and awareness of coastal management through the project activities and strong partnerships with the Ngarrindjeri aboriginal community.	\$44,827
CC083129	Goolwa To Wellington Local Action Planning Board Incorporated	SA	Restoration of orange-bellied parrot habitat and Raukkan community bat monitoring project	The primary aim of this project is to re-establish habitat for the critically endangered Environment Protection and Biodiversity Conservation Act listed Orange-bellied Parrot (<i>Neophema chrysogaster</i>). This will involve revegetation of 27 hectares and 2.5 km of fencing to protect a total area of 160 hectares of land within the Lower Lakes and Coorong. The revegetation projects will involve the establishment and, in some cases, extension of regionally threatened vegetation communities to provide both roosting and feeding habitat. The secondary aim of this project is to set up a community bat monitoring program within the Ngarrendjeri community at Raukkan. Project methods involve sampling and analysing bat calls from around the Lower Lakes and Coorong. Bat monitoring equipment will be purchased and training will be provided for these activities. All of the information collected will be provided to the South Australian Museum database.	\$45,236
CC084102	Port Macdonnell Landcare Group	SA	Monitoring coastal habitat change	The lower south east coast of South Australia is part of a national biodiversity hotspot and has undergone significant landscape change since settlement with loss of vegetation and wetlands. Along with the Coorong, it is a vital winter habitat for the critically endangered Orange Bellied Parrot (orange bellied parrot), as well as other migratory birds and resident fauna. The coastal grasslands which provide food and shelter for the orange bellied parrot have been significantly reduced by clearing and shrub invasion. The Carpenter's Rocks and Port MacDonnell areas are considered to be a priority coastal area due to the presence of a particularly high diversity of native flora and fauna, the presence of several threatened plant and animal species and provision of key habitat for the Orange Bellied Parrot. The project will identify the extent of vegetation change over 60 years, raise and promote public awareness of the change in our coastal habitat, enhance existing skills and knowledge in local coastal community groups,	\$40,350

Grant	Proponent	State	Title	Project description	Value
				volunteers and schools to carry out on ground vegetation change surveys.	
CC084001	North-West Environment Centre Inc.	TAS	Sea spurge eradication in the Hunter Island group	The project will compliment the Cradle Coast NRM Coastal Weeds Strategy and provide the best opportunity for maintaining a locally supported Sea Spurge control program in the Hunter Islands group, Northwest Tasmania. Volunteers will map and remove all Sea Spurge (<i>Euphorbia paralias</i>) infestations on land managed by the Tasmanian Parks and Wildlife Service in the Hunter Islands Group (approximately 230km coastline). Local community knowledge of the weed, its vector characteristics and its impacts on the local environment will be gained through targeted media, active project participation, and promotional/awareness raising materials. Sea Spurge is prolific in the area - providing a seed bed for infestation of mainland Tasmanian sites. The weed is decimating migratory feed resources of the Orange-bellied Parrot and threatens important coastal vegetation communities. Through an initial knockdown of Sea Spurge in these islands, followed by pro-active monitoring and follow up control, further infestation of the islands and mainland Tasmania can be significantly minimised.	\$39,327
CC083529	Tasmanian Land Conservancy Inc.	TAS	Protection of natural values at Eggs Islands Reserve, Tasmania	This project will enhance the value and integrity of <i>Eucalyptus ovata</i> (black gum) forest and woodland, <i>Eucalyptus globulus</i> (blue gum) forest, <i>Melaleuca squarrosa</i> and <i>Leptospermum</i> shrub-land and wetland vegetation communities, including saline wetlands, saline grasslands and Restionaceae.	\$3,200
CC083476	South Gippsland Landcare Network	VIC	Supporting coastal pest animal management along the Cape Liptrap coast	Nationally threatened species such as the Southern Brown Bandicoot, migratory shorebirds and the Orange-bellied parrot and many others are threatened via predation by the European fox found in the Cape Liptrap Coastal Park and its hinterlands. This project will focus on training, empowering and supporting private landholders to increase and improve their fox management practices. This will align with a landscape-scale fox eradication program initiated by the Friends of Venus Bay Peninsula and Parks Victoria. Venus Bay residents and Parks Victoria have committed to improving fox management by initiating a more intense fox baiting program. This commitment provides the strong basis to engage the managers of the large properties comprising the remaining areas within the landscape in order to improve their fox management activity. The project will encourage private landholders to change or add to their fox management activity by the establishment of permanent control points (comprising regular baiting, trapping or shooting) on their properties.	\$45,455
CC084541	Melbourne Water	VIC	Western lagoon saltmarsh restoration, Port Phillip Bay (western shoreline) and Bellarine Peninsula Ramsar site, Victoria	Several ponds of a now decommissioned sewage treatment lagoon at the Western Treatment Plant, which lies within the Port Phillip Bay and Bellarine Peninsula Ramsar Site, will be restored. Two ponds covering 12 ha will be restored to coastal salt-marsh and brackish sedgeland. The Western Lagoon is adjacent to The Spit Nature Conservation Reserve which is one of the most significant sites for the Critically Endangered Orange-bellied Parrot when overwintering in Victoria. The restoration of native vegetation at Western Lagoon will provide	\$223,636

Grant	Proponent	State	Title	Project description	Value
				additional habitat for the Orange-bellied Parrot and is also intended to provide additional habitat for the Flora and Fauna Guarantee Act 1988 (Vic.) listed Altona Skipper Butterfly and a range of other species, such as crakes and rails, potentially including the threatened Lewin's Rail. Converting two freshwater ponds to salt-marsh will stop freshwater leakage into existing salt-marsh and the consequent degradation of this native vegetation.	
CC083973	Department Of Sustainability And Environment	VIC	Restoring the orange bellied parrot coast: Community focused education, protection and habitat restoration	This project employs a whole-of-landscape approach to protect and restore assets in coastal dunes, estuaries and saltmarshes. Works will focus along the coast between Yambuk and Warrnambool in South West Victoria with particular emphasis on the coastal reserve system, and adjacent unreserved crown land and private land. This area contains the most significant wintering sites for Orange-bellied Parrots on mainland Australia and supports other significant natural and cultural heritage assets. The project area has hosted the largest known over-wintering flocks of Orange-bellied Parrots in recent years, is used by over one third of the state's population of Hooded Plovers and contains significant areas of salt-marsh. Significant cultural heritage values include a ceremonial ground, stone flake scatters, burial sites, and middens. Illegal use of 4WD vehicles and Invasive weeds threaten the native vegetation communities in the area which pose an immediate threat to these natural and cultural assets. This project will address these threats.	\$180,827
2008 open call	Birds Australia Western Australia Inc.	WA	Protecting Critical Habitat for the Endangered Carnaby's Black-Cockatoo	This project will identify, protect and manage critical feeding habitat within priority areas for the endangered Carnaby's Black-Cockatoo. Priority breeding sites have been identified, and are currently undergoing nomination as Important Bird Areas. Accordingly, this project proposes to identify, protect and manage critical feeding habitat on private land surrounding these priority breeding areas.	\$161,935
OC12-00949	Corangamite Catchment Management Authority	VIC	Protecting Orange-bellied Parrot Habitat in Coastal Victoria	This project will protect and enhance Victorian coastal saltmarsh communities in four CMA regions, including two Ramsar sites. These areas provide critical habitat for a number of threatened species, including the critically-endangered orange-bellied parrot. A market-based tender approach will be used to allocate funds for on-ground works on public and private land. The activities will protect biodiversity and enhance the extent, condition and connectivity of habitats.	\$550,000
OC12-00660	The Trustee for Trust for Nature	VIC	Restoring landscape links and habitat for threatened wildlife at Ned's Corner	This project will connect 23 000ha of threatened semi-arid woodland and mallee habitats across Trust for Nature's 30 000ha Ned's Corner conservation property and nearby land. A landscape approach will be used to restore 1452ha of native vegetation linking the Murray River with the woodlands and mallee. The project will reduce rabbit numbers, fence and revegetate sites and retire cropping land. These actions will also aid the recovery of the vulnerable Regent Parrot and 20 other threatened species by increasing habitat.	\$525,800

Grant	Proponent	State	Title	Project description	Value
OC12-00610	Royal Zoological Society of South Australia	SA	Working with SA's SE farmers to increase vital SE Black-cockatoo habitat	Farmers in south-east South Australia will be supported to develop property habitat plans, and protect and re-establish feeding habitat of the south-east black-cockatoo. Extension will be undertaken by a local farmer mentored in the role, and will foster a peer network for extending capacity and outcomes beyond the life of the project.	\$168,322
OC12-00193	Birds Australia Western Australia	WA	Carnaby's Black-cockatoo recovery in a Globally Significant Important Bird Area	Birds Australia will engage volunteers, landholders, agencies and partner organisations to increase native habitat and deliver landscape-scale conservation outcomes within a cluster of four internationally recognised Important Bird Areas declared for the highly visible endangered carnaby's Black-cockatoo.	\$450,979
OC12-00462	Peel-Harvey Catchment Council	WA	Restore habitat and manage threats to Lake Clifton's listed thrombolites and species	Critical threats to the Lake Clifton Thrombolite community, Carnaby's black-cockatoo, western ringtail possum and more than 20 migratory species within Yalgorup National Park and adjacent properties will be reduced. Activities will include vegetation restoration and community engagement.	\$768,723
OC11-00883	The Trustee For Trust for Nature	VIC	Linked Landscapes and Community in the Wimmera's Buloke Woodlands and Biolinks	This project will protect and restore nationally threatened Buloke woodlands, assist the nationally threatened red-tailed black-cockatoo, and strengthen the ecological sustainability of the Wimmera.	\$624,000
OC10	Bellarine Catchment Network	VIC	Bellarine Ramsar wetlands and coastal hotspots biodiversity protection and enhancement through integrated coastal community engagement.	This project is a continuation of a highly successful innovative project that has built partnerships through an integrated program involving community, private landholders, government, non government organisations and industry. The Bellarine Catchment Network (BCN) (formerly the Swan Bay Integrated Catchment Management Committee) involves 20 organisations as part of the network. The delivery of an integrated program that is owned by the community will build capacity restoring coastal environments, Ramsar wetlands and deliver conservation projects. The BCN covers 137 km of coastline, including the marine Ramsar wetland of Swan Bay, Lake Connewarre Ramsar wetland (which both include critical habitat for Orange-bellied parrots), the Point Lonsdale section of the Port Phillip Heads Marine National Park and high conservation Coastal Moonah Woodlands. With multiple land managers including private landholders, the BCN is well placed to provide delivery of a program that engages coastal communities to deliver conservation outcomes for coastal hotspots and Ramsar wetlands.	\$100,000
CAG-726558-665	Anderson Inlet Landcare Group	VIC	Increasing biodiversity in the Anderson Inlet catchment area	This Project will build on our previous projects and will improve the water quality in the tributaries of Anderson Inlet and also the water quality on farms in the catchment. This will be done through a number of revegetation projects that will be strategically targeted on private land, aiming to create wildlife corridors/biolinks across the catchment. The projects will help control erosion through creating buffer strips of vegetation along the riparian zones of the Pound and Screw Creeks. The revegetation projects will enhance and extend the habitat for rare and endangered fauna species that use the creeks and the foreshore in the Anderson Inlet Catchment. These species include the orange bellied parrot, lace goanna and swamp antechinus.	\$20,000

Grant	Proponent	State	Title	Project description	Value
CAG-722232-536	Boonah Organisation for a Sustainable Shire	QLD	Fassifern Reserve Indigenous Bush Tucker Project	The Scenic Rim region is classed as a biodiversity hotspot, with inappropriate practices resulting in the biodiversity status being endangered. Warrill Creek runs into the Bremer River, classed as poor in the 2010 Ecosystem Health Report Card. It is also identified as koala and glossy black cockatoo habitat, both threatened species. Plantings will focus on local Indigenous bush tucker foods for both humans and animals, including blue gums and ghost gums for witchetty grubs, lemon myrtle, brigalow, she-oaks and eucalypts for glossy black cockatoo food and nesting, melaleucas for parrots, etc. Boonah Organisation for a Sustainable Shire would manage in collaboration with revegetation experts, traditional owners, council, the community and youth.	\$20,000
CAG-726570-667	Circular Head Landcare Group Inc.	TAS	Rice grass control in internationally important Robbins Passage, Boullanger Bay	Rice grass (<i>Spartina anglica</i>) is an invasive plant which colonises intertidal mud flats. Infestations threaten outstanding natural values; Duck Bay, Robbins Passage and Boullanger Bay have some of the largest sea-grass beds in Tasmania, the endangered orange-bellied parrot (<i>Neophema chrysogaster</i>) feeds during migration on native plants which grow in the intertidal area, and Robbins Passage and Boullanger Bay are internationally significant sites for 23 migratory birds, covered by Japan-Australia Migratory Bird Agreement, China–Australia Migratory Bird Agreement and the Bonn Convention. Monitoring, mapping and control measures have previously been funded by Tasmania’s Department of Primary Industries, Parks, Water and Environment, and Cradle Coast NRM. Circular Head Landcare Group want to continue the project.	\$20,000
CAG-727374-745	Fullerton Hadley Landcare Group	NSW	Building the ecological resistance of Southern Tableland Remnants	Fullerton Hadley Landcare recognized the loss of species once prolific within agricultural lands of the region including the iconic and now Environment Protection and Biodiversity Conservation listed vulnerable superb parrot. This and other species rely on old tree hollows present within box woodlands. In our district this type of habitat has decreased significantly in some locations by up to 90% with many more ancient individual specimens in their last years. With their loss, habitat connectivity and ecosystem functioning for species like the parrot were in trouble. This project will help address this loss of iconic species and biodiversity by increasing the extent, condition and connectivity of native remnant stands on five farms.	\$20,000
CAG-716832-191	Murdoch Environmental Restoration Group	WA	Breed & Feed Habitat Protection & Restoration for 2 Endangered Black Cockatoos	Murdoch University (MU) has resident endangered carnaby’s (CBC) and forest red-tailed black cockatoos (FRTBC). Numbers on campus have increased as habitat nearby is cleared and birds desperately seek food, shelter and breeding sites. A MU nest tube was the first to be used by a FRTBC, with two more currently being inspected. This project focuses on retention and expansion of specific CBC habitat on campus, for both species, which is critical for their long-term survival. This includes: fencing, weeding and revegetation of a key CBC roost site and FRTBC breeding site (woody pear reserve), maintenance of nest tubes and extensive planting of food/roost trees along a new wildlife corridor.	\$20,000

Grant	Proponent	State	Title	Project description	Value
CAG-729658-965	Wildlife Australia Incorporated	WA	Jarrah Forest in Decline: Controlling Ferals and Restoring Damaged Jarrah Forest	Wildlife Australia Incorporated (WAI) operates from the Kaarakin Black Cockatoo Rehabilitation Centre (BCRC) and is situated on the outskirts of Perth. It is surrounded by the Jarrah/Marri/Wandoo forest of Banywola Regional Park (BRP). The 18 hectare site is heavily impacted upon by feral foxes and cats that kill endemic fauna on site and in the surrounding BRP. WAI has a ongoing revegetation program to rehabilitate a severely degraded former wildlife park and eradicate feral animals. Both programs aim to reduce the impact of invasive flora and fauna species and promote and protect native fauna and flora in this biologically sensitive important area. This is in line with Caring for Our Country's five year plan in biodiversity and conservation.	\$19,810
CAG-727779-794	Yanchep National Park Volunteer Association	WA	Weed removal and revegetation to protect biodiversity at Yanchep National Park	Yanchep National Park (YNP) is an important conservation area which is under increasing pressure from invasive weeds. Invasive weeds impact on biodiversity and functioning of ecosystems through competitive displacement of native species. 133 weed species have been identified within YNP. This project aims to actively control infestations of invasive weeds, targeting Weeds of National Significance, Declared Weeds and Environmental Weed Strategy WA high priority species, at four sites within YNP. We propose to revegetate and restore one hectare of degraded bushland with native provenance species to maintain biodiversity and improve habitat, particularly for Carnaby's black cockatoo which is listed as endangered under the Environmental Protection and Biodiversity Conservation Act.	\$18,450
CAG-720393-393	Armadale Gosnells Landcare Group Inc	WA	Rehabilitation of Newell Loop, Southern River	This project will allow successful eradication of two Weeds of National Significance, bridal creeper and blackberry, on a 150m stretch of foreshore along the Southern River, Gosnells. The control of these two weeds will allow the native habitat to rejuvenate naturally and increase biodiversity of the area. The group will also be planting 4000 locally endemic seedlings to increase the wildlife corridor, stem erosion and improve water quality of the Southern River. The area is also a feeding ground for the endangered black cockatoo, which the group will continue to encourage by planting <i>Corymbia callophylla</i> (marri) seedlings. The weed control will be conducted by certified contractors and the planting will be done by Armadale Gosnells Landcare Group and local residents.	\$16,100
CAG-659649-10	Rummerys Hill Landcare Group	NSW	Community action to protect a regionally significant wildlife corridor in NE NSW	Land managers within a 100km uncleared regional wildlife corridor want biodiversity management information, skills and leadership to protect and improve the condition of this key native habitat. This project will foster community awareness and action to stop habitat degradation and protect local threatened species such as the koala, glossy black cockatoo, powerful owl and speckled warbler, across 11000 hectares centred on Rummerys Hill.	\$11,000
CAG10-00355	Central Natural Resources Management	SA	Increase community understanding of wetlands and their effect on salinity and nutrient	The project aims to increase community understanding of the value of wetlands in the Butcher Gap Conservation Park. The park is one of the last stands of coastal scrub between the Coorong and Robe and is home to the endangered orange bellied parrot. The Butcher Gap Drain divides the wetland area in the park and brings large amounts of fresh water each winter	\$10,800

Grant	Proponent	State	Title	Project description	Value
	Group		levels in the water and facilitate environmental education studies by the Kingston Area School	from the farmlands through the park and out to sea. Excess drainage has decreased groundwater recharge and reduced the opportunity for reed beds to filter excess nutrients and salts from the water before reaching the sea. The project will compare electrical conductivity and nutrient levels in the wetland with the conductivity levels in the drain, and highlight the biodiversity changes in the wetland area. Two school visits and two field days or community walks will be conducted. Information about nutrient and salinity levels will be provided as an extremely important tool to engage landholders whose properties adjoin the drain.	
CAG10-01092	Kowree Farm Tree Group	VIC	Fattening red-tailed black cockatoos - remnant buloke woodland rehabilitation program in the south-west Wimmera	Buloke woodlands are an endangered ecological community that provide a critical food resource for the Environmental Protection and Biodiversity Conservation Act 1999 listed red-tailed black cockatoo. To strengthen the existing remnant buloke woodland and provide more support for the cockatoo and other native species, the Kowree Farm Tree Group will recruit and manage three two hectare blocks of remnant buloke woodland on farms that have not previously participated in conservation activities. The group will plan site layout and management with landowners. Revegetation areas will be prepared with fencing ripping and weed control and school and community groups will be involved in planting 2000 buloke seedlings. Project objectives will be promoted in the community through a field day at earlier buloke conservation works. The project will raise the profile of on farm conservation in the community, a cultural change essential to preserving rehabilitation works as well as conserving older high yielding paddock trees to sustain the cockatoo and other native species.	\$20,000
CAG10-01039	Torbay Catchment Group Incorporated	WA	A Torbay wildlife corridor – completion of a vegetated corridor linking native remnant vegetation to adjoining bushland	This project will complete a vegetated corridor linking an adjoining bushland with a 2.5 ha stand of marri trees that are currently isolated. The habitat reconnection will provide a critical link for the endangered Carnaby's black cockatoo as well as other native fauna such as brush-tail and ring-tail possums. The Torbay Catchment Group will prepare the ground to be replanted, erect fencing with access gates, plant native vegetation and undertake post planting maintenance and weed control. Local students will be involved in the project and this will provide them with continuing suitable training for future work in natural resources management.	\$7,236
CAG09-00687	McKenzies Hill Action and Landcare Group	VIC	Rehabilitation of land and vegetation for, and education about the Brush Tailed Phascogale and the Swift Parrot	This project progresses a long term project on Lushington Bushland Reserve and Old Diamond Hill Reserve, areas degraded from the gold rush era and part of the drainage area for Campbell's Creek and wildlife corridor. Much of the surrounding land is owned by developers for residential and industrial expansion. Landcare group members have considerable holdings close to the reserves. Both reserves have mature Yellow Gum, Red and Grey Box with very little under storey. The issue of restoring the original ecosystem rich in diversity is a challenge for us and an objective, with a focus on educating the community about the urgency of protecting habitat for the brush tailed phascogale and the Swift Parrot. This would be achieved by weed eradication, the provision of nesting boxes; a public information and field day with an expert presenter; information in the local paper and newsletters; information boards at each of the reserves focusing on biodiversity and resident icons.	\$11,460

Grant	Proponent	State	Title	Project description	Value
CAG09-00160	Kooloonong Natya Landcare Group Inc	VIC	Bridal Creeper Eradication and Control and Revegetation of affected Corridor.	Bridal Creeper is increasingly invading dry land from infestations along riverine corridors and affecting roadside corridor vegetation. The project will control weeds from the dry land back to the river, and revegetate and strengthen a strategic habitat corridor that plays an important role in the movement of Mallee fowl and the Regents parrot. This corridor is currently the only weak link between large areas of Mallee which supports a large number of breeding Mallee fowl and is an important flight path and food source for Regents parrot. Consolidating the habitat corridor through invasive weed control and prevention will strengthen a large, broader area of habitat for key faunal species.	\$17,318
CAG09-00784	Wildcare Incorporated	TAS	Eradication of ecosystem transforming coastal weeds in SW Tasmania	This project will eradicate the ecosystem transforming weeds, sea spurge and marram grass from the Tasmanian Wilderness World Heritage Area and adjacent wild coastlines. If left untreated the weeds would be intractable in 3 years and ultimately invade all sand and boulder coasts. At risk are faunal (Tasmanian Devil) and avifaunal habitats (Little Tern, Fairy Tern, Hooded Plover, Red-capped Plover, Sooty Oyster Catcher, Pied Oyster Catcher and Orange Bellied Parrot), geoheritage and World Heritage values, Aboriginal cultural heritage and coastal vegetation communities. Sea spurge is an aggressive colonizer and will have a competitive advantage as rising sea levels destabilize coastlines.	\$18,182
CAG09-00842	Kowree Farm Tree Group	VIC	Saving Karak: Buloke conservation for Red-tailed Black Cockatoos	Of the 32 patches of degraded Buloke grassy woodland fenced in 2009 in the south west Wimmera., eleven sites on 11 farms require enhancement. This consists of ripping, weed control, planting seedlings and guarding. Also required is follow up weed control, erection of a sign on each site and a field day. Fences, seedlings and guards are already ordered and paid for. The other work is unfunded. Local contractors will prepare and provide aftercare. Three schools and three community groups together with the land-owners will plant and guard, which requires substantial supervision. Buloke grassy woodland has been depleted to two percent of its original extent. The south-eastern subspecies of the Red-tailed Black Cockatoo is rare and its population is limited by food shortage, particularly Buloke. Both Bulokes and Red-tailed Black Cockatoos are listed in the Environment Protection and Biodiversity Conservation Act 1999. This project addresses both on farm conservation and community involvement.	\$20,000
CAG09-00728	Murdoch University Guild of Students	WA	Provenance Seedling Purchases & Perimeter Fencing Installation for Carnaby's Habitat Restoration & Protection	The Banksia Woodland at Murdoch University is an essential feeding site for resident and summer flocks of endangered Carnaby's Black-Cockatoos. It is being degraded by arson; four wheel drives; motorbikes; weeds; illegal plant removal and dumping. Fencing is required to protect this Regional Park area. Planting of a weed buffer and restoration of the degraded Chelodina Wetland buffer area using provenance seedlings (especially Carnaby's Black-Cockatoo food plants) is also needed to protect key habitat and complete a wildlife corridor linking the Chelodina Wetland and Banksia Woodland, for Carnaby's Black-Cockatoos, quenda	\$14,050

Grant	Proponent	State	Title	Project description	Value
				and other biodiversity. This work will support investments to date, including seed collection and Chelodina Wetland fencing.	
CAG09-00323	Katanning Land Conservation District Committee	WA	Greening the Eastern Blackwood	This project will see 6.2 km of fencing erected and 17,000 local native seedlings planted to directly tackle three major environmental issues being faced in the Katanning area. The trees will provide protection against wind erosion, and with less than 10% native vegetation remaining, protection of remnant stands and increasing vegetation areas for nesting, feeding and dispersal is critical for local animals, including the endangered Carnaby's Black Cockatoo. Salinity is also a major environmental and agricultural concern leading to native vegetation deaths, collapse of waterways and reduced agricultural production, which the project aims to also address through an increase in deep-rooted vegetation.	\$20,000
CAG09-00019	Black Cockatoo Preservation Society of Australia	WA	To educate the public in building bio diverse gardens and land management practices in addressing the endangered species of Western Australia.	This project will control invasive weeds in an area of land near Martin in Western Australia, and revegetate with native species. The project will support native seed collection and infrastructure needed for propagating and establishing revegetation species. Engagement of local volunteers will aim for greater involvement and appreciation among the wider community. The regenerated landscape will support communities of native fauna including the endangered black cockatoo.	\$18,182
				Total	\$4,295,205

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