

ACT State of the Environment Report 2011

THEME: Biodiversity

Indicator cluster: Native species - fauna

The indicators for this cluster are:

- *Status of native species (C)* - status of native species including threatened species listings and other data for common species;
- *Threatened species conservation (R)* - effectiveness of threatened species conservation management; and
- *Native species conservation (R)* - native species population trends and management issues, such as kangaroo management.

Condition indicators (C) present data on the state of the environment at any particular time.

Pressure indicators (P) present data about the main human activities that could potentially adversely affect the condition of the environment.

Impact indicators (I) present data on the effects of environmental changes on environmental or human health.

Response indicators (R) present data about the main things we are doing to alleviate pressures, or to improve the condition of the environment.

Summary

The ACT has a diverse range of landscapes and ecological communities. They range from natural temperate grasslands on the tablelands to sub-alpine woodland and bog complexes in the mountains. The fauna living in these habitats are diverse, but 15 animal species are listed as vulnerable and 9 are listed as endangered under the ACT *Nature Conservation Act 1980*. Three new species (the Little Eagle, the Glossy Black-cockatoo and the Pink-tailed Worm Lizard) have been listed as threatened under the Act since the last reporting period.

A set of conservation Action Plans focusing on particular ecological communities, provides direction for the threatened fauna conservation effort in the ACT. An Action Plan for a species or community outlines proposals either to increase its conservation and protection or to minimise the effects of threatening processes.

Action Plans exist for all but 2 threatened species, the Little Eagle and the Glossy Black-cockatoo, and these are in preparation. Action Plans warrant individual review, which should include updating the performance criteria for each plan. This process should also address any deficiencies in data on population trends of threatened animal species in the ACT, such as the status of threatened woodland birds.

Introduction

This indicator cluster paper reports on the information available about the status of threatened and other native species in the ACT, along with actions being undertaken to secure the future of native fauna in the ACT. Fauna that are sensitive to changes in the environment can, by their presence, abundance or absence, be a valuable indicator of changing environmental conditions or impacts that may be otherwise hard to detect. Assessment of the effectiveness of native species conservation

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measures and pest management helps identify successes and/or gaps in regulation, programs and initiatives to improve future management.

Condition indicators

Status of native species

In total, 24 animal species are currently listed under the *ACT Nature Conservation Act 1980* (ACT Government 2011a), comprising 15 vulnerable and 9 endangered species. During the reporting period the Little Eagle (*Hieraetus morphnoides*), the Glossy Black-cockatoo (*Calyptorhynchus lathami*) and Pink-tailed Worm Lizard (*Aprasia parapulchella*) were listed as vulnerable (ACT Government 2011a). (Tables A1-A7 in the Annex give more detailed information.)

Action Plans have been developed in consultation with the ACT community for all species, ecological communities or threatening processes that are listed under the ACT Nature Conservation Act. These plans (TAMS 2006) outline conservation and protection proposals for the species or ecological community concerned, or proposals to minimise the effect of threatening processes. Monitoring of the threatened species is an action listed in the Action Plans; there is no wider census of native animals in the ACT.

Monitoring of native species in the ACT is carried out by a number of government agencies, university groups and community organisations. The ACT Government supports some university and community-based monitoring work through grants, scholarships, direct funding and technical support. Examples include monitoring of threatened grassland fauna by University of Canberra researchers, of woodland birds by the Canberra Ornithologists Group, and of frogs by the Frogwatch program volunteers.

Birds

The Canberra Ornithologists Group (COG) is the main organisation monitoring birds in the ACT. Each year COG produces an Annual Bird Report, which provides a valuable indication of trends in bird abundance within the Canberra region. During the reporting period bird species richness has remained stable in the ACT with around 233 species being recorded. Note that information the group collects about threatened species is generally insufficient to assess trends in populations because of the small sample size (Bounds et al. 2010).

During the reporting period, the drought and resulting dry conditions across south-eastern Australia meant that some inland bird species were seen in Canberra: for example, the Black-tailed Native-hen (*Tribonyx ventralis*), and Singing Honeyeater (*Lichenostomus virescens*), White Fronted Honeyeater (*Purnella albifrons*) and Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*), which are rarely seen in the ACT.

Regrowth in the wet forest areas following the 2003 fires has allowed resident species such as the Eastern Whipbird (*Psophodes olivaceus*) and Red-browed Tree Creeper (*Climacteris erythroptera*) to return to their pre-fire habitats. In spite of 2009-10 being significantly wetter than the previous years the continuing low levels of

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Lake Bathurst and Lake George reduced the number of wader species recorded at these sites and also within the ACT at sites such as the Jerrabomberra Wetlands.

The results of 10 years of woodland bird monitoring in the ACT (1998-2008) were published by COG in 2010 (Bounds et al. 2010). The results highlight the complexities of natural systems and show there is still a lot to learn about the factors influencing species abundance. Species that were reported in more than 1% of the surveys were analysed for trends in the numbers reported. In total 55 species were considered (34 woodland dependent species and 21 non-woodland species). Of these:

- 15 species (9 woodland-dependent) showed some evidence of a declining trend over the ten years;
- 25 species (17 woodland-dependent) showed no overall change; and
- 15 species (8 woodland-dependent) showed an increasing trend.

Why some species have increased while others declined is not clear.

It is of concern that species such as the Hooded Robin (*Melanodryas cucullata*) listed as vulnerable in the ACT and NSW) and the Diamond Firetail (*Stagonopleura guttata*) (listed as vulnerable in NSW but not listed in the ACT) have declined to a point where trends cannot be determined from the Woodland Project. The Scarlet Robin (*Petroica boodang*), recently listed as vulnerable in NSW but not listed in the ACT, continues to decline in the ACT. While the woodland bird survey provides a valuable record of trends of more common woodland birds it is clear that a targeted monitoring program is required to evaluate the status of birds present at low densities.

The trends of more common species with wider ecological tolerances (see bullet points above) may mask a continuing decline in woodland function, potentially highlighted by the status of more sensitive species like the Hooded Robin, which are sensitive to disturbance and require large areas of structurally diverse habitat (Freudenberger 1999). A targeted program that monitors population trends of sensitive species may provide more robust data on the status of woodland birds, allowing establishment of monitoring 'surrogates' for threatened populations.

One threatened woodland bird species that is on the increase in the ACT is the Superb Parrot (*Polytelis swainsonii*). The ACT is near the south-eastern extent of the summer breeding range for this species. The COG records indicate that numbers of Superb Parrots visiting the ACT during the spring breeding season have increased over the past few years. The reason for this increase is unclear; some possible explanations include an increase in the species' population, unfavourable conditions elsewhere in its distribution, or the attraction of foraging and nesting opportunities in the ACT. A targeted study during the 2009-10 breeding season by COG in the Gungahlin area identified breeding activity within the proposed suburb of Throsby. Behavioural observations suggested breeding may have also occurred in the central Molonglo Valley in the vicinity of the Kama Nature Reserve, south-west of Hawker. Both these areas have the potential to be directly or indirectly affected by proposed urban expansion zones.

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In contrast, the Little Eagle population appears to continue to decline. A nest study in 1990-1992 found 11 nesting sites actively in use by the species. In 2008 only 4 active nests were found. A similar decline has been noted in the Wedge-tailed Eagle (*Aquila audax*); 12 of 21 nests actively in use in 2002-03 were found to be abandoned in 2008. The continued population growth and urban expansion of the ACT is likely to further pressure large raptors because these species are often sensitive to disturbance by people during nesting.

With funding from the ACT Government, the Fenner School of Environment and Society at the Australian National University (ANU) has two PhD research studies investigating why woodland birds are apparently continuing to decline. The studies aim to identify urban planning design principles that are sympathetic to woodland bird conservation.

Amphibians

The ACT and Region Frogwatch program is a community frog-monitoring program that conducts a frog census in spring each year. The major aim of the program is to monitor frogs by involving community volunteers to help collect information about the presence and abundance of frog species.

During the reporting period, the three most commonly recorded species were Spotted Grass Frog (*Limnodynastes tasmaniensis*), Plains Froglet (*Crinia parinsignifera*) and Common Eastern Froglet (*Crinia signifera*). The Spotted Burrowing Frog (*Neobatrachus sudelli*) was detected during Frogwatch-monitoring at 4 sites in 2009, whereas during 2008 it was only recorded at 1 site; previously it had not been recorded since 2005.

The 2009 season appeared favourable for frogs: more species (10) were detected overall, and the average number of species detected at each site was higher than in previous years (GCG 2009). Rains prior to the 2009 census may have been responsible for the higher diversity of frogs recorded.

Numbers of the endangered Northern Corroboree Frog (*Pseudophryne pengilleyi*) are critically low and continued to decline during the reporting period. A chytrid fungus is now considered to be the primary cause of decline (Australian Government n.d.), and dry years have further reduced the species' breeding success. In the ACT there are now estimated to be fewer than 100 Northern Corroboree Frogs left in the wild, and wild populations are likely to become extinct within the next 5-10 years unless their decline can be halted (TAMS 2010a).

Invertebrates

Invertebrates are vital for ecosystem function and comprise a significant proportion of the species diversity of any ecosystem. Less is known about the status of invertebrates in the ACT than about other animal groups.

Two terrestrial invertebrates are listed under the ACT Nature Conservation Act: the Golden Sun Moth (*Synemon plana*), which is also listed as critically endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act*

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1999 (EPBC Act), and the Perunga Grasshopper (*Perunga ochracea*) (Australian Government 2011).

Recent surveys for the Golden Sun Moth since 2009 identified 16 new sites of occurrence for this species. Most of the new sites of occurrence are secondary grassland sites found throughout the areas of Gungahlin not yet under urban development. These sites generally appear to maintain relatively small Golden Sun Moth populations but they show, nonetheless, that this species is not exclusively a natural temperate grassland species as first thought. The Golden Sun Moth is now recorded in 60 sites across the ACT including large grassland reserves and small unreserved areas. Several Golden Sun Moth sites are located in future urban development areas. Any clearing of habitat should be avoided. Where such clearing is to occur, funding paid as compensation by developers will contribute to research to improve understanding of the ecology and biology of this species.

There is no practical method of survey for the Perunga Grasshopper and so information on its abundance and distribution in the ACT continues to come from opportunistic sightings by the public or during surveys for other species.

It is likely that other invertebrates that are associated with Lowland Woodlands and Lowland Native Grassland communities within the ACT have suffered similar declines to the Golden Sun Moth and Perunga Grasshopper. An absence of baseline data and subsequent surveying means that any such population declines have gone unnoticed. Other insect species identified as species of concern in the Action Plans for threatened species and ecological communities within the ACT include the Canberra Raspy Cricket (*Cooraboorama canberrae*), Key's Matchstick Grasshopper (*Keyacris scurra*) and Lewis's Laxabilla Grasshopper (*Laxabilla smaragdina*). No formal monitoring has been undertaken for these species, though opportunistic sightings are recorded and collated.

During the reporting period research, the ecology of crayfish in the Cotter and Murrumbidgee rivers was studied as part of the development of the Enlarged Cotter Dam Fish Management Plan. It was found that the Murray River Crayfish (*Euastacus armatus*) continues to have a patchy distribution in the Murrumbidgee River and lower Cotter River within the ACT. The species was most often found where public access was difficult, and most catches were of individuals that had not yet reached sexual maturity.

Mammals

Fauna surveys in Namadgi National Park and Tidbinbilla Nature Reserve have shown that small mammal populations, devastated by the 2003 bushfire, have recovered to about pre-fire levels. Examples are the Agile Antechinus (*Antechinus agilis*), Dusky Antechinus (*Antechinus swainsonii*) and Bush Rat (*Rattus fuscipes*). In particular, the Dusky Antechinus, a fire-sensitive species, was not recorded again until 5 years after the 2003 fire. This species has now been recorded at 2 locations in Namadgi National Park, indicating a slow population recovery.

Surveys by the ACT Government in urban nature reserves have not detected any small mammals, indicating that some small mammal species (such as the Brown

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Antechinus (Antechinus stuartii), Common Dunnart (*Sminthopsis murina*) and Bush Rat are either absent or occur at very low density (PCL). Historical data indicate that small mammals were present in significant numbers in these reserves 2 decades ago. The decline of small ground-dwelling mammals in Canberra's urban nature reserves has been attributed to habitat fragmentation, reduced groundcover (through fire and clearing) and predation by foxes and cats. Studies indicate that the Common Dunnart is still present at Mulligans Flat and Goorooyaroo nature reserves. There are some data to indicate recovery of the Common Dunnart within the predator-proof fence in Mulligans Flat Nature Reserve.

Information on the current status of all threatened animal species listed under the ACT Nature Conservation Act can be found in Tables A1-A7 in the Annex to this paper.

Reptiles

The ACT is home to three reptile species listed as threatened under the ACT Nature Conservation Act: the Grassland Earless Dragon (*Tympanocryptis pinguicolla*), the Striped Legless Lizard (*Delmar impar*) and the Pink-tailed Worm Lizard (*Aprasia parapulchella*) (ACT Government 2011a). All three are also listed as threatened under the Commonwealth EPBC Act (Australian Government 2011), with the Grassland Earless Dragon listed as endangered.

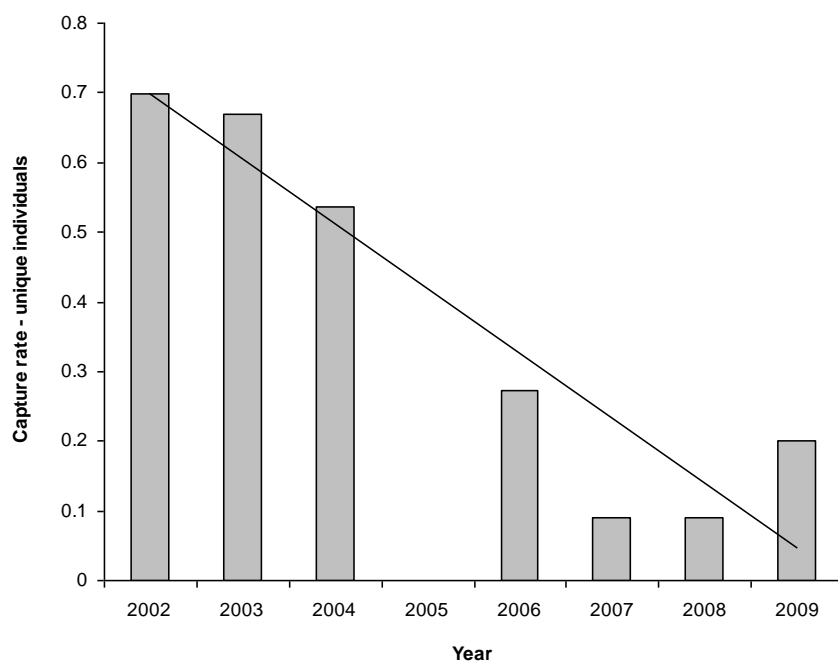
In the ACT, the Grassland Earless Dragon is found in two disjunct populations, one in the Majura Valley and one in the Jerrabomberra Valley. The species has been monitored at the Majura Training Area since 2002 and at the Jerrabomberra Grasslands Reserve since 2005, and it has been the subject of surveys at a number of other locations in the ACT by University of Canberra researchers. The results show a dramatic decline in the Grassland Earless Dragon since 2005 across the species distribution in the ACT; currently it is found in very low numbers (Diamond 2010).

Loss and degradation of habitat are the main causes of decline, and development proposals are still current for a number of sites where the species is known to occur. Monitoring since 2002 (Figure 1, based on occupancy of burrows) has found that the population of the species declined during 2005 and 2006, largely the result of drought, exacerbated by loss of cover through overgrazing (TAMS 2010a). Research indicates a real risk of extinction of the species in the ACT within the next 10 years if current trends continue. If this occurs, this species could become the first confirmed reptile extinction in Australia since European settlement (Diamond et al. unpublished).

The predicament of the Grassland Earless Dragon after this significant decline in numbers was highlighted in the *2007-08 State of the Environment Report*. The report recommended urgent action to relieve the pressure of grazing by kangaroos at the site of the Majura population.

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Figure 1. Monitoring results for the Grassland Earless Dragon at the Majura Training Area, ACT, 2002-2009, with trend line (no data are available for 2005)



Source: TAMS 2010a

Plans for urban expansion in the Lower Molonglo Valley have prompted pre-development studies including a number of surveys for the Pink-tailed Worm Lizard and mapping of the species' habitat in the Molonglo and Murrumbidgee river corridors. These maps and data provide baseline data that are valuable to guide current and future urban planning and conservation management actions for the species. The results show that substantial areas of habitat exist in the river corridor (Wong and Osborne 2010a, 2010b). While much of the habitat has been set aside for protection from development, some fragmentation of habitat and effects such as extra weeds, fire, rock removal, trampling and contamination by nutrients, from adjacent new urban areas are still likely to have an impact on the species.

The Striped Legless Lizard occurs in three grassland reserves set aside for its conservation in the north of the ACT (Mulanggari, Crace and Gungaderra) as well as on Commonwealth land in the Jerrabomberra valley. Substantial areas of habitat also lie outside these reserves and are subject to planned urban development. The results of pre-development surveys indicate that the species is still present in reasonable numbers in suitable habitat.

A study by members of the Institute for Applied Ecology at University of Canberra (Roe et al. 2011) on freshwater turtles in Gungahlin found the species to be relatively common in urban areas and in nature reserves, and no evidence that suburbs were having an overall impact on the population. Losses through road deaths were

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compensated by the extra wetland habitat in the urban area. The research identified road-death hotspots and potential locations for barriers to reduce turtle mortality on roads.

Fish

Two-spined Blackfish (*Gadopsis bispinosus*) in the ACT occur only in the Cotter River, above, but not in, the Cotter Reservoir. The population appears to be recovering in the lower Cotter (below Bendora Dam) following on from the effects of the 2003 bushfire, which is likely to result from the environmental flows in that reach. Data indicate an increase in fish numbers and breeding records at the lower sites (TAMS 2010a). Fish numbers in the unregulated upper Cotter River (above Corin Dam) have been variable, reflecting responses to environmental conditions such as drought and flooding. An increased proportion of juveniles found in 2010 at sites that receive regulated environment flows suggests that there have been improvements in habitat quality following the 2003 fire and that environmental flow releases have been effective at mitigating the effects of the recent drought (TAMS 2010a).

Two populations of Trout Cod (*Maccullochella macquariensis*) occur in the ACT region: in Bendora Reservoir on the Cotter River, and in the Murrumbidgee River. Both result from conservation stocking. The Bendora Reservoir population appears to have reproduced infrequently since 2004, which may be related to variations in water level; the population appears to have smaller numbers of fish but of a larger size. No juvenile Trout Cod were caught in Bendora in 2010. It is encouraging that these relatively large Trout Cod are surviving in Bendora Reservoir, where the ACT's largest recorded specimen was caught in 2010. A single Trout Cod was captured from the Murrumbidgee River stocking sites during 2010. The low capture rate may be related to extensive dispersal of individuals from the stocking site within the 2 years (TAMS 2010a). In Autumn 2011, a juvenile Trout Cod was recorded at Angle Crossing on the Murrumbidgee River for the first time since stocking ceased in 2005, suggesting that the stocked population is now breeding.

The status of the Macquarie Perch (*Macquaria australasica*) population in the Cotter River has improved since 2003, and numbers counted in the annual monitoring remain consistently high. It appears that Macquarie Perch are becoming well established in the Cotter River upstream of the Cotter Reservoir, assisted by a fishway installed at Vanities Crossing. As part of mitigating adverse effects of enlarging the Cotter Dam, the developer has committed to improving the road crossings for fish at Pipeline and Burkes creek crossings to help extend the available range and habitat for Macquarie Perch in the Cotter River (TAMS 2010a). However, this is yet to occur because of construction delays and high river flows. In the Queanbeyan River, the population of Macquarie Perch has reduced to below detectable limits. The Queanbeyan River was not surveyed in 2009-10 but it is proposed to resurvey the site now there have been 1-2 years of average or better flow (TAMS 2010a).

The expanded range of Macquarie Perch may result in additional illegal and/or inadvertent capture of this species by anglers despite the species' protected status.

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An increased visibility of rangers, and enforcement of fishing regulations in the open section of the Cotter River, particularly during the breeding period of October to December, is warranted to reduce potential impacts of fishing (TAMS 2010a).

Silver Perch (*Bidyanus bidyanus*) are surveyed during the bi-annual Murrumbidgee River fish survey. Silver Perch have not been captured in the Murrumbidgee River for 20 years within the ACT (TAMS 2010a).

Further information on aquatic condition in the ACT is included in the *Rivers, lakes and wetlands health* indicator cluster paper.

Pressure indicators

There are no Pressure indicators for this indicator cluster. Many pressures on fauna populations arise from local factors related to the growing population of the ACT: for example, increases in roads and traffic, impacts of hazard reduction activities to reduce the threat of bushfires, and firewood gathering. Other pressures operate at a larger scale, such as effects attributed to climate change. These pressures are examined in detail in the *Threatening processes* indicator cluster.

Impact indicators

There are no Impact indicators for this indicator cluster. Impacts on fauna are discussed in detail in the *Threatening processes* indicator cluster. Threatening processes currently affecting fauna in the ACT include:

- weed invasions, resulting in habitat degradation, added fire hazard, and suppression of native plant species needed by the fauna;
- pest animal invasions, resulting in habitat degradation, added likelihood of parasites and diseases, competition for common food sources, and predation;
- ecological degradation and habitat loss, resulting from overgrazing by stock, rabbits and kangaroos; and
- urban development and associated impacts of an increased human population, including loss and fragmentation of habitat and predation by domestic pets.

Response indicators

Threatened species conservation

Listed species

Legal protection is an important component in species conservation. In May 2011, the Nature Conservation (Special Protection Status) Declaration (ACT Government 2011b) was added to the ACT Nature Conservation Act. This ensures that species

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listed nationally as threatened under the EPBC Act automatically receive special protection status in the ACT.

Such species, although given legal protection in the ACT, are not always included in the ACT Action Plans that provide direction for the conservation of fauna in the ACT. However, national recovery plans are generally prepared for EPBC-listed species and the ACT is guided by those.

The process for declaring a threatened species in the ACT (and subsequent preparation of an Action Plan for that species) requires a nomination to be made to the ACT Flora and Fauna Committee by a person or organisation. The Flora and Fauna Committee considers new nationally listed species and NSW listed species at each of its quarterly meetings, to determine whether consideration should be given to nominating the species under ACT legislation.

Species that do not yet justify nomination but are considered close to meeting the criteria should be the subjects of monitoring, research and subsequent reporting.

Action Plans

Conservation of threatened animal species is guided by Action Plans that outline conservation goals, objectives and actions for the conservation of relevant ecological communities or habitat, and the threatened species that inhabit them (TAMS 2006).

Assessing the implementation and effectiveness of these Action Plans in terms of threatened fauna recovery is, in many cases, hampered by a lack of data. As one example, already mentioned, data collected in the woodland-bird monitoring program are not sufficient for accurate assessment of the status of threatened woodland birds covered by ACT Lowland Woodland Conservation Strategy: Action Plan 27 (Bounds et al. 2010). It is acknowledged that monitoring can be costly, and in some cases no feasible monitoring method has been developed, but data management is not helped when data gathered for other purposes are not pooled. For example, data from surveys by consultants before urban development are often held in planning and development units of the ACT administration rather than being shared with the teams managing biodiversity across the ACT.

Implementation of a number of the Action Plans has been reviewed by the ACT Flora and Fauna Committee during the reporting period:

- *ACT Lowland Woodland Conservation Strategy: Action Plan 27* (for the period 2004-2010); and
- *ACT Lowland Grassland Conservation Strategy: Action Plan 28* (for the period 2004-2008);
- *ACT Aquatic Species and Riparian Zone Conservation Strategy: Action Plan 29* (for the period 2007-2010).

The reviews found that many of the performance indicators relating to fauna recovery have been addressed to some extent. However, there is a lack of population trend data in these review reports, and therefore it is unclear if the

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actions undertaken have been effective in terms of species recovery. The reports of Action Plan reviews should be made publicly available.

The three ecosystem-based Action Plans listed above are comprehensive and provide a strategic approach to biological conservation in the ACT. If the specific actions for species recovery were to be put into an order of priority, then a ranking could be developed for conservation actions, including monitoring of population trends, for particular threatened species and ecosystems, based on their cost-effectiveness. This approach has been used in New Zealand (Joseph et al. 2009a), and in NSW in the preparation of threatened-species priority action statements (Joseph et al. 2009b). It is also recommended in the review of the EPBC Act (Hawke 2009) for prioritising the various aspects of recovery management in Australia.

Monitoring

It is important that trends in the populations of threatened species be monitored to support the successful management of the species (Joseph et al. 2009b, Diamond et al. unpublished). Monitoring is often a costly and difficult task because populations can be small and individuals may be cryptic. For some threatened ACT species, such as the Perunga Grasshopper, no practical survey methods exist.

The ACT Government and associated research teams have been actively addressing the problem of surveying cryptic threatened species: for example, a method for assessing the abundance of the Grassland Earless Dragon uses artificial burrows. This technique is now accepted nationally for best practice monitoring of the species (TAMS 2010a). Different artificial shelters using tiles are being trialled for monitoring the Striped Legless Lizard (TAMS 2010a).

In 2010 the ACT Government released guidelines on monitoring the Golden Sun Moth, with the aim of promoting a consistent and reliable method for determining the species distribution and/or its abundance at sites in the ACT. The guidelines are consistent with survey guidelines for the species under the EPBC Act (Australian Government 2011).

Research

Research during the reporting period has added to knowledge about the threatened fauna species in the ACT (Table 1). Many of the research projects are collaborations between the ACT Government and tertiary institutions such as University of Canberra (UC) and the Australian National University (ANU). A significant proportion of the threatened species research has been associated in some way with infrastructure developments such as the Enlarged Cotter Dam and urban expansion projects. Given the challenges posed by monitoring and data management, it is essential that the research findings are made accessible to all those who are responsible for managing biodiversity and conservation in the ACT, and in as timely a manner as possible.

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Table 1. Examples of research projects with a focus on threatened fauna (ECD = Enlarged Cotter Dam)

Project	Undertaken by	Outcomes/description
Large biota project	ACT Government (pre-development study)	Radio-tracking methods for 4 fish species, 1 crayfish, 1 reptile species and 1 mammal trialled in the laboratory and field situations. Diet movements and habitat preferences of Macquarie Perch in Cotter Reservoir determined. Research recommendations used to guide reservoir, river management and construction of the ECD.
Constructed homes project, Murray Crayfish and other projects for Enlarged Cotter Dam (ECD) management	UC, ANU, ACT Government (pre-development study)	Artificial habitat use by Macquarie Perch assessed and ECD construction activities guided by recommendations. Movement patterns of Two-spined Blackfish in Bendora determined. Murray Cray survey techniques and densities determined; swimming speeds of Macquarie Perch and alien fish species in the Cotter determined to help understand and manage fish passage.
Pink-tailed Worm Lizard habitat mapping project	ACT Government and UC	On-ground mapping and modelling
Pink-tailed Worm Lizard habitat mapping project (Molonglo)	ACT Government and UC (pre-development study)	Detailed mapping of Pink-tailed Worm Lizard habitat and ground truthing, including rock-rolling surveys along the Molonglo Valley
Local genetic population structure of Macquarie Perch	The University of Adelaide, ACT Government and ECD Construction	Macquarie Perch population in ACT Region distinct at a local level. Cotter population secure; Queanbeyan River population in genetic stress and Upper Murrumbidgee population showing potential structuring. Project helps to understand genetic population size and distinctiveness to guide potential re-introductions.
PhD research study on Golden Sun Moth	ACT Government and UC	Study of ecology, habitat requirements and genetics
PhD and Honours research studies on Grassland Earless Dragon	ACT Government and UC	Studies of ecology, population modelling, habitat requirements and genetics
Captive breeding of Northern Corroboree Frog	ACT Government	The species was successfully bred in captivity for the first time in 2008 and now there are over 1000 individuals in captivity
Striped Legless Lizard survey method development	ACT Government	The use of artificial shelters (concrete tiles of various reflective properties and wooden blocks) has been trialled as an alternative survey method to the usual pitfall trapping method
Calcein marking	ACT Government	A marking method for Macquarie Perch was successfully

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Project	Undertaken by	Outcomes/description
trial of Macquarie Perch	and ECD Construction	developed and over 400 juvenile Macquarie Perch were marked and released into Cotter Reservoir with the assistance of University of Canberra.
Goorooyarroo	ANU, ACT Government	Small mammal diversity and abundance in Goorooyarroo Bird diversity and abundance in Goorooyarroo
PhD research on threatened woodland birds	ANU, ACT Government	Conservation of woodland birds in the ACT and in Molonglo/urban areas (including boundaries with nature reserves)
PhD research in Mulligans Flat – Goorooyarroo	ANU, ACT Government	Brown Treecreeper reintroductions, and bird-banding project

Source: Compiled from TAMS 2008, n.d; OCSE 2011

Key actions

Mulligans Flat Woodland Sanctuary

In 2009 a 450 ha woodland sanctuary was established in the Mulligans Flat Nature Reserve by the construction of an 11.5 km predator-proof fence. The project aims to restore the woodland ecosystem that was present before European settlement, and reintroduce locally extinct fauna.

A strong emphasis is placed on supporting research into the ecology and restoration of woodlands. The ACT Government and researchers from ANU are using the site to investigate management manipulations, with the aim of improving woodlands for biodiversity.

Captive breeding programs

The previous *State of the Environment Report* highlighted the plight of the Northern Corroboree Frog and reported on the initiation of a captive-breeding program by the ACT Government at Tidbinbilla Nature Reserve. During the current reporting period significant breakthroughs have been made. The species was successfully bred in captivity for the first time in 2008, and subsequently breeding was successful in 2009 and 2010. There are currently around 1000 individuals held in captivity.

Decline in the wild populations is thought to be caused by a species of chytrid fungus (*Batrachochytrium dendrobatidis*) which is now widespread in the environment and all over the world, and is unlikely ever to be eradicated. However, there is some evidence that frog species in northern Australia are able to survive with the fungus at endemic levels (e.g. Retallick et al. 2004), and in frog populations elsewhere in Australia there is evidence that some individuals are resistant to the fungus (DECCW 2009).

The captive breeding program has two aims: first, to breed a population to ensure the species' survival in the event of the wild population becoming extinct; and also, to release frogs into the wild to bolster wild populations and enable natural disease resistance to develop. The National Corroboree Frogs Recovery Team and other experts in amphibian species recommended these actions, to support development of natural disease resistance in the wild populations.

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For the Grassland Earless Dragon, similarly, the possibility of establishing a captive breeding program is being investigated (TAMS 2011b). Such a program, along with protection of its habitat could help to prevent extinction of the species.

Further actions undertaken to conserve threatened animal species during the reporting period are included in Tables A1-A7 in the Annex.

Native species conservation

The preservation both of habitat and of connectivity between reserves is paramount to the conservation of native species. The ACT Government currently maintains a comprehensive reserve system that covers over 50% of the Territory. Its ecosystem management approach aims to conserve habitat for a range of native animal species (see the *Ecological communities* indicator cluster for more information on connectivity).

Effective conservation activity needs data. As already mentioned, monitoring data for frog and bird species are collected by community groups and made available through individual reports. However, to improve the accessibility and usability of fauna distribution and abundance data collected in the ACT, they could be added to the Atlas of Living Australia¹, along with other research data. Entering ACT data in the Atlas of Living Australia database would also mean that ACT data could contribute to other large databases such as the NSW Wildlife Atlas and Birds Australia database.

Research

During the reporting period the ACT Government's Nature Conservation Policy Section (NCPS) has been involved in the establishment and operation of several significant research projects relevant to native fauna and their habitat within the ACT. Key research areas have included woodland restoration and kangaroo management.

Upper Murrumbidgee Demonstration Reach Project

The concept of a demonstration reach is an initiative under the Murray-Darling Basin Authority Native Fish Strategy, with the aim of improving fish habitat in the river. The Upper Murrumbidgee Demonstration Reach project began in 2009 after a cooperative of government and community groups successfully applied for funding from the Australian Government Caring for Our Country fund (ACT Government 2010b). The demonstration reach is 100 km long and the project aims to improve native fish habitat and showcase the cumulative benefits of many management

¹ The Atlas of Living Australia is a national initiative focused on making Australia's biodiversity information more accessible and useable online. It is a partnership between CSIRO, Australian museums, herbaria and other biological collections, and the Australian Government.
<http://www.ala.org.au/>

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interventions along this single river reach between Bredbo (NSW) and Casuarina Sands Reserve (ACT). Further information can be found in Sustainability Stories.

Woodland restoration

The Mulligans Flat Woodland Sanctuary is the setting for the Mulligans Flat - Goorooyaroo Woodland Experiment. This project is a partnership between researchers at the ANU, the ACT Government and CSIRO, which aims to assess ways of restoring Yellow Box-Red Gum Grassy Woodland to support biodiversity. Work completed so far by the researchers has generated over 10 publications in national and international journals with several others in preparation.

Some of the findings from the experiment include: heavy grazing by kangaroos can have negative effects on beetle abundance and beetle species richness; addition of logs can have positive effects on beetle diversity by acting as refuges for the insects where grazing is heavy (Barton et al. 2011); beetles can act as an indicator of broader species richness in an ecosystem; and beetles are a food resource for insectivores. These findings and others have significant implications for the conservation of biodiversity in box-gum grassy woodlands.

Seven groups of Brown Treecreepers (*Climacteris picumnus*) were released in Mulligans Flat and Goorooyaroo nature reserves in November 2009 following woodland restoration. Monitoring of the success of the reintroduction and of the types of habitats used is expected to provide useful information on the habitat requirements of the species. It should help identify the reasons for the decline of the species from this area, which is useful information for management of these reserves.

Continued restoration of the Mulligans Flat Woodland Sanctuary, including the translocation of animal species such as the Eastern (or Tasmanian) Bettong (*Bettongia gaimardi*), is expected in the future (Manning 2011).

Kangaroo management

The ACT Government has prepared a Kangaroo Management Plan (TAMS 2010b) which considers the environmental impact of high densities of Eastern Grey Kangaroos, along with animal welfare and human welfare.

In 2009 the ACT Government began an annual kangaroo culling program in urban and periurban nature reserves that contain endangered ecological communities vulnerable to overgrazing. An average kangaroo population size has been calculated for each reserve based on new mapping of the forest, woodland and grassland extent in each reserve, and predictions from an interactive kangaroo-pasture model. This target population size is intended to be sufficient to provide enough grazing pressure and disturbance for the conservation of many plant species, while being low enough to enable relatively abundant ground layer vegetation to persist, as required by many small animals. The counted population of kangaroos is then reduced annually to achieve that target population, on average.

Research has also been improving understanding of the movements and home ranges of kangaroos in urban Canberra. Using GPS tracking collars, a pilot study has

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recorded the movements of 25 individual kangaroos over two years. Preliminary results suggest that home ranges in the suburbs are similar to those occupied by non-urban kangaroos, and they are surprisingly small for such a large species capable of rapid and sustained travel. A novel finding is evidence of road sense, with the kangaroos being more wary of roads with higher speed. Interestingly the study shows that while kangaroos generally stay within a defined home range some of the kangaroos monitored occasionally undertook apparently purposeful excursions of up to several kilometres, returning the same day or after a few days. Further research into the movement of urban kangaroos will help inform management and planning decisions to minimise the incidence of kangaroo vehicle collisions in the ACT (TAMS 2010b, 2010c).

Grazing by kangaroos is among threats to grassy ecosystems identified in Action Plans 27 and 28. The plans include actions for identifying and monitoring threats (including grazing) to ensure the recovery of the grassy ecosystems. The Office of the Commissioner for Sustainability and the Environment identified a number of grassy ecosystems as being overgrazed and approaching a threshold from which they will be difficult to rehabilitate. In 2009 a monitoring program was begun to measure the condition of vegetation and the density and off-take of vegetation by kangaroos at a number of grassland and woodland Nature Reserves. No comparisons between the vegetation parameters and the abundance of kangaroos have been undertaken, because additional annual records are required to allow for a comprehensive analysis (TAMS 2010a).

In relation to kangaroo fertility, the ACT Government has been supporting two research projects - one in partnership with the Marsupial Research Laboratory (at the University of Newcastle), and one with a group in CSIRO funded by the Invasive Animals Cooperative Research Centre. Both are developing immunocontraceptive vaccines that are expected to cause infertility in macropods several years after inoculation. The vaccines have the potential to be developed for delivery in food such as pellets, meaning there is the possibility of using them to control wild kangaroo populations. See the *Threatening processes* indicator cluster for additional information.

Community engagement

Community groups make an important contribution to biodiversity conservation and management in the ACT. Volunteers from organisations such as Frogwatch, Parkcare, Landcare, Greening Australia and the Canberra Ornithologists Group are active in monitoring and managing biodiversity in ACT nature reserves.

For more information on the role of community groups in conservation see the *Community engagement* indicator cluster in the *People* theme.

Glossary

Biodiversity: the variability among living organisms from all sources (including terrestrial, aquatic, marine and other ecosystems and the ecological complexes of which they are part), at all levels of organisation, including genetic diversity, species diversity and ecosystem diversity

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Chytrid fungus: The chytrid fungus *Batrachochytrium dendrobatidis* (itself commonly known as Chytrid) is responsible for a recently discovered disease of amphibians, chytridiomycosis. Discovered in 1998 in Australia and Panama this disease is known to kill amphibians in large numbers, and has been suggested as a principal cause for the worldwide amphibian decline. The actual process leading to mortality is, however, unknown. A popular theory is the fungus hardens the skin of amphibians which hinders respiration.

Connectivity: habitat connectivity is the degree to which an organism can move around the landscape using adequately spaced patches or bands of habitat. For fauna, connectivity has been defined as the degree to which the landscape facilitates or impedes movement among patches

Ecological community: naturally occurring groups of plants and animals. Their species composition can be determined by factors such as soil type, position in the landscape, climate and water availability

Ecosystem: a dynamic combination of plant, animal and micro-organism communities and their non-living environment (e.g. soil, water and the climatic regime) interacting as a functional unit. Examples of types of ecosystems include forests, wetlands, grasslands and tundra.

Habitat fragmentation: the result of removal (usually by clearing) of large parts of a natural area, resulting in the retention of only small parts (fragments or remnants) of habitat.

Species: a level of biological classification comprising one or more populations of individuals capable of interbreeding to produce fertile offspring

Threatened species: species categorised as, in order of increasing threat, *vulnerable*, *endangered*, or *critically endangered*. Although *threatened* is the term generally used to refer to species in any of the three categories, the term *vulnerable* can be used interchangeably with it, because those in the more at-risk categories of threatened species (namely *endangered* and *critically endangered*) must, by definition, also qualify as vulnerable.

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Other data sources

In addition to these published reports, data for this paper were also sourced from:

ACT Department of Territory and Municipal Services (TAMS) -now Territory and Municipal Services Directorate (TAMSD)

ACT Department of the Environment, Climate Change Energy and Water (DECCEW) - now Environment and Sustainable Development Directorate (ESDD)

NSW Department of Environment, Climate Change and Water - now the Office of Environment and Heritage within the Department of Premier and Cabinet

Canberra Ornithologists Group (COG)

Parks, Conservation and Lands (PCL) - now part of the Environment and Sustainable Development Directorate (ESDD)

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Annex A: Status of Animal Species listed under the *Nature Conservation Act 1980* in the ACT

(NC Act = ACT *Nature Conservation Act 1980*; EPBC Act = national *Environment Protection and Biodiversity Conservation Act 1999*)

CPR stands for the ACT Conservation Planning and Research team)

Table A1. Status of Birds

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Swift Parrot (<i>Lathamus discolor</i>)</p> <p>NC Act - Vulnerable</p>	<p>Reported in ACT every second or third year; 5 sightings recorded in the ACT in 2008-09 compared with 8 in 2007-08; only 1 record in 2009-10.</p>	<p>Main pressure is clearing of critical over-wintering habitat features (winter flowering eucalypts and eucalypts carrying lerps).</p>	<p>The migratory nature of this species means that it cannot be conserved in the ACT, but protection of known and potential Swift Parrot habitat on rural leases and federal land has been pursued through Land Management Agreements and a memorandum of understanding with federal agencies. See ACT Action Plan 27 (2004) for proposed conservation actions.</p>	<p>Woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010).</p> <p>Small numbers and migratory nature make assessment difficult.</p>
<p>Superb Parrot (<i>Polytelis swainsonii</i>)</p> <p>NC Act - Vulnerable</p> <p>EPBC Act - vulnerable</p>	<p>In the ACT the species is regarded as a non-breeding summer migrant restricted to the north western area of the ACT. However in recent years the number of sightings in the ACT have increased. Breeding has been confirmed in the Gungahlin area and is suspected in the central</p>	<p>Main pressure on this species is loss and fragmentation of habitat, and lack of large living and dead trees with hollows for nesting sites. Urban expansion has the potential to impact on this species in the ACT. Species commonly feeds on ground on spilt grain and many are struck by motor vehicles. Trapping for aviary trade occurred in past, but</p>	<p>See ACT Action Plan 27 (2004) for proposed conservation actions.</p> <p>Surveys for breeding sites in areas proposed for urban expansion in Gungahlin have been undertaken. Results will inform the development layout to conserve important habitat.</p>	<p>General woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010).</p> <p>Threat of habitat loss through urban expansion.</p> <p>Further research, surveys and careful planning will be required to ensure the continued use of</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
	Molonglo Valley.	present extent is unknown and is likely to be a far less significant threat than habitat loss.		habitats within and adjacent to proposed urban expansion. Opportunities exist to restore degraded woodland and improve habitat for the species.
Regent Honeyeater (<i>Xanthomyza phrygia</i>) NC Act - Endangered EPBC Act - Endangered	ACT reports show a decline from the 1960s with sightings now single birds, pairs or small flocks. Considered a rare breeding visitor in the ACT. There was 1 record of this species in both the 2008-09 and 2009-10 seasons; the last records for this species before that were in 2005.	The main pressure is loss of rich flowering eucalypts from fertile river flats and lower slopes.	While the species requires conservation at a landscape scale, within the ACT the species will benefit from the protection of woodland areas with large Yellow Box and mistletoe (e.g. Mulligans Flat Nature Reserve). The species is included in the ACT Action Plan 27 (2004).	Woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010). The long-term future of the species remains uncertain in the ACT and is largely dependent on conservation efforts outside the ACT within the remainder of the species range.
Painted Honeyeater (<i>Grantiella picta</i>) NC Act - Vulnerable	The species is considered a very rare vagrant to the ACT. An influx of the species occurred in 2002-03 with reports of breeding (Lenz and Dabb 2003). There were no ACT records for the species in the 2007-08 season and only 2 records in the 2008-09 season. During the 2009-10 season 2 birds were reported 5 times including a record of a breeding attempt.	The main pressure appears to be loss of habitat - woodland with older trees and Mistletoe (<i>Amyema</i> spp.).	Habitat along the Murrumbidgee River corridor and within woodland has been protected in reserves, but because of its general scarcity, specialised diet and nomadic habits, the species cannot be effectively protected in reserves alone. For proposed conservation actions refer to ACT Action Plan 27 (2004).	Woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010). Conservation efforts outside the ACT in the remainder of the species range will determine the levels of habitat usage within the ACT.
White-winged	Relatively high numbers of	Degradation of woodland habitat	For proposed conservation	Woodland bird monitoring is

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
Triller <i>(Lalage sueurii)</i> NC Act - Vulnerable	sightings (101, 124, 124) were recorded by COG in the 2007-08, 2008-09 and 2009-10 seasons respectively. These numbers are up on the previous years' results (<85)	including removal of fallen timber and litter, weed invasion, overgrazing, rural tree dieback. An additional threat comes from predation by feral and or domestic animals.	actions refer to ACT Action Plan 27 (2004).	inadequate to determine the population trends of threatened species (Bounds et al. 2010), but there is evidence that numbers of this species fluctuate from year to year.
Glossy Black-cockatoo <i>(Calyptorhynchus lathamii)</i> NC Act - Vulnerable	This species is considered a rare visitor. There were 20 records in 2006-07, 1 record in 2007-08, 7 records in 2008-09 and 6 records in 2009-10; 2 records of breeding were made during the reporting period. Most records come from Mt Ainslie/Mt Majura where significant stands of cone bearing <i>Allocasuarina verticillata</i> feed trees occur.	The major threat to this species is habitat loss, degradation and fragmentation. Loss of casuarina food trees and large hollow-bearing nest trees due to changed fire regimes and clearing are implicated in the species decline. Nest predation by possums and feral cats and competition for nest hollows by galahs and introduced honey bees are additional factors that threaten the species.	An Action Plan for this species is in production. Surveys of feed trees (<i>Allocasuarina verticillata</i>) in the northern ACT has been undertaken by CPR. Data on habitat characteristics of feed trees has led to the development of recommendations for the establishment of new stands of feed trees.	This species has been listed as vulnerable under the ACT Nature Conservation Act during the reporting period. A recovery plan is to be completed. Continue observation of the species and habitat usage within the ACT. Continue habitat mapping in the southern ACT. Trial plantings of <i>Allocasuarina verticillata</i> using information gathered from habitat characteristics of existing stands. Protect young (<25 year-old) stands from fire, and trial burns in older stands.
Little Eagle <i>(Hieraetus morphnoides)</i>	In spite of reasonably high numbers of Little Eagles recorded by COG surveys, the species appears to be in	Increased human disturbance is implicated in the decline of this species in the ACT. Urbanisation of habitat is likely to increase the	An Action Plan is in production for this species. University of Canberra has led several surveys monitoring.	This species has been listed as vulnerable under the ACT Nature Conservation Act 1980 during the

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
NC Act - Vulnerable	significant decline in the ACT. A nest survey found only 4 of the 11 nests active in 1990-1992 were still active in 2008.	pressure on this species.	nesting attempts	reporting period. The Action Plan for this species is to be completed. Species is likely to decline further and breeding pairs may be lost from the ACT in the face of increased urbanisation (Olsen et al. 2010). Investigations into the potential impacts of rabbit pindone baiting on raptors is recommended, along with radio tracking studies to determine habitat usage and home ranges for the species (Olsen et al. 2010).
Brown Treecreeper (<i>Climacteris picumnus</i>) NC Act - Vulnerable	Large reductions in density have been reported over most of the range of the species. Considered an uncommon breeding resident in the ACT. While not necessarily reflective of population trends there was an increase in COG records in the 2008-09 season (101) compared with 81 records in 2007-08, but the 2009-2010 results were back to 74.	Main pressure is loss of habitat. Species appears to need large woodland/forest patches (300 ha) with native understorey, especially grasses and fallen dead timber but without a dense, woody shrub layer.	A reintroduction project has been undertaken by the ANU, CSIRO and the ACT Government (CPR) to reintroduce the species into two woodland reserves in the ACT. Seven groups of Brown Treecreepers have been released into Mulligans Flat and Goorooyarroo Nature Reserves. For other proposed conservation actions for this species see ACT Action Plan 27 (2004).	Woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010).
Varied Sitella	The COG Woodland Bird survey	Loss and simplification of habitat	This species is covered in the	Woodland bird monitoring is

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p><i>(Daphoenositta chrysoptera)</i></p> <p>NC Act - Vulnerable</p>	<p>10 year results (1998-2008) indicate there is weak evidence of an increase in numbers but few records were collected for this species</p>	<p>through clearing, loss of paddock trees and collection of firewood are implicated in the decline of this species. The sedentary nature of the Varied Sitella makes it prone to fragmentation impacts. The species is also affected by the dominance of Noisy Miners which are increasing in their habitat.</p>	<p>ACT Action Plan 27 (2004).</p>	<p>inadequate to determine the population trends of threatened species (Bounds et al. 2010).</p>
<p>Hooded Robin <i>(Melanodryas cucullata)</i></p> <p>NC Act - Vulnerable</p>	<p>Considered an uncommon breeding resident in the ACT. Local disappearances are documented in the ACT especially adjacent to the urban area. Woodland bird surveys conducted by COG indicate that the Hooded Robin has been in decline in the ACT, but numbers have dropped too low for data analysis by the project.</p>	<p>Main pressure is loss of suitable habitat (woodland/native grassland with retention of understorey). The species tends not to be found in or near urban areas.</p>	<p>Protection of known and potential Hooded Robin habitat on rural leases has been pursued through Land Management Agreements. See ACT Action Plan 27 (2004) for proposed conservation actions.</p>	<p>Woodland bird monitoring is inadequate to determine the population trends of threatened species (Bounds et al. 2010).</p> <p>Urban development has impacted on this species in the northern parts of the ACT and its long-term future in this area is uncertain despite the presence of two large woodland reserves, Mulligan's Flat and Goorooyarroo.</p>

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Table A2. Status of Crayfish

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Murray River Crayfish (<i>Euastacus armatus</i>)</p> <p>NC Act - Vulnerable</p>	<p>In the ACT, mainly in the Murrumbidgee River, also the lower Cotter and Paddys rivers. Populations and sizes of individuals greatly reduced. Research into the ecology of crayfish in these rivers indicated the species continues to have a patchy distribution in the Murrumbidgee River and lower Cotter River, largely being found where public access was difficult. Most catches were of individuals that had not yet reached sexual maturity.</p>	<p>Habitat destruction and modification especially sedimentation, overfishing (considered a major factor in decline in Murrumbidgee River in the ACT), heavy metal pollution (Molonglo River), possible effects of introduced fish.</p> <p>Illegal taking of crayfish previously widespread in NSW, and overfishing in ACT prior to legislation; illegal removal is still likely to be occurring.</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 29 (2007)</p> <p>Research has been undertaken as part of the Enlarged Cotter Dam Fish Management Plan. The study identified preferred habitat for the species, and suitable monitoring methods.</p>	<p>Data suggest the species continues to have a patchy distribution; the lack of breeding-age individuals recorded by monitoring is of concern. Potential threats to be mitigated include illegal fishing and instream developments.</p> <p>Research as part of the Enlarged Cotter Dam recommends the preservation or remediation of habitat critical to the survival of the species as identified by the research, and the development of a management plan encompassing populations in the lower Cotter, Paddys and Murrumbidgee rivers.</p>

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Table A3. Status of Fish

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Macquarie Perch (<i>Macquaria australasica</i>)</p> <p>NC Act - Endangered</p> <p>EPBC Act - Endangered</p>	<p>In the ACT, populations exist in the Murrumbidgee, Paddys and Cotter rivers. The Cotter River population is considered one of the most viable populations in Australia.</p> <p>Macquarie Perch have been translocated into Molonglo River at Kowen Forest, Upper Cotter River and Paddys River (2005-2008).</p> <p>Monitoring indicates the species is becoming well established in the Cotter River above Cotter Dam.</p> <p>The population of Macquarie Perch in the Queanbeyan River above Googong Dam has reduced below detectable levels.</p> <p>In 2009-10 Macquarie Perch were recorded at Angle Crossing on the Murrumbidgee River for first time in 5 years.</p>	<p>Habitat alteration, overfishing, effects of introduced fish and potentially habitat alteration by developments such as the Enlarged Cotter Dam.</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 29 (2007).</p> <p>A Calcein marking trial of juvenile Macquarie Perch was successful and will assist in monitoring impacts of the Enlarged Cotter Dam on the species.</p> <p>A Fish Management plan has been produced for the Enlarged Cotter Dam development and includes 9 research projects; 8 of the projects are directly relevant to the conservation of Macquarie Perch.</p> <p>As part of the mitigation measures, 2 road crossings will be made fish friendly extending the available range of Macquarie Perch.</p>	<p>The construction of the Enlarged Cotter Dam is expected to significantly affect the 2010-2011 spawning season.</p> <p>Monitoring of the response of Macquarie Perch to the Enlarged Cotter Dam development will determine the success of the mitigation measures developed to minimise impacts to the species - refer to the ECD Fish Management Plan 2010 (ACTEW 2010).</p>
<p>Trout Cod (<i>Maccullochella macquariensis</i>)</p>	<p>Only two self-supporting populations remain: River Murray below Yarrowonga, and streams near Euroa, Victoria. Last recorded capture in the</p>	<p>Habitat destruction and modification especially sedimentation, previous overfishing (species was</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 29 (2007).</p>	<p>Stocked population in Murrumbidgee River is surviving but no evidence of breeding. Bendora</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>NC Act – Endangered</p> <p>EPBC Act - Endangered</p>	<p>ACT from Gigerline Gorge, Murrumbidgee River, late 1970s.</p> <p>Stocking has occurred in the Murrumbidgee River at Angle Crossing (1996-2005) and Kambah Pool (2006-2008) and at Bendora Dam. Natural recruitment has been recorded at Bendora Dam on isolated occasions since 2004.</p>	<p>not distinguished from Murray Cod), effects of exotic species including fish diseases.</p>	<p>Monitoring following stocking continues in the Murrumbidgee River and at Bendora Dam.</p>	<p>population likely to occasionally breed but the general trend is fewer larger specimens following stocking.</p>
<p>Silver Perch (<i>Bidyanus bidyanus</i>)</p> <p>NC Act - Endangered</p>	<p>Silver Perch have not been captured in the Murrumbidgee River for 20 years in the ACT.</p>	<p>River regulation severely affected this species through disruption of migration and reproduction. Thermal pollution and interactions with pest species (Carp and Redfin Perch) are also suspected to be a threat.</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 29 (2007).</p> <p>Silver Perch are looked for in the bi-annual Murrumbidgee River Survey.</p>	<p>No evidence for change in status of the Silver Perch in the ACT 2007-2010.</p> <p>No targeted actions are proposed for this species.</p>
<p>Two-spined Blackfish (<i>Gadopsis bispinosus</i>)</p> <p>NC Act - Vulnerable</p>	<p>Last record from the Murrumbidgee River in the ACT in the mid-1970s. Now found only in the Cotter River catchment upstream of Cotter Dam. Monitoring of regulated sites (where an artificial flow was maintained through the drought) has detected higher numbers of juveniles than at unregulated sites suggesting drought is</p>	<p>Habitat destruction and modification especially sedimentation; effects of exotic species including fish diseases (the species appears to be able to coexist with Trout in preferred habitat); not sought as angling fish</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 29 (2007).</p> <p>Monitoring of populations continues.</p> <p>Studies as part of the Enlarged Cotter Dam have been undertaken and have increased the knowledge of the species ecology, movements and habitat usage,</p>	<p>No evidence of change in status in the ACT 2007–10.</p> <p>Continue monitoring recovery and recruitment following the 2003 fire.</p> <p>Continue sediment control works in the lower Cotter catchment to improve</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
	limiting recruitment. Overall records at unregulated sites have increased since 2005.	though accidentally caught.	particularly within Bendora Reservoir.	spawning habitat.

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Table A4. Status of Reptiles

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Grassland Earless Dragon (<i>Tympanocryptis pinguicolla</i>)</p> <p>NC Act – Endangered</p> <p>EPBC Act - Endangered</p>	<p>Now restricted almost entirely to a few remnant patches of natural temperate grassland in the ACT and nearby NSW. In the ACT, the species is found in two disjunct populations, one in the Majura Valley and one in the Jerrabomberra Valley.</p> <p>Monitoring results show a population crash in 2005-06 from which the species has not recovered. The population trends show a steady decline and the species is at serious risk of extinction.</p>	<p>Loss and fragmentation of habitat (rural, urban, infrastructure, industrial development); weed invasion; predation.</p>	<p>Conservation actions for the species are outlined in ACT Action Plan 28 (2005).</p> <p>Regular monitoring occurs, the Majura Training Area (monitored by CPR) and the Jerrabomberra West Grasslands Reserve (monitored by University of Canberra (UC)). A UC project is currently studying the Monaro populations.</p>	<p>The populations in the ACT remain critically small and there are fears that some populations of the species may be lost within the next five to ten years (TAMS 2010a), or become extinct (Diamond et al. unpublished data).</p> <p>The ACT Government has committed significant funds to research aiming to conserve this species including the establishment of a captive breeding program.</p>
<p>Striped Legless Lizard (<i>Delma impar</i>)</p> <p>NC Act - Vulnerable</p> <p>EPBC Act - Vulnerable</p>	<p>The species occurs in three reserves set aside for its conservation in the north of the ACT as well as the Jerrabomberra valley.</p> <p>Monitoring results were not available for the reporting period</p>	<p>Loss and fragmentation of habitat (rural, urban, infrastructure, industrial development) weed invasion; predation; and pressures from encroaching development.</p>	<p>Natural temperate grassland and species such as Striped Legless Lizard now recognised in land use planning. Actions outlined in ACT Action Plan 28 (2005).</p> <p>The use of artificial shelter sites has been trialled as an alternative to pitfall trapping.</p>	<p>Using the recently developed shelter site survey technique many sites across the ACT are currently being surveyed for this species by the ACT Government.</p> <p>A remaining and increasing threat is urban encroachment on grassland areas resulting in urban/grassland edge effects including weeds, increased fire frequency and predation by cats and dogs.</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
				An education campaign building on community support for cat containment in the ACT would benefit this species.
<p>Pink-Tailed Worm Lizard (<i>Aprasia parapulchella</i>)</p> <p>NC Act - Vulnerable</p> <p>EPBC Act - Vulnerable</p>	<p>This species occurs mainly in the Molonglo and Murrumbidgee Riparian Corridors, but significant populations also occur on Mt Taylor and Urambi Hills.</p> <p>Recent detailed habitat surveys and mapping within the Lower Molonglo Valley have confirmed that this area contains nationally significant populations in this area and has increased distribution upstream of Coppins Crossing.</p>	<p>The species is susceptible to degradation of its grassland habitat through weed invasion, inappropriate fire regimes, regrowth of native shrubs and trees, rock removal and stock impacts. Direct loss of habitat through urban expansion is a threat.</p>	<p>Conservation actions for this species are included in Action Plan 29 (2007).</p> <p>The ACT Government has provided \$20,000 towards a current research project mapping habitat for this species.</p> <p>Detailed habitat mapping has been undertaken in the Molonglo Valley in relation to urban expansion plans in the area.</p> <p>An additional area outside the Molonglo urban development zone is proposed as a reserve dedicated to the protection of the Pink-tailed Worm Lizard. This area contains the highest densities of the species recorded in the ACT.</p>	<p>No regular monitoring of this species is undertaken in the ACT. Regular surveys for individuals at the same sites are likely to degrade habitat and should be avoided.</p> <p>The development of the land in the Molonglo Valley for urban expansion has the potential to impact nationally significant populations.</p> <p>Conducting research into the ecology and effective habitat management and restoring key areas of habitat thereby increasing connectivity of the existing populations.</p> <p>Careful consideration of the species will be required to ensure its continued existence down slope of the urban zone in the Lower Molonglo Valley.</p>

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Table A5. Status of Mammals

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Brush-tailed Rock Wallaby <i>(Petrogale penicillata)</i></p> <p>NC Act - Endangered</p> <p>EPBC Act - Vulnerable</p>	<p>Species presumed extinct in the ACT with last confirmed sighting in 1959. Captive population at Tidbinbilla Nature Reserve (animals introduced from Kawau Island, New Zealand). Wild populations no longer exist.</p>	<p>Reintroduction within the ACT is not possible until fox control is feasible in the remote areas of Tidbinbilla and Namadgi National Park.</p>	<p>Actions outlined in Action Plan 22.</p> <p>The captive ACT population is being used for education and research. The population forms part of a reintroduction program in Victoria.</p>	<p>Until effective and sustained fox control is feasible in Namadgi National Park no reintroductions within the ACT are likely to occur.</p>
<p>Smoky Mouse <i>(Pseudomys fumeus)</i></p> <p>NC Act – Endangered</p> <p>EPBC Act - Endangered</p>	<p>Records of Smoky Mouse in the ACT come from two males that were trapped in Namadgi National Park (Bulls Head 1986, Mt Kelly 1987) and one possible hair from Mt Namadgi in 1994. Repeated trapping and hair tube surveys to find the species since this time have not resulted in any additional records.</p>	<p>Difficult to interpret given long-term decline. Loss of habitat, inappropriate fire regimes and predation by foxes and cats.</p>	<p>Actions outlined in ACT Action Plan 23 include survey, ecological research and management actions to limit disturbance to likely habitat.</p> <p>No further surveys have been undertaken.</p> <p>Appropriate fire regimes for habitat have been incorporated into fire planning, and are stated in the Fuel and Fire suppression guidelines for ACT declared Threatened Species and Endangered Ecological Communities</p>	<p>No monitoring is undertaken for this species in the ACT.</p> <p>Further work is unlikely to be undertaken for this species considering the low probability of obtaining useful data. Habitat protection and control of pests continues as part of the management of Namadgi National Park.</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
			(2008).	
<p>Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)</p> <p>NC Act - Vulnerable</p> <p>EPBC Act - Endangered.</p>	<p>In spite of intensive searches from 1999 to 2004 there have been only twelve specimen records of the Spotted-tailed Quoll in the ACT since the 1950s, the most recent in 2009. In the past three years two Quolls have been captured in the suburbs and released into Namadgi National Park.</p> <p>No monitoring has been undertaken for this species since 2004.</p>	<p>Potential non-target impacts from increased wild dog and fox baiting in Namadgi National Park, but the removal of competition (foxes) and predation pressures (wild dogs) may benefit the Spotted-tailed Quoll.</p> <p>Potential road kill impacts.</p>	<p>ACT Action Plan 30 lists conservation actions for this species.</p> <p>1080 wild dog baiting in Namadgi National Park complies with best practice prescriptions. No actions other than collating observations are currently being undertaken.</p>	<p>No monitoring is undertaken for this species in the ACT.</p> <p>A monitoring program, using infra-red cameras, would provide information on the potential impacts of increased wild dog baiting in Namadgi National Park and provide information on the status of the species.</p>

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Table A6. Status of Amphibians

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Northern Corroboree Frog <i>(Pseudophryne pengilleyi)</i></p> <p>NC Act - Endangered</p> <p>EPBC - Vulnerable</p>	<p>Annual monitoring shows numbers of the Northern Corroboree Frog are critically low and continue to decline.</p> <p>In the ACT there are now estimated to be fewer than 100 Northern Corroboree Frogs left in the wild.</p>	<p>A chytrid fungus is now considered to be the primary cause of decline, with dry years further reducing breeding success.</p>	<p>Conservation actions are outlined in Action Plan 6.</p> <p>The ACT Government has facilitated research through direct assistance or provision of data. Studies include genetics, habitat distribution, impacts of UV light on tadpoles and captive breeding experiments.</p> <p>Annual monitoring and reporting continues, as does the protection of habitat, especially the Ginini Flats wetlands.</p> <p>Captive breeding program for the species at Tidbinbilla was successful for the first time in 2008 and subsequent breeding has occurred in 2009 and 2010. There are now over 1000 individuals in captivity at Tidbinbilla.</p>	<p>Captive breeding has been a success. Releases of captive bred individuals back into the wild are planned. A revised Action Plan reflecting current knowledge of the species is recommended.</p> <p>Wild populations are likely to become extinct in the ACT within the next 5-10 years unless their decline can be halted.</p>

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Table A7. Status of Insects

Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Golden Sun Moth (<i>Synemon plana</i>)</p> <p>NC Act - Endangered</p> <p>EPBC - Critically Endangered</p>	<p>In the ACT the species occurs in natural temperate grassland dominated by <i>Austrodanthonia carphoides</i>.</p> <p>Currently recorded from 60 sites in the ACT including large grassland reserves and small unreserved areas. It is spread widely but generally in low to very low numbers in secondary grassland or native pasture throughout many of the undeveloped areas of Gungahlin.</p> <p>Evidence indicates that the species has increased in distribution and possibly in number within the ACT over the last 20 years. It was discovered in numerous secondary grasslands in 2009 (Hogg 2010). The species is listed as critically endangered nationally.</p>	<p>Loss or degradation of habitat (further fragmentation of grassland, weed invasion, changes to grazing regimes). A number of ACT sites are very small and potentially vulnerable to surrounding activities.</p>	<p>The species is covered in the strategic conservation document Action Plan 28 (2005).</p> <p>A report outlining a strategic approach to conservation in the ACT has recently been produced (Hogg 2010). Recommendations of the report include conserving and managing core conservation areas across the ACT with additional insurance populations.</p>	<p>In the ACT there is evidence that the species is relatively resilient having survived in several small sites in spite of continued disturbance. The habitat preferences of the species appear to be wider than originally thought and there is even circumstantial evidence that the invasive weed Chilean Needle Grass may be a host for this species (Hogg 2010), but this observation requires further investigation.</p> <p>Urbanisation is likely to impact on some Golden Sun Moth populations and others may be lost as woodland tree cover regenerates, particularly in the Gungahlin area.</p> <p>The reserves established by the ACT Government to protect natural temperate grassland conserve much of the quality Golden Sun Moth habitat in the ACT.</p> <p>Adoption of the recommendations in the <i>Strategic Approach To The Conservation and Environmental Assessment of Golden Sun Moth Sites in the Canberra Area</i> report would improve the resilience of the species by increasing the species distribution and ensuring conservation efforts targeted key populations.</p>

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Species and Declared Status	Condition	Pressure	Response	Status/outlook
<p>Perunga Grasshopper (<i>Perunga ochracea</i>)</p> <p>NC Act - Vulnerable</p>	<p>Species is found in natural temperate grassland also native pasture and open grassy woodland. Recorded from Wagga Wagga (NSW) and areas north and east of the ACT.</p> <p>No population studies have been undertaken in the ACT.</p>	<p>Loss or degradation of habitat (further fragmentation of grassland, weed invasion).</p>	<p>Actions outlined in ACT Action Plan 28 (2005) include specific management arrangements for sites, survey, monitoring, research and education. Four areas are in reserves, and other known habitat areas are covered by a Memorandum of Understanding with federal agencies.</p>	<p>Lack of suitable survey method for species, low density and small cryptic appearance mean that population trends are difficult to determine, but there is no evidence for change in status of the Perunga Grasshopper in the ACT 2007-2010. Opportunistic observations are still occasionally reported for the species.</p> <p>Ecological studies needed to gain a better understanding of the species' habitat requirements, threats and distribution in the ACT. This will help to confirm that the ecosystem conservation approach adopted by the ACT Government is adequately protecting this species.</p>