

3 | Riparian Fauna

3.1

Riparian Zone Fauna and Habitat

This section includes consideration of animals that use the riparian zone exclusively or in conjunction with a range of terrestrial habitats. It also includes a smaller number of animals that are mainly aquatic but use the riparian zone, particularly riverbanks for important parts of their life cycles e.g. Platypus (*Ornithorhynchus anatinus*) and the Eastern Water Rat (*Hydromys chrysogaster*). Fish, crayfish and aquatic macroinvertebrates are discussed in Chapter 4.

3.1.1 Aquatic and Riparian Habitats

AQUATIC HABITATS

Aquatic habitats in the region have been grouped by Lintermans and Osborne (2002) broadly according to altitude: upland bogs, fens, seepages, creeks and rivers; lakes and reservoirs at varying altitudes; and lowland rivers, creeks, backwaters, billabongs, swamps and farm dams.

There has been an increase in some types of aquatic habitat since European settlement because of the construction of farm dams, water storages and urban lakes; however, the habitat value of many natural environments has been dramatically reduced (Lintermans and Osborne 2002):

- (a) Small lowland wetlands have been drained for various purposes and/or invaded by weeds.
- (b) Creeks in urban areas have been straightened, piped, or converted into concrete-lined drains.
- (c) Large streams and rivers have flows altered by dams, temperatures lowered by cold-water pollution or raised following the clearing of riparian vegetation, and water quality affected by sedimentation due to erosion or catchment degradation (see s. 4.4, s. 4.12).
- (d) Ephemeral wetlands have been drained or permanently flooded by lakes and/or invaded by weeds.
- (e) A variety of habitats have been invaded by introduced aquatic species.

RIPARIAN HABITATS

There is a diversity of habitat in riparian areas which may include fringing aquatic vegetation, boggy areas or wet grassland, various riparian vegetation communities, the ecotone between riparian and upslope vegetation, riverbanks, flood terraces and steep, rocky gorge areas. In general, the condition or level of disturbance of the vegetation is the most critical factor for riparian habitat with the presence of understorey species an important biodiversity consideration. The importance of riparian vegetation for wildlife habitat has been shown in a number of studies e.g. Crome *et al.* 1994; Fisher and Goldney 1997; Recher and Lim 1990. In extensively cleared areas, where riparian vegetation may form the majority of the remnant native vegetation, it may be considered a critical landscape component in maintenance and restoration programs (Fisher and Goldney 1997). Riparian areas and their associated watercourses are 'keystone' ecosystems, with the health of ecological communities elsewhere in the landscape dependent upon the health of riparian areas (MacLeod 2002a). They are particularly important drought refuges and it is during these periods that conflict with livestock is most acute, as native fauna are restricted to patches of favourable habitat typically found in riparian areas (Morton 1990 in Macleod 2002a). Riparian areas wind their way through a variety of ecosystems, form natural corridors linking habitats, and provide routes for dispersal or migration of terrestrial and aquatic animals. For example, riparian zones are used as movement corridors by honeyeaters migrating between the southern highlands (including the ACT) and coastal areas. The role of riparian areas as corridors has become increasingly important as surrounding ecosystems are modified for urban and agricultural purposes.

Vegetation in the ground and shrub layers, rocks and fallen timber all provide habitat for invertebrates, frogs, lizards, snakes and small ground dwelling mammals. Some waterbirds (such as herons, rails and bitterns) and warblers use thick reed beds and other vegetation

fringing watercourses for shelter, foraging and nesting. Shallow, lentic water with vegetation provides habitat for frogs and their tadpoles and for aquatic macroinvertebrates (see Chapter 4). Outcropping rocks and river cobbles provide important habitat for reptiles, including a number of species confined to riparian areas. Emergent trees and snags provide perching places for waterbirds. Vegetation with a complex structure (herb, shrub and tree layers), which often occurs in the riparian zone, is important nesting and foraging habitat for many bird species. Large trees in or beside watercourses provide nest sites for raptors or nesting hollows for possums, bats and birds such as cockatoos, kingfishers and some duck species.

Rocky gorges and cliffs provide habitat for raptors, martins, swallows and bats and may have added significance where other habitat, such as large trees, have been lost from the landscape. Migratory Rainbow Bee-eaters (*Merops ornatus*) build their nests by tunnelling into sandy riverbanks and a number of areas along the Murrumbidgee River, including Point Hut and Gigerline Nature Reserve, are important habitat. The *Murrumbidgee River Corridor Management Plan* notes that special attention will be given to protection of riverbanks used by the species (Environment and Recreation 1998, p. 24). This type of habitat is particularly affected by trampling from stock (Fisher and Goldney 1997).

The riparian zone is intrinsically linked to the surrounding catchment through material flows (water, soil, nutrients, chemicals), an extensive ecotone, and animal movement. Compared to the surrounding landscape, riparian zones can be relatively nutrient rich environments and hence higher quality habitat. Soil and nutrients are transported from surrounding areas and deposited in riparian zones. These fertile alluvial soils and often-moister conditions result in productive environments for both plants and animals. Variable flood duration and frequency, and concomitant changes in water table depth and plant succession, create an environment that is a complex of shifting habitats, established and destroyed on different spatial and temporal scales (Naiman and Décamps 1997).

Riparian zones are long and thin, and consequently have an extensive interface with adjacent ecosystems. These ecotones are often more structurally complex and hence contain more animal species than the vegetation communities they separate. They are also the lowest lying (drainage) areas in the landscape. This physical connectivity means that activities occurring in adjacent ecosystems or elsewhere in the catchment

(e.g. land clearing, agriculture, pasture improvement (including fertiliser application) and urbanisation) can also affect habitats in the riparian zone, either directly or through effects arising from changes to sediment loads, water quality or flow patterns. The narrow width of riparian zones leaves little to buffer them against impacts occurring in adjacent ecosystems. Indeed, the riparian zone itself is important in buffering aquatic environments against erosive or polluting land uses. Connections between the riparian zone and other ecosystems also occur through animal use and movement. For example, the home ranges of many animals include areas of both the riparian zone and adjacent habitats, and so habitat modification to either area will affect these species. Many riparian zones are now characterised by the loss of linear and upslope connectivity.

3.1.2 Fauna as Part of the Riparian Zone

Animals are intrinsic to the overall functioning of ecosystems, including riparian systems. Animals are essential for pollination and dispersal of many plants and are involved in nutrient recycling and maintenance of soil condition and water quality. Whilst some animals are largely restricted to the riparian zone, other animals living in the surrounding landscape use the riparian zone and associated rivers or streams as a source of food, water, shelter or nesting sites. Other animals move mainly between the water and adjacent riparian areas. Reference to riparian zone fauna in this sub-section is to all three categories. Loss of native animal species or establishment of introduced animal species can alter ecosystem processes and may lead to a change in the composition of fauna or flora. There may be adverse affects also on the health of the ecosystem (such as the decline of native plants following loss of their insect pollinator or increased erosion of banks resulting from removal of vegetation cover by heavy grazing).

3.1.3 Threats to Riparian Zone Fauna

Threats to the terrestrial or aquatic fauna of the riparian zone stem largely from habitat removal or modification; either to the riparian zone itself or arising from land-uses in adjacent ecosystems. Other threats include changes in water quality or flows (which also affect riparian habitats and fauna), increased predation from introduced predators, and human disturbance. These threats to riparian zone fauna and other, mainly aquatic fauna are described in more detail in the following sections. Threats to fish and crayfish are discussed in Chapter 4 (sections 4.4 to 4.9).

HABITAT REMOVAL, FRAGMENTATION AND MODIFICATION

Clearance of native vegetation, including riparian vegetation, still remains the most significant threat to terrestrial biodiversity despite apparently tight legislative controls and is recognised as a key threatening process in NSW and nationally. Expanding urban development increases pressure on catchments, aquatic and wetland habitats, and remnants of native vegetation, whereas construction of roads and other urban infrastructure leads to increased fragmentation of habitat. Fragmentation of riparian zone habitat reduces the value of these zones as corridors connecting different areas and habitats. The Australian State of the Environment Committee (ASOEC 2001) documented the Australia-wide degradation of riparian areas, riverbanks and wetlands. It also estimated that river and stream salinities are likely to increase substantially over the next 50 years resulting in additional stress on flora and fauna.

Loss of habitat diversity in the riparian zone has a major impact on riparian fauna. Ecosystems with a complex 'architecture' support more species than ecosystems that have been simplified, and many species require a complex vegetation structure to meet their habitat requirements (Mac Nally 1995). Structural complexity is created by the presence of trees of different ages, tree hollows, standing dead trees, a patchy shrub layer, a species-rich understorey of grasses and forbs, fallen timber and water, all of which provide shelter, food or nesting sites for animals (Martin and Green 2002). A reduction in habitat complexity (or quality) occurs through removal of mature trees, fallen timber and rocks, grazing by stock at an intensity that reduces floral diversity of the ground layer and prevents tree and shrub regeneration, inappropriate fire regimes, invasion by weeds and soil erosion. For example, invasion by weeds and removal of bush rock from habitat of the Pink-tailed Worm Lizard (*Aprasia parapulchella*) are both likely to have severe impacts on this species.

Grazing by domestic stock (cattle particularly) is a major cause of disturbance to Australian riparian habitats (Commonwealth of Australia 2002b; MacLeod 2002a) (see s. 5.6.4). Feral animals (especially rabbits) have also had a significant impact (Smith and Smith 1990). Grazing has altered and continues to alter the structure and function of the riparian landscape of the Murrumbidgee River and its tributaries. In a study of the riparian landscape downstream of the ACT, Robertson and Rowling (2000) found that seedlings and saplings of the dominant *Eucalyptus* tree species were up to three orders of magnitude more abundant in areas with no stock access compared with grazed

areas. Similarly, the biomass of groundcover plants was an order of magnitude greater in areas with no stock access compared with grazed areas. Differences between stocked and unstocked areas were most pronounced where the riparian zone had been excluded from stock for more than 50 years.

Fallen timber, leaf litter and other ground cover provides important habitat for a range of invertebrates, many of which depend on dead wood and leaves for their survival. These invertebrates, together with microbial organisms and fungi, are important in the breakdown of timber (Araya 1993) and recycling of nutrients back into the soil. In turn, invertebrates provide the main food source for a range of birds, reptiles, amphibians and some mammals. Land uses such as clearing and intensive grazing result in loss of riparian vegetation, which leads to a reduction in leaf litter deposition, streambank stability and consequential impacts to water quality and stream health.

ALTERATION OF NATURAL FLOWS

The modification of 'natural' flow regimes in river systems is considered to be one of the most significant impacts on Australian inland aquatic ecosystems (ASOEC 2001). The impact of altered flow regimes on fish and crayfish is discussed in s. 4.4.4. Altered flow regimes can have a major effect on habitat for both terrestrial and amphibious fauna. Natural flow regimes in the ACT have been altered by dam construction and upstream water abstraction. Riparian areas have been affected by the reduced incidence of high flow events. The establishment of urban lakes with relatively stable water levels has favoured some waterbirds and resulted in the creation of additional wetland areas such as those in the Jerrabomberra Wetlands Nature Reserve.

PREDATORS

Foxes, cats and dogs are known to prey on a range of native animals, many of which occur in riparian habitats, and can form a substantial proportion of the diet of these introduced predators. The native prey of foxes and feral, stray and domestic cats includes mostly ground-dwelling small mammals, reptiles, frogs and birds commonly found on the ground or in lower understorey, and occasionally bats and small arboreal mammals (Coman 1995; Newsome 1995; Dickman 1996). The impact of this predation on population sizes of fauna has not been well quantified. It is evident, however, that some species have been highly vulnerable to predation by introduced predators. Feral cat and fox predation on native wildlife are listed as key threatening processes in NSW and nationally. The uncontrolled roaming of domestic cats, and in some

cases dogs, in riparian zones close to urban areas is likely to contribute to increased predation on wildlife. Conservation of susceptible fauna in these areas will depend on responsible pet ownership or stronger controls. New urban development close to the lower Molonglo River may result in an increased threat from these causes.

Terrestrial vertebrate pests identified of most concern in the Murrumbidgee and Molonglo River Corridors are wild pigs, wild dogs, European fox, rabbits, and feral cats (Environment ACT 1998, 2001a). Fallow Deer are widely distributed throughout the lower elevation riparian areas (D. Fletcher, pers. comm.) and whilst currently in low density, may represent an emerging threat. As well as these species, feral goats (populations of which have been reduced by aerial culling) and feral horses (which seasonally re-invade from Kosciuszko National Park and are culled) are also potential threats in the Cotter catchment (ACT Government 2002i; ACT Government 2005c).

OTHER HUMAN IMPACTS

As well as the impacts of pastoralism and farming, threats to riparian habitat and riverbank morphology derive from construction of infrastructure (dams, weirs, bridges), recreational use and facilities, road and river traffic, and dumping of rubbish. Human disturbance to habitat is exacerbated in riparian areas close to population centres. These impacts are discussed in more detail in Chapters 4 and 5.

3.2

Riparian Zone Fauna in the ACT

A variety of data sources were used to compile composite information on fauna in riparian areas of the ACT region. These sources included scientific papers and books; reports and/or records of observations by government staff, consultants, other government agencies including the NSW Department of Environment and Conservation, and community groups such as the Canberra Ornithologists Group (COG). The detail and accuracy of these data vary within the region, depending upon the locations and methods of surveys and the inclusion of opportunistic observations.

Some terrestrial or amphibious animal species in the ACT region are restricted to, or highly dependent upon the riparian zone. Other animals that frequent riparian areas also occur in adjacent ecosystems such as forests, woodlands and grasslands. Riparian areas are important drought refuges for many of these species.

3.2.1 Birds

(Bird names are based on Barrett *et al.* 2003)

Riparian zones, particularly the Murrumbidgee and Molonglo river corridors, are noted for their high bird diversity (Taylor and COG 1992). Over 200 bird species have been recorded in the ACT and at least three-quarters of these have been recorded in the riparian zone. Few of the bird species occurring in the riparian zone are restricted to this habitat. Many bird species typically found in forests, woodlands and grasslands also use riparian areas and some birds strongly associated with riparian zones, such as waterbirds, also occur in wetlands outside the riparian zone (such as lakes and farm dams). Whereas individuals of some species may live entirely within the riparian zone (such as wrens, thornbills, some honeyeaters and other small, non-migratory passerines), individuals of other bird groups (such as raptors, ravens, currawongs, cockatoos and parrots) may satisfy their foraging, shelter and breeding requirements by having home-ranges that include a mix of riparian and other habitats. Riparian areas are an important component of the habitats used in seasonal altitudinal migrations by some species.

Compared to the rest of the ACT region, the Murrumbidgee and Molonglo river corridors have a higher diversity and abundance of raptors (birds of prey), with at least 12 species recorded. The Molonglo Valley provides critical hunting and breeding habitat for birds of prey due to the mosaic of habitats in the area (rural lands, woodlands, grasslands and river corridor). Commonly seen raptors in the river corridors include Wedge-tailed Eagle (*Aquila audax*), Little Eagle (*Hieraetus morphnoides*), Whistling Kite (*Haliastur sphenurus*), Black-shouldered Kite (*Elanus axillaris*), Nankeen Kestrel (*Falco cenchroides*) and Brown Falcon (*Falco berigora*).

At least ten of these species are known to nest in the riparian zone, including the Wedge-tailed Eagle, White-bellied Sea Eagle (*Haliaeetus leucogaster*) and Peregrine Falcon (*Falco peregrinus*). For most of these species, especially the eagles and larger kites, the surrounding rural areas provide essential foraging habitat.

Other landbirds strongly associated with the riparian zone in the ACT region include Yellow Thornbill (*Acanthiza nana*) and Mistletoebird (*Dicaeum hirundinaceum*) (both of which use River Oaks and Mistletoe), Rainbow Bee-eater (*Merops ornatus*), Sacred Kingfisher (*Todiramphus sanctus*), Yellow-tufted Honeyeater (*Lichenostomus melanops*), Fairy Martin (*Hirundo ariel*), Tree Martin (*Hirundo nigricans*), Welcome Swallow (*Hirundo neoxena*) and Clamorous

Reed-Warbler (*Acrocephalus stentoreus*). Vegetated riparian areas are also important habitat and movement corridors for small passerine species for which cover is important e.g. Mistletoe Bird (*Dicaeum hirundinaceum*), Silvereye (*Zosterops lateralis*), Western Gerygone (*Gerygone fusca*) and White-browed Scrubwren (*Sericornis frontalis*). Yellow-tailed Black-Cockatoos (*Calyptorhynchus funereus*) are common along the Murrumbidgee River, but historically have been rare in areas to its east (Taylor and COG 1992). Loss of the extensive pine plantations in the lower Cotter and Paddys River areas in the bushfires of 2003 has resulted in the species becoming a common sight in urban Canberra (COG 2006). Sulphur-crested Cockatoos (*Cacatua galerita*) have a strong association with the Murrumbidgee River corridor.

Waterbirds are attracted to a range of waterbodies in the ACT region that include lakes, ponds, rural dams, streams and rivers. Australian waterbirds are largely nomadic, their movements triggered by flooding and drought. They are also capable of moving large distances, providing the potential for numerous species to visit the ACT on a regular or vagrant basis. Because of the presence of permanent waterbodies in the ACT region, many waterbird species are residents that stay year-round and breed. Lake Burley Griffin and Molonglo Reach are important breeding locations for a significant population of the Darter (*Anhinga melanogaster*) and three species of cormorants: Great (*Phalacrocorax carbo*); Little Black (*Phalacrocorax sulcirostris*); and Little Pied (*Phalacrocorax melanoleucos*) (Allan 2003). The most commonly seen species in the riparian zone and associated streams and rivers include the Great Cormorant (*Phalacrocorax carbo*), Little Pied Cormorant (*Phalacrocorax melanoleucos*), White-faced Heron (*Egretta novaehollandiae*), Pacific Black Duck (*Anas superciliosa*), Australian Wood Duck (*Chenonetta jubata*), Australasian Grebe (*Tachybaptus novaehollandiae*) and to a lesser extent Dusky Moorhen (*Gallinula tenebrosa*), Purple Swamphen (*Porphyrio porphyrio*), Eurasian Coot (*Fulica atra*) and Nankeen Night Heron (*Nycticorax caledonicus*). Latham's Snipe (*Gallinago hardwickii*), a migrant between Australia and Japan, occurs in wetlands and riparian areas of the ACT.

Not all water bodies are equally suitable habitat for waterbirds. The upper reaches of rivers and streams, which are fast-flowing and rocky, or deep cold water in dams such as Corin Dam, are not ideal habitat. Most waterbird species prefer shallow, still or slow-flowing water bodies with abundant emergent or fringing vegetation.

HONEYEATER MIGRATION

First documented in the early 1950s, the autumn exodus of many thousands of honeyeaters from the Canberra region to lower elevations nearer the coast is a special phenomenon (Taws 1999; Wilson 1999). The birds mass together and move from the higher ranges in a general west to east direction following various land features, especially the river systems including the Murrumbidgee Valley. Honeyeaters using riparian zones for migration are mostly the Yellow-faced Honeyeater (*Lichenostomus chrysops*) and White-naped Honeyeater (*Melithreptus lunatus*), and to a lesser extent Fuscous Honeyeater (*Lichenostomus fuscus*), Red Wattlebird (*Anthochaera carunculata*), Noisy Friarbird (*Philemon corniculatus*) and White-eared Honeyeater (*Lichenostomus leucotis*).

The availability of tree cover along the Murrumbidgee River is a particular issue, as the migrating honeyeaters prefer to make short distance flights between cover rather than crossing extensive open areas. Historically, Point Hut Crossing was a major location for exiting the river corridor but the Angle Crossing area has emerged as a major gathering and exit point in recent years. East of the river at Angle Crossing, the Ingeldene pine plantations used to provide a corridor of cover before the 2003 bushfires. Urban development close to Point Hut and lack of vegetation cover may be the reason for the shift in movement patterns. Revegetation with trees and shrubs at strategic nodes along the Murrumbidgee River is likely to assist movement along and exit from the corridor.

3.2.2 Mammals

Native mammals occurring in riparian zones of the ACT region include large grazing marsupials, smaller ground dwelling mammals, arboreal marsupials and bats. Two mammal species (Platypus *Ornithorhynchus anatinus* and Eastern Water Rat *Hydromys chrysogaster*) are largely restricted to waterbodies and the adjacent riparian zone. These species are somewhat cryptic and not often readily observed, but neither is particularly rare. Both species were hunted in the past for fur to make rugs and coats, and given that a rug required 60–80 Platypus pelts, the impact on populations was probably considerable (Lintermans and Osborne 2002).

The range of the Platypus is eastern Australia including Tasmania, but its distribution is discontinuous and related to the presence of suitable bodies of fresh water (Carrick 1995). Features of suitable habitat are: (a) water depth of less than about 5 m as the species must be able to dive to the bottom to feed, (b) suitable

banks for resting burrows (3–5 m long) and nesting burrows (3–8 m, but up to 30 m long), and (c) a substrate not smothered in sediment which results in declining abundance of freshwater invertebrates, the main food for Platypus (Lintermans and Osborne 2002). Threats to platypus are sedimentation of pools, clearing of riparian vegetation and stock trampling (resulting in slumping of riverbanks and their unsuitability for burrows), and human disturbance (domestic dogs, entanglement in plastic litter, and entrapment in illegal gill nets) (Lintermans and Osborne 2002). Platypus are still regularly recorded from the Cotter, Murrumbidgee and Molonglo rivers, and are commonly observed in the waterfowl dams at Tidbinbilla Nature Reserve.

The Eastern Water Rat is an active swimmer creating a distinctive 'V' shaped wake on a calm water surface. Individuals often have a favourite surface used for feeding, such as a flat rock, where food remains are left. They feed on a wide range of other animals, including large insects, fish, crustaceans, mussels, frogs, lizards, small mammals and even waterbirds, mostly taken in the water. The species lives in burrows in the banks of rivers and lakes. Drainage of wetlands has reduced some of their habitat and they appear to be sparse along rivers, however, they have adapted to drainage swamps in irrigated areas and to urban lakes in the ACT. Hunting until the 1940s seriously reduced their numbers, but they have subsequently recovered, and are considered to be common and widespread in the ACT and region. Clearing of riparian vegetation and stock trampling may result in slumping of riverbanks and their unsuitability for burrows (Lintermans and Osborne 2002). Water rats are commonly found in the urban lakes such as Lake Burley Griffin and Lake Ginninderra and have been recorded from the Molonglo, Cotter, Paddys, Orroral, Naas, Tidbinbilla and Murrumbidgee rivers and Sullivans and Ginninderra creeks.

The other mammals occurring in the riparian zone in the ACT region are also found in a range of non-riparian ecosystems such as forests, woodlands or grasslands. Some of these species have adapted well to pastoral and urban areas, particularly where mature native trees have been retained.

Larger native mammals include Common Wombat (*Vombatus ursinus*), the ubiquitous Eastern Grey Kangaroo (*Macropus giganteus*), Red-necked Wallaby (*Macropus rufogriseus*), Swamp Wallaby (*Wallabia bicolor*) and, less commonly, Wallaroo (*Macropus robustus*). The small mouse-like insectivorous Agile Antechinus (*Antechinus agilis*) and the Dusky Antechinus (*Antechinus swainsonii*) have been

recorded in riparian areas and it is likely that the other Antechinus species in the ACT region, the Yellow-footed Antechinus (*Antechinus flavipes*), also occurs in riparian areas. There are some records of the vulnerable Spotted-tailed Quoll (*Dasyurus maculatus*) from riparian areas in the Orroral Valley in Namadgi National Park (ACT Government 2005b). Other native ground mammals frequenting riparian zones include the Bush Rat (*Rattus fuscipes*), the Broad-toothed Rat (*Mastacomys fuscus*) and Echidna (*Tachyglossus aculeatus*). Arboreal marsupials include the Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Sugar Glider (*Petaurus breviceps*). The Koala (*Phascolarctos cinereus*) is rare in the ACT region, but there are historical records from riparian areas.

Bats occur in a range of habitats in the ACT region including riparian areas, which are used for feeding on insects flying above water or for roost sites in tree hollows. Bat species known to occur in riparian areas of the ACT region are the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Lesser Long-eared Bat (*Nyctophilus geoffroyi*), Gould's Long-eared Bat (*N. gouldi*), White-striped Freetail Bat (*Tadarida australis*), Chocolate Wattled Bat (*Chalinobius morio*), Gould's Wattled Bat (*C. gouldii*), Common Bentwing Bat (*Miniopterus schreibersii*), Little Forest Bat (*Vespadelus vulturnus*), Southern Forest Bat (*V. regulus*), Large Forest Bat (*V. darlingtoni*) and Southern Freetail Bat (*Mormopterus planiceps*) (Menkhorst and Knight 2001).

3.2.3 Reptiles

(Reptile common names are based on Lintermans and Osborne (2002) with common names used locally in brackets.)

The riparian zone in the ACT region provides habitat for many species of reptiles, most of which are also found in other habitats. Snakes typically associated with riparian areas are the Red-bellied Black Snake (*Pseudechis porphyriacus*), Highland Copperhead (*Austrelaps ramsayi*) (usually found above 700m) and Eastern Tiger Snake (*Notechis scutatus*). The Eastern Brown Snake (*Pseudonaja textilis*) is common in the ACT and occasionally seen in riparian areas.

The Eastern Snake-necked Turtle (Long-necked Tortoise) (*Chelodina longicollis*) is the most truly aquatic reptile species and is common and widespread throughout the ACT, occurring wherever there is a water source such as a creek, river, swamp or farm dam. The species is distributed throughout eastern continental Australia along coastal and inland waterways (Cogger 2000). It is an active freshwater predator capturing a wide range of

invertebrates, snails and frogs. Preferred habitat is swamps and well-vegetated farm dams, but the species is also found in slow moving rivers and lakes. Turtles sometimes undertake extensive overland migrations in summer when many are run over by motor vehicles. Mechanised disturbance to river channels and banks may destroy nesting sites (Lintermans and Osborne 2002).

The Murray River Short-necked Turtle (Murray Turtle) (*Emydura macquarii*) occurs in the Murrumbidgee River downstream of the ACT and is relatively common in Lake Burrinjuck. However, the northern ACT border is close to the upstream limit of this species in the Murrumbidgee Catchment and it is rare in the ACT (Lintermans and Osborne 2002).

At least 41 lizard species have been recorded in the ACT region and many of these are present in riparian areas where there is suitable substrate such as rocks, fallen timber, leaf litter and grass tussocks. The Gippsland Water Dragon (*Physignathus lesueurii howittii*) and Heatwole's Water Skink (*Eulamprus heatwolei*) are riparian species typically associated with watercourses. The Gippsland Water Dragon is common along streams and rivers in the lowland parts of the ACT and region. The dragons forage along banks for invertebrates, fruits and flowers and may also take small lizards, crustaceans and fish. They are often noticed as they leap from tree branches or logs into the water. Vegetation, logs and other debris along watercourses are important habitat for this species (Lintermans and Osborne 2002). The Nobbi Dragon (*Amphibolurus nobbi*) is uncommon and in the ACT has only been recorded from dry, rocky woodlands close to the Murrumbidgee River. Rosenberg's Monitor (*Varanus rosenbergi*), a species rarely seen in the ACT, has been recorded near the Orroral, Murrumbidgee and Queanbeyan rivers (Lintermans and Osborne 2002) and there is one record from the Kowen escarpment near Molonglo Gorge. Stony hillsides within riparian areas of the Murrumbidgee and Molonglo rivers contain key habitat for the threatened Pink-tailed Worm Lizard (*Aprasia parapulchella*) (see section 3.3.2). Much of the known habitat for this species is within these river corridors.

3.2.4 Amphibians

Frogs occur in a range of wetter habitats in the ACT region. Riparian zones tend to contain moist terrestrial areas (under rocks, logs and leaf-litter and in thick vegetation) that provide habitat for frogs. Most species of frog live on land, although free water is required for their aquatic stages (eggs and tadpoles) and for rehydration. Streams, rivers and large dams or lakes

generally provide poor habitat for the aquatic stages of most frog species, as they tend to be fast-flowing or deep and have aquatic predators such as fish and Dragonfly (Odonata) larvae. Many species prefer aquatic habitats that are shallow, still, or slow-flowing, have few predators and contain abundant aquatic vegetation (such as swampy areas, temporary pools and farm dams). Nevertheless, there is a component of the frog fauna that occurs along rivers and streams. These are collectively referred to as 'riverine frog species' (Hunter and Gillespie 1999). Trout are considered to be significant predators on some of these species, resulting in low population densities in upland streams. It is likely that fish are able to exert their greatest impact on frog populations by preying upon larval stages rather than adults (Gillespie and Hero 1999; Gillespie and Hines 1999).

In the ACT this riverine group includes the rare Southern Leaf-green Tree Frog (Cotter River form) (*Litoria nudidigitus*), Lesueur's Frog (*Litoria lesueurii*) and Broad-palmed Frog (*Litoria latopalmata*), all of which are strongly associated with riparian areas. The Southern Leaf-green Tree Frog is rare in the ACT region, being known only from the Cotter River in the ACT and the Goodradigbee and Geehi rivers in NSW. Lesueur's Frog is widely distributed across the ACT region and is strongly associated with rocky streams. The Broad-palmed Frog is largely restricted to riparian areas of the lower Murrumbidgee and Molonglo rivers and adjacent creeks and farm dams. Other species known or likely to be found in riparian areas in the ACT region include Peron's Tree Frog (*Litoria peronii*), Whistling Tree Frog (*Litoria verreauxii*), Plains Froglet (*Crinia parinsignifera*), Common Eastern Froglet (*Crinia signifera*), Eastern Banjo Frog (*Limnodynastes dumerilii*), Brown-striped Frog (*Limnodynastes peronii*), Spotted Grass Frog (*Limnodynastes tasmaniensis*), Smooth Toadlet (*Uperoleia laevigata*) and the uncommon Brown Toadlet (*Pseudophryne bibronii*) (Cogger 2000; Lintermans and Osborne 2002; Rauhala 1997).

The threatened Northern Corroboree Frog (*Pseudophryne pengilleyi*) occurs in pools and seepages in *Sphagnum* bogs, wet tussock grasslands and wet heath in the Brindabella and Bimberi ranges in the ACT. This species is not included in this Strategy but is the subject of a separate Action Plan (ACT Government 1997).

3.2.5 Invertebrates

Insects, other macro-invertebrates and microbiota account for more than 90 per cent of biodiversity and are vital for healthy ecosystem function. They are essential for pollination and reproduction of many

woodland plants, are involved in nutrient recycling through the breakdown of dead plant and animal material and are the main food of many aquatic and terrestrial animals. Terrestrial invertebrates are more diverse and abundant in habitats with mature trees (loose bark) and a well-developed ground cover of leaf litter, rocks, logs, branches or tussock grasses. Less information, however, exists on the composition, biodiversity and ecological requirements of invertebrates in most ecosystems (including riparian) than for other faunal groups. Consequently, conservation of most invertebrate species falls under the umbrella of habitat protection for vertebrates and vegetation communities.

There is increasing recognition of the importance of mistletoe in woodland ecosystems and as a 'keystone' resource for some fauna (Watson 2001). For example, Needle-leaf Mistletoe (*Amyema cambagei*) on *Casuarina cunninghamiana* in ACT riparian zones is the food plant for the larvae of the small brilliant blue butterfly *Amaryllis Azure* (*Ogyris amaryllis amata*) mainly found flying high in the canopy of mature trees. The larvae of the Wood White butterfly (*Delias aganippe*) also feed on this species (Common and Waterhouse 1981). Mistletoe offers food, shelter, nest sites and protection from predation for a wide variety of bird species from raptors to fairy-wrens (Watson 2001).

Aquatic macroinvertebrates are discussed in Chapter 4.

3.3

Threatened and Uncommon Riparian Zone Fauna Species in the ACT

The riparian zone in the ACT region provides important habitat for several threatened or uncommon terrestrial or amphibious species that are strongly associated with riparian habitats. Threatened species include the Painted Honeyeater (*Grantiella picta*) and the Pink-tailed Worm Lizard (*Aprasia parapulchella*). These species are discussed in section 3.3.2.

Many threatened or uncommon species typically associated with the adjacent woodlands or grasslands also use the riparian zone to varying extents. Riparian vegetation is important for birds in partially cleared landscapes. Eight woodland bird species are declared as threatened in the ACT under the *Nature Conservation Act 1980* (ACT Government 2004a). In addition to these threatened species, there is a suite of woodland bird species that is in apparent decline based on evidence from Taylor and COG (1992), Reid (1999), Traill and Duncan (2000), and data from both

COG and NSW Atlasers group. This suite includes the Diamond Firetail (*Stagonopleura guttata*), Speckled Warbler (*Chthonicola sagittata*), Flame Robin (*Petroica phoenicea*), Crested Shrike-tit (*Falcunculus frontatus*), Scarlet Robin (*Petroica multicolor*), Jacky Winter (*Microeca fascinans*), Dusky Woodswallow (*Artamus cyanopterus*) and White-fronted Chat (*Epthianura albifrons*). The White-bellied Sea-Eagle, an uncommon species in the ACT, has been recorded nesting in the riparian zone of the lower Molonglo River. Cliffs along the Molonglo and Murrumbidgee rivers provide some of the few suitable nesting sites in the ACT for Peregrine Falcons. This species is thought to use the same cliff nest sites, in some cases for hundreds of years. The Little Eagle, an uncommon species in the ACT (COG 2006), appears to be declining possibly due to habitat loss and competition with the Wedge-tailed eagle.

The uncommon Nobbi Dragon (*Amphibolurus nobbi*) is largely confined to eucalypt and cypress pine woodlands with a northerly or westerly aspect flanking the Murrumbidgee River. Rosenberg's Monitor (*Varanus rosenbergi*) is rarely seen in the ACT (s. 3.2.3) and is listed as vulnerable in New South Wales.

The rare Southern Leaf-green Tree Frog (Cotter River form) is known only from the Cotter River in the ACT (see s. 3.2.4). The Brown Toadlet has disappeared from bushland in the vicinity of Canberra and is now known only from a few scattered sites in riparian areas in the foothills of the southern ACT.

Key's Matchstick Grasshopper (*Keyacris scurra*), an uncommon grassland invertebrate, has been recorded from several sites in the ACT including areas adjacent to the Murrumbidgee River.

3.3.1 Conservation of Riparian Zone Fauna in the ACT

Consistent with the requirements for threatened species in the *Nature Conservation Act 1980*, protection goals adopted for the *Aquatic Species and Riparian Zone Conservation Strategy* are to:

- **Conserve in perpetuity viable, wild populations of all aquatic and riparian native flora and fauna species in the ACT.**
- **Conserve in perpetuity aquatic and riparian native vegetation communities in the ACT as viable and well-represented ecological communities.**

As noted in s. 3.1.1, riparian zones are important as habitat in their own right, as ecological or linking corridors, and as a distinctive part of a wider habitat mosaic with special features such as access to water and often structurally complex vegetation.

The major threat to riparian zone fauna in the ACT and

region and the apparent reason for decline of some species is the loss, modification and fragmentation of riparian habitat (s. 3.1.3). The premise of this *Strategy* is that protection in nature reserves and off-reserve conservation management of riparian habitat provides the foundation for long-term conservation of riparian zone fauna, including threatened species. For this reason, objectives and actions in the *Strategy* for conservation of fauna relate largely to habitat protection and management. In general, the *Strategy* takes an ecosystem approach to the conservation of riparian zone fauna rather than treating each species separately. Exceptions are threatened species, for which there is a legislative requirement to prepare Action Plans. In addition, some threatened species have specific recovery requirements.

From the general threats previously discussed (s. 3.1.3), it is evident that all riparian zone fauna will be advantaged by the conservation of the linear connectivity of riparian zone vegetation communities and streambank condition, as well the connectivity to upslope terrestrial ecosystems. Previous and ongoing land uses have impacted severely on this connectivity.

Actions undertaken to conserve threatened, declining or uncommon animal species and their habitats will also benefit the more abundant animal species. For example, maintenance of the *Casuarina cunninghamiana* community (especially large trees with mistletoe) is important for a number of birds and invertebrates. Any key conservation requirements for non-threatened species that do not fall under the umbrella of protection of the riparian zone or habitat protection for threatened species need to be explicitly identified.

Objectives and actions for the *Strategy* related to riparian zone fauna, including threatened species, are

shown in Table 6.1. The actions are not designed to prescribe every detailed task needing to be undertaken. Detailed actions will be developed by responsible agencies, often with community involvement and will be refined over time as more information is gained (as part of ‘adaptive management’). With regard to threatened species, objectives and actions in this *Strategy* must be integrated with state and national conservation efforts. Information in the next section provides a guide to more detailed or specific actions related to the conservation of threatened species.

Conservation of riparian habitat in the ACT contributes to the regional conservation of several threatened (e.g. Painted Honeyeater) or uncommon (e.g. Nobby Dragon) animal species and to those species that regularly use riparian zones as migration routes (e.g. Yellow-faced Honeyeater). The long-term viability of threatened and uncommon species across their range at regional or national levels is dependant on appropriate conservation measures both within and outside the ACT.

3.3.2 Conservation Actions: Threatened Riparian Zone Fauna Species in the ACT

Two listed threatened species are strongly associated with riparian zones in the ACT. These are the Painted Honeyeater *Grantiella picta* and the Pink-tailed Worm Lizard *Aprasia parapulchella* (Table 3.1).

Threatened Species: Painted Honeyeater (*Grantiella picta*)

The Painted Honeyeater is one of the bird species included in the *ACT Lowland Woodland Conservation Strategy*, which contains conservation actions for the

Table 3.1: Conservation Status Nationally of Threatened Animal Species Occurring in ACT Riparian Zones

Species	ACT	NSW	Cwith	Other
Painted Honeyeater	V	V	—	V(Vic), R(Qld)
Pink-tailed Worm Lizard	SPS	V	V	E(Vic)

V: Vulnerable; **SPS:** Special Protection Status; **E:** Endangered; **R:** Rare.

LEGISLATION:

Commonwealth: *Environment Protection and Biodiversity Conservation Act 1999*

ACT: *Nature Conservation Act 1980*

NSW: *Threatened Species Conservation Act 1995*

Vic: *Flora and Fauna Guarantee Act 1988* (Note that under this Act, species are listed as ‘threatened’ and specific conservation status (e.g. endangered) is applied in lists prepared by the Victorian Department of Sustainability and Environment (VDSE 2006).)

Qld: *Nature Conservation Act 1992; Nature Conservation (Wildlife) Regulation Act 1994*

species (ACT Government 2004a, pp. 53–54). The most significant of these is the conservation of its woodland habitat, comprising Yellow Box–Red Gum grassy woodland and *Casuarina cunninghamiana* riparian woodland.

This species was recorded from River She-oak (*Casuarina cunninghamiana*) along the Murrumbidgee River in 1948 and 1950 (Lamm and Calaby 1950) and occasionally in subsequent years. Wilson (1984) noted the large trees near Uriarra Crossing as a breeding area. However, since these earlier reports there have been no records of large numbers of Painted Honeyeaters associated with River She-oaks. The breeding distribution of *G. picta* is dictated by the presence of mistletoes, which are largely restricted to older trees, and by the seasonality of mistletoe fruiting (Garnett and Crowley 2000). River Oaks in the riparian zone of the Murrumbidgee River are host to the Needle-leaf Mistletoe (*Amyema cambagei*).

The Painted Honeyeater has been described as a ‘very rare vagrant making a spectacular influx to the region’ (COG 2003). In 2002–2003, an influx of at least 35 birds was reported (Bounds 2003). Most records were from Yellow Box–Red Gum grassy woodlands away from the riparian zone (COG 2003). This followed four decades with few reported sightings (Wilson 1999). The species was again present in the Canberra region in spring and early summer of 2004, with most records from a woodland remnant north of Gundaroo (Bounds 2004).

Threatened Species: Pink-tailed Worm Lizard (*Aprasia parapulchella*)

The Pink-tailed Worm Lizard has a restricted and patchy distribution in south-eastern Australia. Most of the known population occurs in the ACT, where the species has a fairly wide distribution and is locally common. Outside the ACT it is known from only scattered and isolated sites, including Tarcutta, Cootamundra, Cooma, Queanbeyan, Bathurst, Albury and Yass in NSW and near Bendigo in Victoria (NSW NPWS 1999).

Within the ACT, the species is largely restricted to the Murrumbidgee and Molonglo river valleys and nearby hillslopes (in particular Mt Taylor). Major populations in the ACT occur in the lower Molonglo River corridor from upstream of Coppins Crossing to the junction with the Murrumbidgee River, Mount Taylor and Cooleman Ridge, Woodstock, Stony Creek, Bullen Range and Gigerline reserves in the Murrumbidgee River Corridor. There are also some records from Googong foreshores (Figure 3.1) (Barrer 1992b; Osborne and McKergow 1993; Osborne and Jones 1995, Osborne *et al.* 1991, Osborne pers. comm.). The

Molonglo and Murrumbidgee river corridors are particularly important, because they provide extensive corridors of habitat that potentially allow for dispersal and hence gene flow between localised populations.

The Pink-tailed Worm Lizard is a small, thin, legless lizard that lives a largely subterranean existence. It apparently spends considerable time beneath partly embedded rocks in ant tunnels. It is a dietary specialist feeding on the eggs and larvae of various ant species, mainly *Iridomyrmex 'rufoniger'* (Webb and Shine 1994; Jones 1999). Its habitat is open grassland communities, usually dominated by Kangaroo Grass (*Themeda triandra*), with numerous partially embedded rocks. These areas typically have not been pasture improved and still have a moderate to extensive cover of native grasses (Osborne and Jones 1995). Soils at these locations include infertile skeletal soils and darker, deeper, finely grained soils with a porous or sandy fabric (Barrer 1992b). The Pink-tailed Worm Lizard has specialised habitat requirements in that it lives beneath partly embedded rocks in burrows formed initially by ant colonies. In the ACT region, suitable habitat for the lizard occurs in open (treeless) rocky areas on hillsides, and, particularly, on slopes of the Molonglo and Murrumbidgee river valleys (Osborne and Coghlan 2004). It is this particular land surface and associated ant biota that is critical habitat for the species rather than a riparian location, *per se*. A more detailed description of the species and its ecology is given in Appendix 1.2.

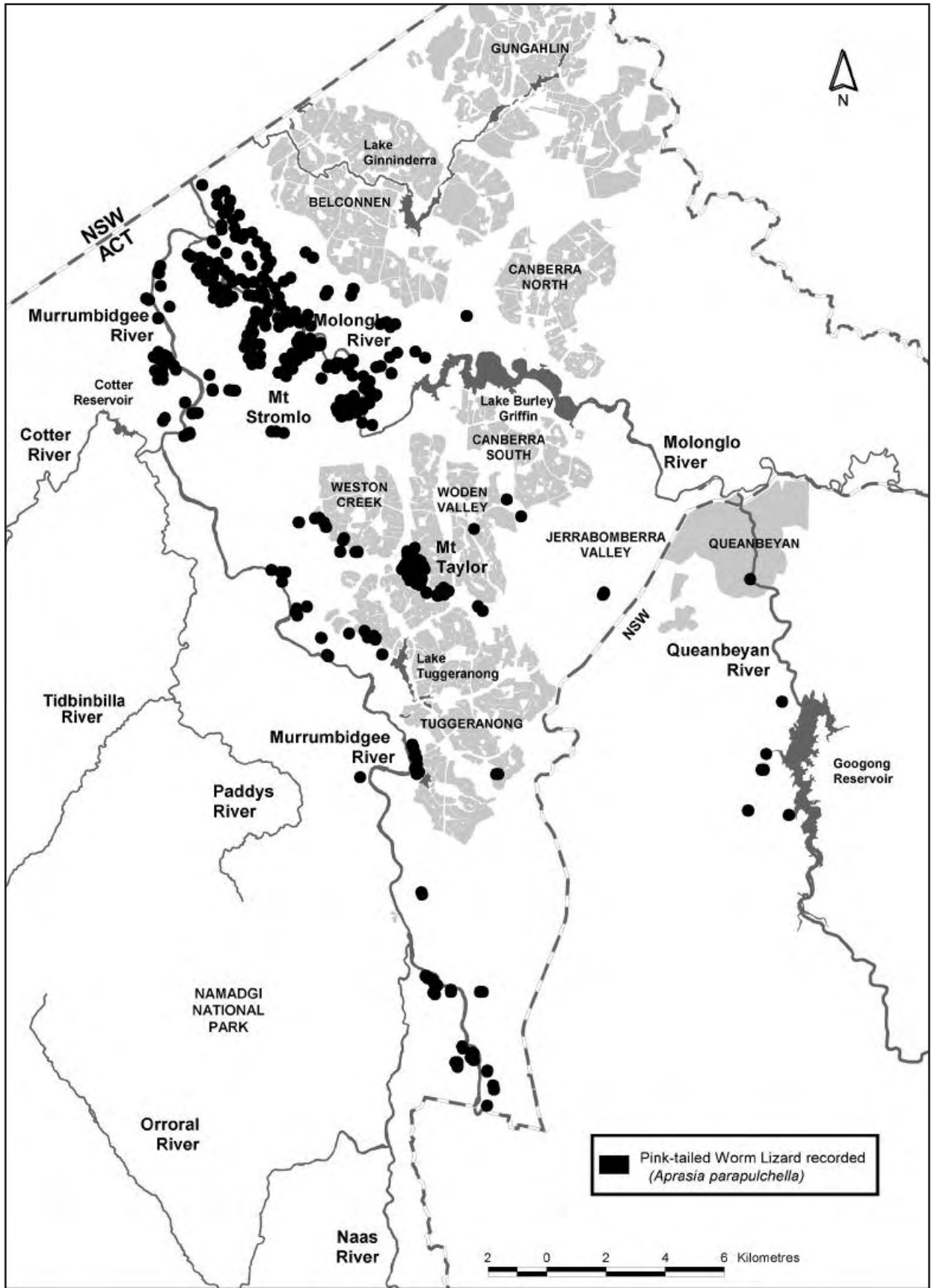
Because of its restricted distribution, low abundance, and threats to its habitat, the Pink-tailed Worm Lizard has been given formal conservation status at the national level and in each state or territory in which it occurs. It is declared threatened (endangered) in Victoria, and vulnerable in NSW and under Commonwealth legislation (Table 3.1). In the ACT, the species is reasonably common, mostly occurs in nature reserves, and is not considered to be in danger of extinction (Osborne and Coghlan 2004). For this reason it is not declared a threatened species in the ACT, but has been assigned Special Protection Status (SPS) under the *Nature Conservation Act 1980* (ACT), recognising the importance of the ACT populations in a national and regional context.

THREATS

The Pink-tailed Worm Lizard is a grassland species closely associated with rocky ground surfaces. The main threats to the species are:

- The loss or degradation of this habitat (by livestock grazing, cultivation and other forms of soil disturbance, rock removal, tree and/or shrub growth, weed invasion).

Figure 3.1: Records of the Pink-tailed Worm Lizard (*Aprasia parapulchella*) in the ACT and at Googong Foreshores



- The small size and fragmentation of the sites that now support the species across its known range.

The concentration of remaining populations of the species in the ACT appears to be related to less soil (and rock) disturbance than elsewhere, evidenced by the presence of a native grass cover, particularly Kangaroo Grass *Themeda triandra*, Red-leg Grass *Bothriochloa macra*, and Wattle Mat-rush *Lomandra filiformis*. The likelihood of occurrence of the lizard increases with increasing cover of Kangaroo Grass. By contrast, increase in cover of speargrasses (*Ausrostipa scabra* ssp. *falcata*, *A. bigeniculata*), weeds (indicators of disturbance) and River Tussock (*Poa labillardieri*) decreases the likelihood of finding the species (Jones 1992, 1999). In NSW sites, dominance by Kangaroo Grass is not a common feature, but the sites would still be described as native grassland (NSW NPWS 1999). Livestock grazing and agricultural activities (e.g. pasture improvement, cropping) have probably had the most impact on populations of the species through ground disturbance and changes to groundcover vegetation, and remain a threat to the lizard in the ACT outside reserves.

Rocks are an important micro-habitat feature for the species and rock removal is a threat. Rock removal may increase predation risk and potentially have a significant impact on small separated populations (NSW NPWS 1999). Bushrock removal is listed as a key threatening process in NSW for a number of species including the Pink-tailed Worm Lizard.

Establishment of shrub or tree cover on grassland sites is another threat. In the ACT, plantation pine trees have been planted over rocky clearings that supported small populations (Osborne and Coghlan 2004). There is also a potentially serious threat from the spread of Burgan (*Kunzea ericoides*) and St John's Wort (*Hypericum perforatum*), which have colonised pastoral land and invaded native grassland along the Murrumbidgee and Molonglo rivers (Kirschbaum and Williams 1991; Osborne and Jones 1995, Osborne pers. comm.).

While ACT populations of the species are in areas with habitat connectivity (Murrumbidgee and Molonglo river valleys and Mt Taylor), the main threat to NSW populations is pasture improvement and the small and fragmented nature of sites that support the species. At Tarcutta and Bathurst, the species survives in single populations and extensive searches of apparently suitable sites have failed to locate more. This has serious consequences for the long-term survival of the lizard at these sites (NSW NPWS 1999). In the ACT, maintaining habitat connectivity is an important consideration in planning for urban

development in the Molonglo Valley (ACT Government 2004b, p. 72). Habitat areas are likely to experience urban edge effects once urban development proceeds (see s. 2.3.1).

CONSERVATION OBJECTIVE

The conservation objective is to protect in perpetuity viable populations of the Pink-tailed Worm Lizard in secure native grassland habitat across the range of the species in the ACT and maintain its potential for evolutionary development in the wild.

CONSERVATION ACTIONS

A national recovery plan for the Pink-tailed Worm Lizard was prepared in 1995 and a significant proportion of the biological research recommended for the species has since been carried out (Osborne and Jones 1995; Jones 1999). Surveys were carried out in the ACT and region in the early 1990s (Osborne *et al.* 1991; Osborne and McKergow 1993; Barrer 1992b) and later, in the Tarcutta, Adelong and Bathurst districts, with no new records of the species (Jones 1999). Significant advance was made in the 1990s on knowledge of the biology and ecology of the species including diet, abundance and habitat relationships (Jones 1992); the relationship between the lizard and ant species (Robinson 1996); and diet and ant relationship, reproduction and population dynamics, habitat and microhabitat and conservation management (Jones 1999). There is still limited knowledge of the ability of the species to recover after habitat disturbance. Anecdotal evidence suggests limited ability to survive habitat changes following intensive grazing pressure and subsequent population extinctions. The specialised habitat and dietary requirements of the species suggest that more intensive, focussed management may be needed to maintain the species in the long term (NSW NPWS 1999).

The following conservation actions (mostly to be undertaken by Environment and Recreation) are framed within the objectives and actions for the Strategy as a whole in Table 6.1.

Information (Survey, Monitoring, Research)

- Maintain alertness to the possible presence of the Pink-tailed Worm Lizard when undertaking surveys in appropriate habitat.
- Continue to monitor habitat (vegetation composition and presence of rocks) and Pink-tailed Worm Lizard populations at known sites, including impacts of management practices (particularly grazing).
- Encourage, support, coordinate, and where practicable, undertake research into the biology

and ecology of the Pink-tailed Worm Lizard as a basis for managing the species and its habitat. More specifically, research is required to better understand:

- movement, seasonal activity, home-range and habitat use, dispersal capability, ability to move between fragmented habitat;
- population demographics, including sex ratios and age structure, survivorship, sources of mortality;
- reproductive rates and behaviour, breeding requirements, oviposition sites;
- susceptibility to fires and seasonal effects, optimum fire regimes, value and use of firebreaks;
- ecological relationship to ants (food and shelter), ecological relationship of ants to habitat (vegetation, rocks);
- impact of invasive species, particularly weeds such as Burgan (*Kunzea ericoides*) and St John's Wort (*Hypericum perforatum*); and
- sensitivity of habitat to trampling or other potential damage from multiple use.

Protection and Management

- Seek to ensure known populations of the Pink-tailed Worm Lizard are protected from inadvertent damaging actions such as the application of fertilisers (e.g. by advising land owners and managers of their presence).
- Seek to ensure that urban development and associated recreational pressures do not adversely impact on the viability of the species in the ACT.
- Encourage management to be undertaken in an adaptive framework, and facilitate the incorporation of research results into management of the Pink-tailed Worm Lizard and its habitat.
- Manage sites, and provide advice to other landowners and managers, to maintain optimum habitat for the species (in particular, prevention of intensive grazing, maintenance of native grass cover, retention of partially embedded surface rocks).
- To assist landowners and managers, prepare specific management guidelines for the species, where required.

Regional and National Cooperation

Maintain links with, and participate in, regional and national recovery efforts for the Pink-tailed Worm Lizard to ensure that ACT conservation actions are coordinated with regional and national programs.

3.3.3 Conservation Actions: Uncommon Riparian Zone Fauna Species in the ACT

Species not declared under ACT or Commonwealth legislation as vulnerable, endangered or Special Protection Status may be also of conservation concern and it is important that their status be monitored over time and threats minimised.

Some species occurring in riparian zones are uncommon because they are either at the margin of their distribution, occur naturally at low density or have declined in abundance. Some are vagrants or annual seasonal migrants to the ACT (e.g. migratory honeyeaters). Some of these species are of conservation concern because declines (in the ACT or elsewhere) may be continuing and because small populations tend to be more vulnerable to disturbance. The conservation status of uncommon species needs to be considered in a regional context.

Riparian zone habitat on the Murrumbidgee, Molonglo and Cotter rivers was burnt in the major bushfire of January 2003 with severe impacts recorded on River Oak (*Casuarina cunninghamiana*) (Carey *et al.* 2003). This loss of habitat is likely to have had impacts for riparian zone fauna.

Many declining, uncommon or rare species in the ACT typically associated with woodlands or grasslands are also likely to use the adjacent riparian zone to varying extents, and these species are discussed in s. 3.2. Species strongly associated with the riparian zone that are uncommon in the ACT region include White-bellied Sea-Eagle, Peregrine Falcon, Nobbi Dragon, Rosenberg's Monitor, Southern Leaf-green Tree Frog (Cotter River form) and Brown Toadlet.

CONSERVATION OBJECTIVE

Uncommon fauna species using riparian zones in the ACT are maintained in viable populations in perpetuity.

CONSERVATION ACTIONS

The following conservation actions for uncommon riparian zone fauna species (mostly to be undertaken by Environment and Recreation) are framed within the actions for the *Strategy* as a whole in Table 6.1.

Information (Survey, Monitoring, Research)

- Maintain alertness to the possible presence of uncommon fauna species when undertaking surveys in riparian zones.
- Maintain a database of known occurrences and abundance of uncommon fauna species that use the riparian zone to enable analysis of changes in distribution and abundance.

- Maintain a watching brief on uncommon fauna species that use ACT riparian zones and evaluate their conservation status in a regional context.
- Facilitate and encourage research that will provide information on the status of uncommon fauna species that use ACT riparian zones and their management requirements.

Protection and Management

- Seek to ensure known populations of uncommon fauna species and species that use ACT riparian zones are protected from inadvertent damaging actions (e.g. by advising landowners and managers of their presence).
- Prepare management guidelines for uncommon fauna species where necessary.

- Manage sites, and provide advice to other landowners and managers, to maintain optimum habitat (where known) for uncommon fauna species.
- Consider nomination for ACT listing if uncommon fauna species show evidence of local decline in extent and abundance.

Regional and National Cooperation

- Liaise with interstate agencies involved in protection and management of uncommon fauna species that use ACT riparian zones with the aim of increasing knowledge of their biology, and habitat and conservation requirements.