Description and distribution

The Inland Carpet Python or Inland Carpet Snake, *Morelia spilota metcalfei*, is a slow-moving, nocturnal snake that has an average adult length of 170 to 190 cm (Barker and Barker 1994, Cogger 2000). Being a python (family Boidae), and therefore non-venomous, it overcomes prey by constricting it in coils of its body. The Inland Carpet Python is one of only two pythons to occur in Victoria, the other being the closely-related Diamond Python, *Morelia spilota spilota* (Coventry and Robertson 1991). Inland Carpet Pythons have a contrasting and complicated pattern, generally of black and shades of grey, brown or tan - the back is dark with pale markings, and the sides are pale with dark markings. There is a series of paired, pale, rounded blotches down the back, with some pairs joined to form transverse bars or dumbbell shapes. The sides are pale with a variably-defined, dark, mid-lateral longitudinal stripe. (Barker and Barker 1994). Snakes in the southern portion of the range, the Murray River drainage in Victoria, are essentially black and grey, although some individuals may have a tan colouration on the sides.

The subspecies considered in this Action Statement occurs from the Eyre Peninsula region of South Australia, the Flinders Ranges, across inland northern Victoria, north through inland New South Wales and into southern and central Queensland west of the Great Dividing Range.

Habitat

In Victoria, the Inland Carpet Python inhabits two very different environments in the north of the State; River Red Gum (*Eucalyptus camaldulensis*)
forests and associated Black Box (Eucalyptus largiflorens) woodlands along the major watercourses; and rocky hills, often within woodlands of Blakely’s Red Gum (Eucalyptus blakelyi). There are also some records from other vegetation types, such as mallee shrublands, Callitris woodlands and freshwater swamps.

**Life history and ecology**

Hollow-bearing trees and logs, or large rock outcrops, plus thick litter or shrub cover, are essential to the existence of Inland Carpet Pythons. These are used as shelter sites, to avoid predators, to ambush prey, and to assist in thermoregulation (Shine 1994). Such features also provide essential habitat for prey items, particularly the herpetofauna utilised by juvenile pythons. Inland Carpet Pythons may also use rabbit burrows as shelter, with rabbits being a major food source. In some areas, they make use of houses and other structures, where introduced rodents form part of the diet. Activities which remove large hollow-bearing trees, logs, coarse woody debris, shrubs and litter may all threaten the survival of the Inland Carpet Python.

Female Inland Carpet Pythons in Victoria may breed only every third or fourth year, taking that long to gather the resources needed for reproduction. Mating occurs in spring, with the eggs (averaging 20 per clutch) laid during the December to January period. The eggs are incubated by the female for 50 to 60 days - she coils her body around them, maintaining relatively high incubation temperatures by brief basking excursions and by shivering to produce heat. This is the most advanced form of parental care exhibited by any Victorian reptile (Coventry and Robertson 1991). Inland Carpet Pythons in riverine habitats are known to incubate inside large logs with hollows, while those in rocky habitats are thought to do so within large rock crevices. Hatchlings appear by late February, and are independent of the female from the time of hatching.

While juvenile Inland Carpet Pythons are thought to feed mostly on lizards, adults prey upon small to medium-sized mammals, as well as birds, particularly those roosting in tree hollows. The radical alterations to the abundance and distribution of mammals which have occurred since European settlement in northern Victoria would be expected to have profoundly affected the feeding habits of adult Inland Carpet Pythons, the resultant changes in prey availability potentially limiting both the frequency of breeding and the number of young produced. The number of young surviving to reproductive age may also be altered. Recent studies have shown that the introduced European Rabbit (Oryctolagus cuniculus) now comprises 50% to 80% of the diet of adult Inland Carpet Pythons in Victoria.

The home range size of the Inland Carpet Python in Victoria (30 to 150 ha) appears to be larger than that of other subspecies of Carpet Python studied elsewhere in Australia.

Recent studies have shown that the introduced Red Fox (Vulpes vulpes) can be an important predator of the Inland Carpet Python, individuals of all sizes being taken - presumably because these snakes are slow-moving with no venomous defences, they are particularly vulnerable. Also, because the Inland Carpet Python in some areas is heavily dependent upon rabbits as a major food source, it may be increasingly exposed to fox predation while foraging. Eggs, hatchlings and incubating female Inland Carpet Pythons may also be prone to predation by the Feral Cat (Felis cattus), Tree Goanna (Varanus varius), and possibly the Feral Pig (Sus scrofas).

Where the Inland Carpet Python inhabits woodlands along watercourses, it is continually exposed to disturbance by people fishing, camping and firewood cutting. In rocky hill habitats, where the shrub layer is particularly important, grazing and firewood collection can dramatically reduce the quality of the habitat - in such areas, many on private land, habitat fragmentation via clearing, grazing and firewood collection is an ongoing concern. The Inland Carpet Python's slow-moving nature make it particularly vulnerable when on roads, a problem especially in more densely settled areas. Its slow-moving nature and lack of venom also expose it to deliberate killing or illegal collection - its attractive patterning make it a preferred snake for reptile fanciers.

**Conservation status**

DSE (2003) Endangered
SAC (1992) Threatened

Inland Carpet and Diamond Pythons (Morelia spilota spilota) have been listed as threatened taxa under the *Flora and Fauna Guarantee Act 1988*.

**Decline and threats**

The Inland Carpet Python is described as “once widespread in woodlands along major watercourses and rock outcrops of northern Victoria” (LCC 1987). Since European settlement, the subspecies has been subjected to a series of human-induced threats that have resulted in the number of populations declining, with a concurrent reduction in distribution of the species as a whole (LCC 1987); there are only 160 confirmed records in Victoria. The taxon is now considered to be ‘endangered’ within Victoria (DSE 2003).
Activities known to have or thought to be threatening the Inland Carpet Python include:

- reduction and fragmentation of habitat, by activities such as clearing, cultivation, subdivision and timber harvesting;
- actual and potential loss of connectivity of habitat as many tracts of connecting vegetation become severely degraded, particularly on freehold land;
- degradation of remaining habitat, including the reduction of hollow-bearing trees and logs, shrubs and ground debris, and reduction of cover provided by rock outcrops. A variety of processes contribute to this degradation, including:
  - firewood collection;
  - grazing by domestic stock, particularly of the shrub layer;
  - reduced amount of regeneration of indigenous species due to factors such as dieback of mature trees;
  - inappropriate fire;
  - changed flooding regimes in riverine areas;
  - weed invasion;
  - direct disturbance to and/or removal of rocks by humans, either for quarries, gardens or by reptile fanciers;
- the extinction of 18 species of small to medium-sized mammals in northern Victoria, as well as an overall reduction in extant native mammal populations. This has resulted in a reduced variety and availability of prey, which may have created a dependence on the introduced European Rabbit (Oryctolagus cuniculus);
- direct mortality due to works to control the European Rabbit, including warren fumigation and ripping, and loss of habitat via these processes;
- loss of prey due to decline of rabbit populations as a result of control measures and from the effects of introduced pathogens, viz. Rabbit Calicivirus Disease;
- possible loss of prey populations due to effects on ‘non-target’ species during rabbit poisoning exercises;
- direct attack on individuals by introduced predators viz. the Red Fox, the Feral Cat and probably the Feral Pig;
- direct effects of introduced pathogens on the Inland Carpet Python - the introduced ‘Inclusion Body Disease’ has not yet been reported in wild populations, but represents a significant potential threat;
- killing by a misinformed public, including woodcutters and campers;
- accidental death through road kills;
- illegal collection for the pet trade.

In its final recommendation, the Scientific Advisory Committee (SAC 1992) has determined that the Inland Carpet Python is significantly prone to future threats which are likely to result in extinction, and is very rare in terms of abundance or distribution.

**Wider conservation issues**

Much of the land on which Inland Carpet Pythons now exist in north-western Victoria, and where management activities will be directed initially, is Crown Land. This is being managed for nature conservation purposes in the case of National Parks and conservation reserves, and in other areas management prescriptions require that grazing and wood production are permitted where these activities do not conflict with the conservation values of the land.

In north-eastern Victoria, only some areas of Inland Carpet Pythons habitat on rocky hills are within conservation reserves which are managed giving due consideration to Inland Carpet Python requirements. However, many valuable areas are on private land which is subject to variable management, generally not with biodiversity conservation as a major objective, and where ongoing degradation and fragmentation is frequently a major problem.

Protection of Inland Carpet Python habitat in riverine areas will provide incidental protection for the habitat of a wide range of other wildlife. A reversal of the process of habitat simplification (due to such factors as grazing, trampling and timber removal) along the Murray River will enhance the recruitment and future survival of a variety of floodplain-dependent threatened fauna, including the Giles’ Planigale (Planigale gilesi), Regent Parrot (Polytelis anthopeplus) and Red-naped Snake (Furina diadema). Hollow logs and tree holows retained for Inland Carpet Pythons will also be utilised, when available, by many common species of mammals, birds, reptiles and invertebrates. Similarly, the control of domestic stock grazing on water frontages will aid in bank stabilisation, enhance water quality and subsequently benefit aquatic biota.

Protection of Inland Carpet Python habitat in rocky hills also will provide incidental protection for the habitat of a wide range of other wildlife. A reversal of the process of habitat fragmentation and degradation (due to such factors as firewood collection, grazing, rock disturbance, weed invasion and increasing utilisation) will enhance the recruitment and future survival of a variety of woodland-dependent threatened fauna, including the Grey-crowned Babbler (Pomatostomus
temporalis), Tuan (Phascogale tapoatafa), Squirrel Glider (Petaurus norfolcensis) and Bandy Bandy (Vermicella annulata). Maintenance and enhancement of critical habitat components (such as hollow trees, fallen timber and diverse shrub strata), particularly within important links between currently or potentially fragmented areas of rocky hill habitat, will assist the conservation of many animal species.

In surveying known and presumed habitat for Inland Carpet Pythons, a greater knowledge of the faunal assemblages of these areas will be gained. This information will be crucial in targeting more widespread conservation actions aimed at broader maintenance of biodiversity in the future. Control of feral predators will have far-reaching benefits within all ecological communities. Control of European Rabbits in areas of Inland Carpet Python habitat may have adverse affects upon this species, and will need to be carefully considered.

The conservation measures proposed in this Action Statement are generally aimed at insulating known populations of Inland Carpet Pythons from actions thought to threaten them. These aims can generally be achieved within the Government-accepted land management guidelines proposed by the Land Conservation Council (LCC 1989) and Environment Conservation Council (ECC 2001). In particular, establishment of Conservation Management Networks, as suggested by the ECC (2001), and implemented specifically for the conservation of Inland Carpet Pythons, should prove an effective vehicle for the protection and maintenance of a diverse range of biota.

Previous Management Actions

- A short-term study of the ecology and distribution of Inland Carpet Pythons in north-western and north-eastern Victoria has been undertaken between 1997 and 2002. This involved a program of radio-tracking Inland Carpet Pythons, enabling estimation of home range, and determination of habitat requirements, annual life history, activity patterns and diet. The hitherto unknown effects of introduced predators were documented. Student projects on various aspects of the ecology of the species have been encouraged.
- All records of Inland Carpet Pythons have been collated in central databases, including the *Atlas of Victorian Wildlife*. Deliberate programs and surveys to obtain records from land managers, private land owners and naturalists have been conducted in carefully targeted areas of potential Inland Carpet Python habitat.
- Various media promotions and information dispersal exercises aimed at raising public awareness of the status and conservation of the Inland Carpet Python have been conducted.
- Several private landholders with remnants containing Inland Carpet Python habitat have been provided with information concerning habitat protection and enhancement, and have been encouraged to conserve this species on their properties. Local Landcare groups have been of assistance in this process.
- The recent research project illustrated the occasional use of rabbit burrows by the Inland Carpet Python during the warmer months, and historical anecdotal accounts (D. Christian pers. comm.) document the killing of pythons during warren ripping programs. For practical and wildlife protection reasons, since 1989, the shooting and poisoning of rabbits has replaced ripping and fumigation of warrens as control techniques employed by DSE on the Murray River floodplain - consequently, on the floodplains, Inland Carpet Pythons are now only minimally threatened by rabbit control works (at least directly). Similarly, in north-eastern Victorian areas of Inland Carpet Python habitat, warren ripping is now confined to the cooler months, when pythons are unlikely to be using rabbit burrows. (However, reduction of available prey - rabbits - resulting from such control programs may be of concern. Similarly, any reduction in native prey species of the Inland Carpet Python - such as possums - brought about by 'non-target' poisoning during rabbit control programs, may also be a concern).
- Specifically targeted fox control measures have been undertaken in some key areas of Inland Carpet Python habitat.
- Fire management in some reserve areas has included protection of key elements of Inland Carpet Python habitat (large hollow trees and logs) during controlled burning exercises.
- Management has been modified on an area of Gunbower Island (near Cohuna) specifically for Inland Carpet Python conservation. In 1991, the Department of Conservation & Natural Resources (Bendigo) (now DSE) fenced about 1 000 ha of the island to exclude stock grazing, and timber extraction was halted there.

Conservation objectives

Long-term objective
To ensure that the Inland Carpet Python can survive, flourish and retain its potential for evolutionary development in the wild.
Objectives of this Action Statement

1. Manage currently known and subsequently discovered populations for short-term protection from major threatening processes;

2. Determine the full extent of populations, and deduce critical aspects of the species’ biology and ecology, including the role and importance of individual threats, such that long-term management requirements can be determined and refined;

3. Monitor distribution and abundance of Inland Carpet Python populations;

4. Implement actions to remove or reduce threats, to firstly prevent any further decline in total population size, and secondly to enhance populations such that they become viable in the long-term, and

5. Develop in the community a raised awareness of Inland Carpet Python conservation status and requirements, and implement a cooperative management strategy with involvement of both public and private land managers and conservation groups.

Intended Management Actions

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation database. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

Forest operations

1. Include detailed prescriptions for the protection and management of this species within State forest in the appropriate Forest Management Plans (Mildura, Mid-Murray and North-East). These plans will set aside management or protection zones to modify or exclude harvesting and other threatening activities in order to conserve key population centres for Inland Carpet Python along the length of the Murray River and will ensure continuity of suitable habitat throughout riverine areas.

   Responsibility: DSE (Parks & Forests Division)

Integrated Catchment Management

2. Incorporate actions to protect, enhance and restore Inland Carpet Python habitat into relevant Regional Catchment Strategies or their subordinate strategies via Biodiversity Action Plans. Implement these actions, according to priority, as resources become available, in conjunction with other agencies, community groups and landholders.

   Responsibility: DPI (NW Region, NE Region), Catchment Management Authorities.

Firewood collection

3. Develop prescriptions to retain adequate standing and fallen timber on public land where Inland Carpet Pythons or potentially high quality habitat occur. Provide extension and advice on recommended firewood harvesting levels to landholders on private land where, and near to where, Inland Carpet Pythons occur.

   Responsibility: DPI (NW Region, NE Region), Parks Victoria

Grazing

5. Control grazing in key public land habitats where conservation values, including regeneration of indigenous flora, are compromised by this activity. Negotiate the fencing out of domestic stock from key Inland Carpet Python habitat on freehold land using, where appropriate, Land Protection Incentive Scheme grants, NHT grants or the like.

   Responsibility: DSE (Parks & Forests Division), DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Predator control

6. Implement and maintain regular control of Red Fox, feral Cat and feral Pig within strategic areas of Inland Carpet Python habitat, and monitor the Inland Carpet Python populations at selected control sites. To achieve maintenance of low fox numbers, control measures must be coordinated over a far broader area than just the python habitat.

   Responsibility: DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Rabbit control

8. Ensure that pythons are not directly threatened by rabbit control measures in areas of Inland Carpet Python habitat by undertaking ripping of warrens only during the cooler months, when burrows are unlikely to be occupied by pythons and preventing any
kill of ‘non-target’ species during rabbit poisoning programs.

9. Ensure that consideration of provision of adequate prey resources for Inland Carpet Python in strategic habitat areas is included within relevant documents for rabbit control, such as CMA 'Rabbit Action Plans', 'Resource Protection Guidelines - Rabbit Control', and similar rabbit management plans. Because Inland Carpet Pythons are often dependent upon rabbits as prey, the short-term maintenance of existing low numbers of rabbits in areas of python habitat may be considered. A long-term strategy should include enhancement of populations of native prey species as an alternative to rabbits.

Responsibility: DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Recreation

10. Encourage non-passive recreational pursuits only in areas identified as not significant for Inland Carpet Pythons. Develop and implement measures to minimise firewood collection for camping in areas identified as significant for Inland Carpet Pythons.

Responsibility: DPI (NW Region, NE Region), DSE (Parks & Forests Division), Parks Victoria.

Fire control

11. Generally, exclude fire from Inland Carpet Python habitat. Where fire is required for ecological management, ensure the protection of specific habitat elements important to pythons, such as large hollow trees (both alive and dead) and fallen timber.

Responsibility: DSE (Parks & Forests Division), DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Flood regulation

12. In riverine areas of Inland Carpet Python habitat, ensure that flooding frequency is appropriate to maintain those vegetation elements which comprise important elements for pythons. When determining areas in which to promote flooding for ecological purposes, the presence of Inland Carpet Python habitat should be an important consideration.

Responsibility: DSE (Parks & Forests Division), DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Management agreements

13. Develop and implement cooperative management strategies and agreements for the coordinated regional management of Inland Carpet Python habitat on both private and public lands, including especially the enhancement of links between habitat fragments. Promotion of 'Conservation Management Networks' (as per ECC 2001, p. 187) could be an important vehicle for such strategies, particularly in areas such as the Chesney Vale Hills and the Mt Hope/Terricks areas. Organisations such as Land Care, Greening Australia, Catchment Management Authorities, Parks Victoria and DSE could be involved, in addition to private land owners and public land managers.

Responsibility: DSE (Parks & Forests Division), DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Research

14. Facilitate and/or conduct survey and research for Inland Carpet Pythons, in particular:

• continue to record sightings on the Inland Carpet Python Databases (DPI – Mildura, PV – Wangaratta) and forward those data for inclusion on the Atlas of Victorian Wildlife;
• collect data on the locality, extent and size of Inland Carpet Python populations throughout northern Victoria so that the degree of overlap with various land-use practices may be determined;
• undertake targeted searches of potential habitat for currently undocumented populations;
• monitor populations of Inland Carpet Python in areas of imposed management, such as fox control or log enhancement areas – collect demographic data on these populations;
• continue the investigation of the diet of Inland Carpet Pythons in different habitats, to determine the relative importance of introduced and native prey species; investigate methods of enhancing populations of native prey species;
• continue the investigation of the key components of Inland Carpet Python habitat, so that management may aim to preserve and enhance these components;
• investigate the importance of recognised threats to Inland Carpet Pythons, to recommend appropriate actions for their amelioration;
• investigate the ecology of juvenile and breeding female pythons to determine appropriate management of their specific habitat requirements and threats;
• continue investigation and monitoring of the role and importance of habitat linkages and private remnants, to provide appropriate advice on the maintenance and/or enhancement of these areas. Such studies could target areas in which 'Conservation Management Networks' are established;

• encourage participation of tertiary education institutions in research and monitoring programs.

Responsibility: DSE (Biodiversity & Natural Resources Division), Parks Victoria.

Extension and public education

15. Produce and distribute extension and community education information, including:

• extension programs, such as those available via ‘Land for Wildlife’, aimed at protection of key Inland Carpet Python habitat on freehold land.

• a popular leaflet explaining the identification, unique biology, significance and ecological niche of the Inland Carpet Python. The general public, woodcutters and campers will be the target audience, and will be encouraged to avoid disturbing the pythons and to report any sightings.

• detailed information sheets aimed primarily at private landholders and land managers of areas of Inland Carpet Python habitat, to clearly explain the significance ecological requirements of the species, and to present guidelines for management of its habitat.

• appropriate explanatory signage in areas of cooperative management agreements, imposed management and habitat enhancement works.

• a web-site for the presentation of all relevant published information on the of Inland Carpet Python, and to enable dissemination of regular updates on the research, monitoring and management programs.

Responsibility: DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Interstate liaison

16. Liaise with interstate wildlife authorities in South Australia and New South Wales concerning Inland Carpet Python distribution and conservation in order to maximise local knowledge and standardise data collection on population demographics. Develop cross border management agreements with relevant authorities.

Responsibility: DPI (NW Region, NE Region), Parks Victoria.

Management plans

17. Ensure that provisions for the management actions (as per this Action Statement) are included in all relevant management plans for areas which include potential Inland Carpet Python habitat, such as the ‘Warby Range State Park Management Plan’, ‘Barmah State Park Management Plan’, CMA plans (e.g. ‘Goulburn Broken Catchment Rabbit Management Action Plan’), and that local government authorities include similar consideration within planning guidelines under their jurisdiction (such as ‘conservation overlays’, ‘native vegetation retention controls’, etc.).

Responsibility: DPI (NW Region, NE Region), Parks Victoria, Catchment Management Authorities.

Disease management

18. Undertake a program of regular and obligatory monitoring of the disease status (particularly for Inclusion Body Disease) of all confiscated, some captive and selectively targeted wild individuals, to ensure that any outbreaks of this disease in wild populations may be avoided.

19. Release of confiscated individuals into the wild is not to be contemplated, to prevent potential spread of disease into wild populations by this route.

Responsibility: DPI (NW Region, NE Region), Parks Victoria.

Enforcement

20. Investigate the need for and likely outcomes of increased enforcement activity in relation to the illegal possession and trade of Inland Carpet Pythons, including ‘take from the wild’.

Responsibility: DPI (NW Region, NE Region).

References


