

Guidelines for management activities in Swamp Skink habitat on the Mornington Peninsula.

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This document aims to provide guidelines for the protection and management of the habitat of the Swamp Skink on the Mornington Peninsula.

Description

The Swamp Skink (*Lissolepis coventryi*) is member of the skink family, growing to about 250 mm in total length. It has very shiny, overlapping scales, large scales on the head, and a broad, flat tongue. The colour of its back is pale yellow-brown to dull olive, with two broad, dark brown to black stripes. The sides of the lizard are dark with small pale spots. See photograph below.



Ecology

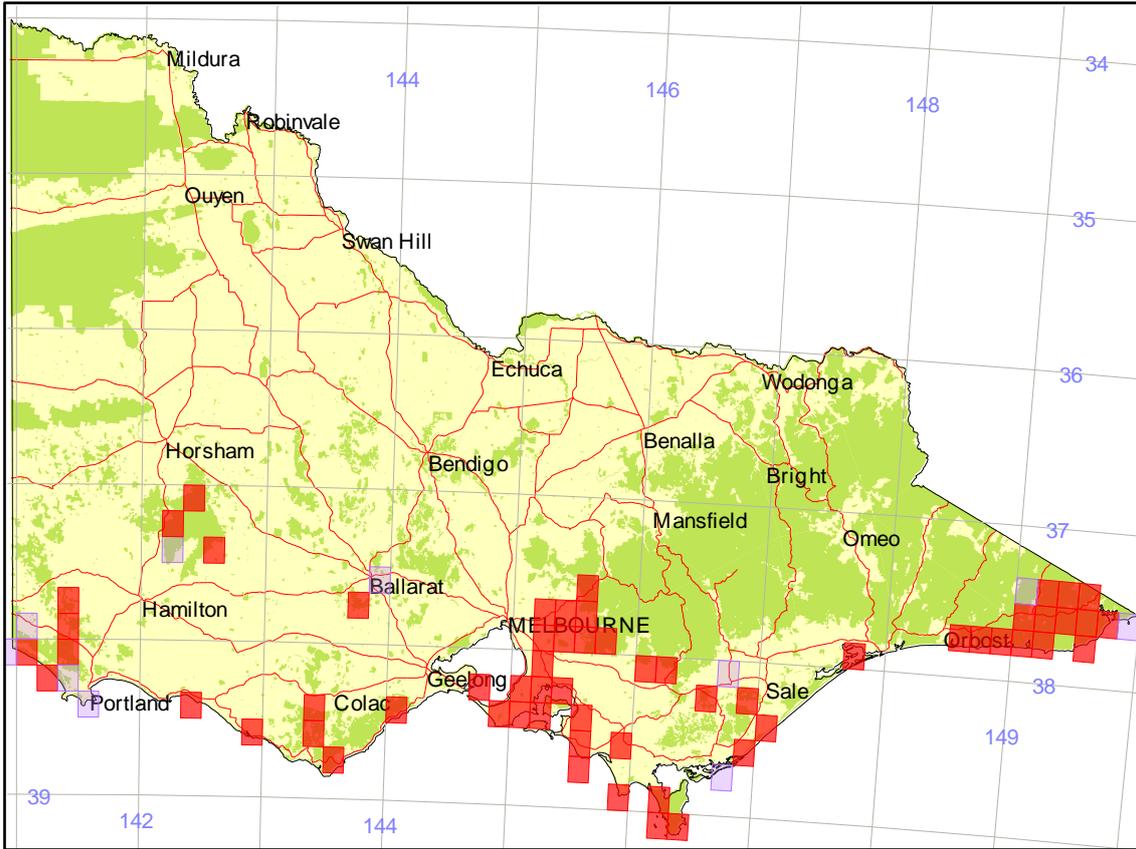
Swamp Skinks are usually active during the day. They bask and forage within and upon dense, low vegetation, occasionally up to two metres above the ground, and will readily enter water if disturbed, remaining submerged for considerable periods. During periods of inactivity, they shelter in burrows excavated in peaty soil beneath vegetation, and sometimes utilize the burrows of yabbies and crabs. They also shelter in or under dense vegetation and debris. Although not present in all Swamp Skink habitats, where they do occur, rocks and logs (and artificial debris) are often used as shelter and retreat sites.

Swamp Skinks are most active from early September to mid-April. They are usually not active during the colder months, however they are capable of activity at this time to escape flooding of refuge sites. Mating takes place in November, with one to six live young born in late January and February.

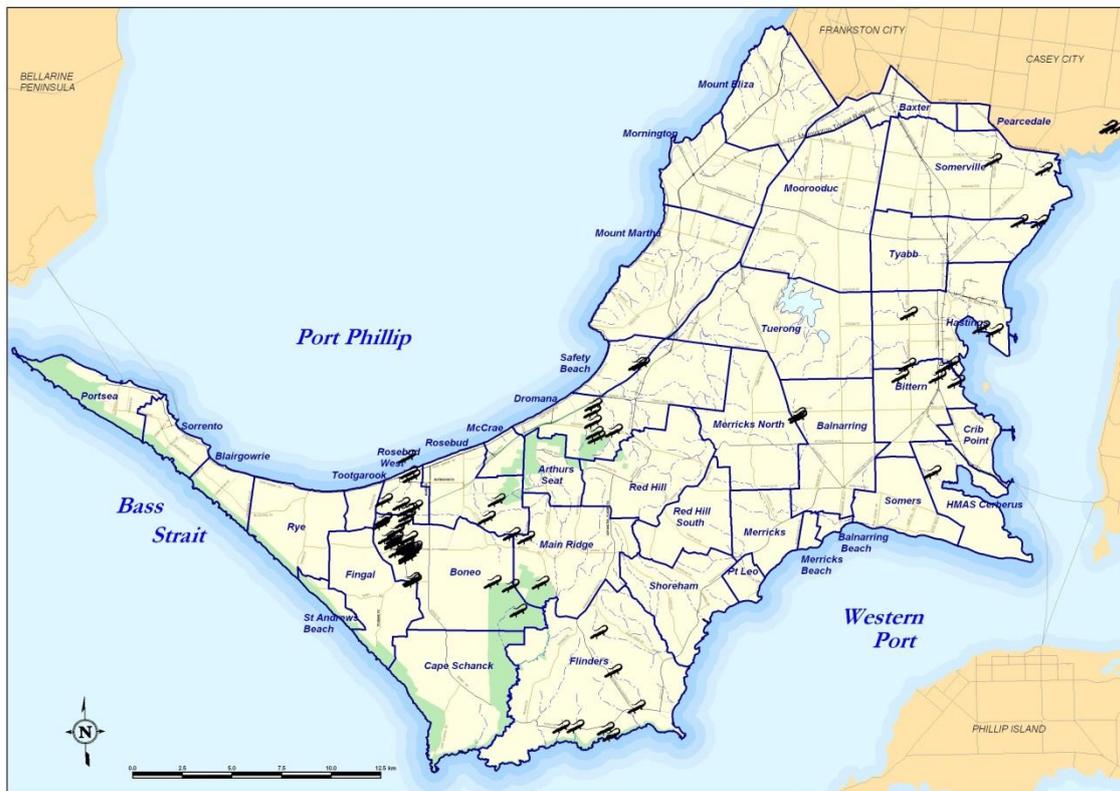
Swamp Skinks are relatively sedentary. A study at Tootgarook Swamp showed that they rarely moved more than five metres from initial capture sites. Whilst they can occur at quite high densities, Swamp Skinks are territorial, and can be very aggressive towards each other.

Distribution

Swamp Skinks occur only in south-eastern Australia, from the Mt Gambier region in the west, across southern Victoria, to the New South Wales border in the east. They are not known from Tasmania or any of the Bass Strait islands. The Victorian distribution of Swamp Skinks is shown on Map 1. Known records from the Mornington Peninsula are shown on Map 2.



Map 1. Broad distribution of the Swamp Skink. (courtesy Viridans Pty Ltd)



Map 2. Records of the Swamp Skink on the Mornington Peninsula. (courtesy Mornington Peninsula shire)

Mornington Peninsula Shire Bushland Reserves where Swamp Skinks are present

- Tootgarook Wetlands Bushland Reserve, Rosebud West.
- Chinamans Creek Reserve (entire length), Rosebud West.
- Sanctuary Park Bushland Reserve, Rosebud West.
- Drum Drum Alloc Creek. 40 Colchester Road, Rosebud West.
- Tootgarook Swamp Bushland Reserve, Boneo.
- Peninsula Sands Bushland Reserve, Rosebud.
- Peninsula Gardens Bushland Reserve, Rosebud.
- 75A Bayview Avenue, Rosebud.
- Main Ridge Equestrian Grounds, Main Ridge.
- Boundary Road Reserve, Dromana.
- Brasser Avenue Bushland reserve, Dromana.
- Yaringa foreshore Reserve South and North, Tyabb.
- Warringine Park, Creek Section and Coastal Section, Hastings.
- Kings Creek Bushland Reserve North, Hastings.
- Hastings Foreshore reserve, Hastings.

Status

Within Victoria, Swamp Skinks are listed as threatened under the *Flora and Fauna Guarantee Act* (1988), and as 'Vulnerable' by DSE (2013).

Habitat on the Mornington Peninsula

On the Mornington Peninsula, Swamp Skinks are patchily distributed, being restricted to densely-vegetated freshwater swamps and associated watercourses, or adjacent wet heaths, sedgeland and saltmarshes. Apart from at coastal saltmarsh sites, the species is generally found in areas of heavier soils, often developed in poorly-drained areas and adjacent vegetated areas on sandy soils.

Ecological Vegetation Classes (EVCs) utilized by the Swamp Skink include Wet Heathland, Coastal Saltmarsh, Estuarine Wetland and Riparian Scrub Complex, Riparian Thicket, Swamp Heathland and Swamp Scrub.

Swamp Skinks prefer micro-environments where the vegetation is very dense at ground level to two metres, but with little or no overstorey. When heathy vegetation or overstorey trees develop a continuous cover at heights greater than two to three metres, the habitat becomes unsuitable for Swamp Skinks. For example, at Tootgarook Swamp, the tall dense Paperbark thickets are avoided, but the margins of these thickets and adjacent sedges and tussock grasses are used extensively. This dense, continuous low vegetation is used by Swamp Skinks for basking, foraging and shelter, but when it is shaded-out by taller plants, it becomes unsuitable for this lizard. Swamp Skinks will also use exotic vegetation that has similar structural attributes to this native preferred habitat. Consequently, in many areas, the persistence of Swamp Skinks may depend on non-native vegetation, and therefore before such weeds are removed or replaced, the possibility of the lizard's presence should be considered, and only appropriate weed control techniques and strategies should be used (see below).

Threats

1. *Loss and fragmentation of habitat, loss of opportunity for dispersal and/or recolonisation following catastrophic events.*
2. *Clearing for agriculture.*
3. *Draining of wetlands, including the construction and maintenance of levee banks.* Many swampland areas which in the past probably supported populations of Swamp Skinks have been drained and subsequently utilized for a variety of agricultural and other pursuits.
4. *Changed water regimes of rivers and wetlands.* Changes to water regimes which could affect Swamp Skink habitat may vary from large and obvious (e.g. dams and impoundments) to those far less apparent, such as track construction changing local hydrological patterns and subsequently vegetation distribution. Water regimes (timing and extent of inundation) at a number of Mornington Peninsula sites have changed greatly, by draining (e.g., Tootgarook Swamp, Langwarrin), impoundment (Arthurs Seat), weed invasion and agricultural runoff (Tootgarook), all with largely unknown effects on the populations

of this species.

5. *Pollution of rivers and wetlands, including resultant changes to the vegetation.* Any process which threatens the integrity of the swampy vegetation upon which Swamp Skinks depend is a potential threat to the species. Pollutants which have the potential to alter swampy vegetation composition or structure may be a threat. Similarly, artificially increased nutrient levels in wetlands (from agricultural runoff, for example) can dramatically change the vegetation, with unknown consequences for Swamp Skinks - this process is evident at Tootgarook Swamp.
6. *Pollution of marine and coastal areas, including resultant changes to the vegetation.* Most Swamp Skink populations occur close to the coast, and are therefore their habitat is susceptible to marine and coastal influences. This is particularly the case for populations that inhabit saltmarsh (such as at the Hastings-Bittern Coastal Wetlands).
7. *Degradation of riparian vegetation.* Riparian vegetation, often present as a narrow strip of habitat through otherwise unsuitable vegetation, may be particularly important for providing long-term dispersal or re-colonization routes for Swamp Skinks. Any disruption to the continuity of this strip probably precludes movement of this species between larger habitat patches.
8. *Weed invasion resulting in vegetation changes and degradation of habitat.* Invasion of Swamp Skink habitats by environmental weeds has the potential to significantly alter the habitat's potential for continued utilization by this species. Swampy and riverine vegetation is particularly susceptible to this process. In particular, woody weeds (and even native tree and shrub species) can shade occupied habitat to the extent that it becomes unsuitable for Swamp Skinks. Conversely, exotic vegetation, including some common weeds, can provide suitable habitat for Swamp Skinks in the absence of native vegetation. Consequently, consideration of the species' potential presence in such areas is important, and any proposed weed control should be planned and conducted appropriately (see below).
9. *Changes to habitat due to recreational pressures.* The direct effects of human recreational pressures on Swamp Skink habitat are evident at many sites, generally making the habitat less suitable for the species by either decreasing its cover, quality or extent. Effects may include: trampling of vegetation in frequented areas (e.g. Arthur's Seat); construction of paths and boardwalks through habitat, decreasing available shelter and increasing predator access (e.g. Hastings); construction of impoundments or artificial 'open water' wetlands, or complete removal of habitat for alternative recreational land uses (e.g. Tootgarook Swamp).
10. *Infection of vegetation by Cinnamon Fungus.* The vegetation at many Swamp Skink sites is known to be subject to infestation by Cinnamon Fungus. This pathogen can dramatically alter the desirable characteristics of Swamp Skink habitat. It develops and spreads particularly in poorly drained soils, and is frequently spread in infected soil carried on vehicles.
11. *Grazing and trampling of habitat by stock.* Much of the Swamp Skink habitat remaining on private land is frequently subject to grazing by domestic stock. This activity may greatly decrease vegetation cover at ground level, inhibit regeneration, disturb soil structure (and lizard burrows), increase nutrient levels, facilitate weed invasion, and change soil drainage characteristics. Sedge-rich communities of lowland drainage lines are particularly susceptible to grazing.
12. *Urban, agricultural and industrial development.* Many areas which once supported Swamp Skink habitat have been destroyed or isolated by development for housing and agriculture (including wineries), and such activities continue on the Mornington Peninsula.
13. *Infrastructure effects (e.g. freeway and road construction and maintenance, pipelines).* Many Swamp Skink sites are adjacent to or crossed by roads and pipelines. Freeway construction proposed at Tootgarook Swamp would remove large areas of habitat. During construction of a pipeline through Tootgarook Swamp considerable efforts were made to cater for the requirements of Swamp Skinks – the long-term effects have still to be assessed. As well as the obvious reduction in the extent of habitat caused by such constructions, they also introduce a number of other less obvious threats, such as:
 - Altered hydrology of sites, followed by (perhaps gradual and hence less noticeable) changes in vegetation.
 - Increased weed invasion.
 - Increased access for introduced predators.
 - Increased fire risk.
 - Increased risk of Cinnamon Fungus infection of habitat plants.
 - Barriers to dispersal and fragmentation of populations.

14. *Predation by exotic animals.* Both the Red Fox and Cat are known to include lizards in their diets, and the Black Rat may also prey on Swamp Skinks. Several human activities may increase exposure of lizards to such predation – these include:
- Reduction in the vegetation cover at ground level (for example by clearing or grazing).
 - Construction of tracks and paths, which are subsequently used by predators to gain access to otherwise dense and difficult vegetation. Boardwalk construction for tourist access to some areas of Swamp Skink habitat (e.g. Hastings) may have unintentionally increased the lizard's exposure to predation.
 - Proximity of some Swamp Skink populations to urban or intensive agricultural areas, where predator populations are high and harbour for predators is abundant, may place these populations at higher threat.
15. *Effects of unpredictable events on small populations, loss of genetic diversity.* Small populations of Swamp Skinks that have become isolated may be particularly vulnerable to unpredictable disturbances such as disease and fire. Small populations are also generally more likely to lose genetic diversity through random genetic processes, with this loss of diversity potentially reducing their genetic fitness or evolutionary potential, and hence placing them at a greater risk of extinction from other threats.

Management overview – habitat aims

General characteristics of Swamp Skink habitat to aim for when managing areas are:

- None or only a sparse overstorey of canopy trees and large shrubs (greater than 2 metres in height).
- Continuous or near-continuous cover of ground layer plants (sedges, tussocks etc.) to around 1 metre in height. Note: if already present at a site, this may include some exotic plant species.
- Habitat in or near permanent water or areas subject to periodic inundation.
- Although not always present in habitat occupied by Swamp Skinks, shelter such as rocks, logs and artificial debris can increase use of an area by the species.

Guiding principles for managing Swamp Skinks and their habitat

- Areas of continuous habitat should not be reduced in area, and not be fragmented (e.g., by roads).
- Hydrological regimes within and around habitat occupied by Swamp Skinks should be maintained.
- Maintenance or development of continuous, dense ground layer vegetation to approximately 1 metre in height is desirable.
- Establishment or spread of overstorey or canopy trees or large shrubs should be avoided.
- As well as sheltering in burrows and amongst vegetation, rocks, logs and artificial debris can be important shelter sites for Swamp Skinks. Such features should be maintained, and, in some cases, enhanced (in consultation with experts on Swamp Skinks).
- Control of exotic predators such as foxes and cats is desirable. Similarly, pet owners should be prevented from allowing their cats to leave their properties.
- Introduction or spread of pathogens represents a risk to some wildlife species and their habitats. During all works within Swamp Skink habitats, measures should be implemented to prevent the spread of pathogens such as Cinnamon Fungus and the Amphibian Chytrid Fungus.
- Any works within potential habitat for Swamp Skinks should be timed so as to minimise impacts on the lizards – this timing may vary according to the habitat type and its use by the lizards at different times of the year, and also vary according to the types of works (see below).
- The use of chemical herbicides and/or pesticides in Swamp Skink habitat should generally be avoided, unless alternative techniques are not available or not effective, and then only if it can be shown that these chemicals will not jeopardise Swamp Skink populations.
- Passive recreational use of Swamp Skink habitat should be discouraged, and access to such areas should be limited to prevent adverse effects on the species' habitat. Fencing may be desirable in some areas.
- Swamp Skinks are secretive, and much remains to be learned about their ecology, habitat use and responses to management actions. Consequently, regular monitoring of populations, habitat, threats, and the species' response to management actions is highly desirable.

Coordination and overseeing of Swamp Skink habitat management

- Within the Mornington Peninsula, there should be one main 'point of contact' for overseeing, managing and advising on all works in potential and known habitat of the Swamp Skink.
- The overseeing body should make use of available ecological experts, to advise on potential effects of management activities, and to assist with on-ground coordination
- The overseeing body should produce and maintain a set of detailed maps showing all records of the species and areas of potential habitat – these to be consulted when planning any works, and to guide any necessary restrictions.
- There should be a coordinated central repository for reporting or all sightings of the species, and prompt updating of the maps and database.
- On-site training of contractors, friends groups and landowners is essential, in conjunction with distribution of these guidelines to all workers and interested parties. Meeting with experts in the field is an important component of this training.

Management guidelines

Management activity	Risk to Swamp Skinks and / or their habitat	Guidelines for implementation
<p>Weed control – woody weeds (greater than 1 metre)</p>	<p>Within Swamp Skink habitat, control of weed trees and large shrubs can generally be undertaken with little adverse effect on the species, provided that ground layer disturbance is minimised.</p> <p>There may be some temporary degradation of ground layer vegetation or some mechanical disturbance or crushing of ground layer vegetation.</p> <p>Spread of pathogens / weeds.</p> <p>Potential toxic effects of herbicides.</p>	<p>If possible, weed removal should be conducted via hand and / or mechanical means.</p> <p>Avoid or minimise machine damage to ground layer vegetation.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Choice of amount and type of herbicides should be made after consideration of potential effects on Swamp Skinks and their prey. In general, if herbicides are deemed necessary, application should be limited to 'cut and paint'.</p> <p>Do not disturb the ground in winter by manually removing entire woody weeds as there is a possibility of damaging swamp skinks burrows when they are less able to escape due to hibernation.</p> <p>Be aware of slopes that are easily damaged, reduce number of people walking through site and frequency of works to prevent damage to sandy slopes along creek line.</p>
<p>Weed control – ground layer (less than 1 metre) species</p>	<p>Within ground layer vegetation, weeds can be important habitat elements for Swamp Skinks. Rapid and total removal of all weeds in an area can have a detrimental impact on this lizard, unless there is sufficient native vegetation amongst the weeds. Maintenance of the integrity and extent of habitat is important during any weed control exercise.</p> <p>Temporary loss of habitat structure.</p> <p>Spread of pathogens / weeds.</p>	<p>Removal of weeds should be conducted carefully. Where large tracts of ground layer weeds occur, removal of weeds should be undertaken in a patchy and / or staggered manner, and desirable ground layer plants should replace weeds as they are removed.</p> <p>If possible, weed removal should be conducted via hand and / or mechanical means, rather than with chemicals. Hand weeding of individual weeds within Swamp Skink habitat is preferable, such that the use of the habitat by Swamp Skinks is not compromised.</p>

		<p>Control of ground layer weeds should be conducted during the Swamp Skink's active season in order to minimise direct mortality of sheltering lizards.</p> <p>Only relatively small areas of any given patch of habitat should be treated at any one time so that adequate alternative refuge is available.</p> <p>If herbicides are deemed necessary, choice of, amount and type should be made after consideration of potential effects on Swamp Skinks and their prey, and should be limited to spot spraying not broad spraying.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Ground for weeds such as Kikuyu and Buffalo grass or other species with a similar form provide optimal habitat for the swamp skink and in some cases where reasonable, should be left in situ.</p> <p>Be aware of slopes that are easily damaged, reduce number of people walking through site and frequency of works to prevent damage to sandy slopes along creek line.</p>
Tree removal	<p>Mechanical disturbance or crushing of ground layer vegetation.</p> <p>Spread of pathogens / weeds.</p>	<p>Avoid machine damage to ground layer vegetation.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Investigate use of felled logs as structural habitat features (pine is not suitable as habitat supplementation)</p>
Revegetation	Planting of trees and large shrubs that shade-out ground layer vegetation.	Revegetation plantings to concentrate on achieving a dense cover of native ground layer species (tussock grasses, sedges, sparse low <1m shrubs). Some shrubs taller than 1m

	<p>Temporary reduction in suitability of ground layer vegetation.</p> <p>Spread of pathogens / weeds.</p>	<p>may be used, but scattered at low densities (~<25% canopy cover). Avoid tree plantings.</p> <p>Only relatively small areas of any given patch of habitat should be treated for weeds at any one time so that adequate refuge is available.</p> <p>Revegetation should generally be conducted during the Swamp Skink's active season in order to minimise direct mortality of sheltering lizards.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Mulching should only be undertaken for plantings to assist in the survival of plants. Assess mulching on a case by case basis and where required apply only thinly.</p> <p>Be aware of slopes that are easily damaged, reduce number of people walking through site and frequency of works to prevent damage to sandy slopes along creek line.</p>
<p>Mowing / slashing</p>	<p>Removal of desirable habitat structure.</p> <p>Direct killing of lizards.</p> <p>Spread of pathogens / weeds.</p>	<p>Mowing and slashing should be avoided where possible in Swamp Skink habitat. If it is necessary, ensure that large areas remain uncut at any time. Mowing and slashing should be minimised during the warmer months.</p> <p>Where mowing is required adjacent to houses and tracks, it should be restricted to linear strips that are as narrow as possible.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>When slashing leave as much height as is practicable to prevent scalping.</p>
<p>Structural habitat enhancement</p>	<p>May compromise ground layer integrity if not implemented carefully.</p>	<p>Generally, avoid areas of dense ground vegetation if possible. Place structural features in areas where weed control (i.e.</p>

	<p>Spread of pathogens / weeds.</p>	<p>woody weeds) have been removed – may be in conjunction with revegetation of ground layer plants.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Avoid use of pines for habitat logs as they are not favourable/suitable for lizards and invertebrates.</p>
<p>Rubbish removal</p>	<p>Removal of shelter sites.</p> <p>Spread of pathogens / weeds.</p>	<p>While some litter can be hazardous to Swamp Skinks (e.g. tin cans), consideration of the potential habitat value of litter and other ground debris is important, and removal only undertaken if not of value to Swamp Skinks, or if adequate alternative shelter sites are present.</p> <p>Care must be taken to avoid removing Swamp Skinks in rubbish (e.g. mattresses, car bodies). This is particularly important during large events where many enthusiastic people are involved, but who may not be aware of Swamp Skinks.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>All rubbish removal should be undertaken when the Swamp Skinks are active.</p> <p>The removal of larger material like car bodies, tires and other porous debris needs to be done in a staged process and preferably moved but left on site for a period of time before totally removed. This allows the skinks that may be inside to move out and not taken off site.</p> <p>Larger flat material that provides good habitat like timber, tiles and sheets of metal should be removed in a staged process.</p>
<p>Infrastructure creation and maintenance (e.g., roads, tracks, pipelines, fences, recreational facilities etc.)</p>	<p>Loss and fragmentation of habitat.</p> <p>Degradation of habitat quality.</p> <p>Direct mortality of lizards.</p>	<p>Where possible, infrastructure should be located outside of potential habitat for Swamp Skinks.</p> <p>If it is not possible to avoid potential Swamp Skink habitat, expert advice should be sought on how best to minimise</p>

	<p>Spread of pathogens / weeds.</p>	<p>impacts.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Maintain connectivity - Introducing/ incorporating suitable pathways to allow movement of SS between barriers such as roads.</p>
In-stream works	<p>Removal of in-stream vegetation may reduce Swamp Skink habitat.</p> <p>Placement on banks of removed aquatic vegetation may damage terrestrial ground layer habitat.</p> <p>Direct mortality of lizards.</p> <p>Spread of pathogens / weeds.</p>	<p>If areas of potential or occupied habitat are to be disturbed, works should be conducted during the Swamp Skink's inactive season in order to avoid disturbing active lizards.</p> <p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Cut fragmites material can be distributed in open areas to further provide additional temporary habitat. This should not be lumped on vegetation but placed in small amounts on the ground around plants like mulching.</p>
Bank works	<p>Direct mortality of lizards.</p> <p>Reduction of extent or suitability of occupied habitat on banks.</p> <p>Spread of pathogens / weeds.</p>	<p>Avoid or minimise machine damage to ground layer vegetation.</p> <p>Revegetation plantings to concentrate on achieving a dense cover of native ground layer species (tussock grasses, sedges, sparse low <1m shrubs). Some shrubs taller than 1m may be used, but scattered at low densities (~<25% canopy cover). Avoid tree plantings.</p> <p>When positioning structural habitat elements, where possible avoid areas of dense, low ground vegetation.</p> <p>If areas of potential or occupied habitat are to be disturbed, works should be conducted during the Swamp Skink's active season so that lizards can evade direct mortality.</p> <p>Where possible, only short segments of banks should be disturbed at any time, and allowed to recover as suitable habitat before adjoining sections are disturbed.</p>

		<p>Avoid pathogen / weed introduction on vehicles and machinery by appropriate cleaning and disinfection.</p> <p>Be aware of slopes that are easily damaged, reduce number of people walking through site and frequency of works to prevent damage to sandy slopes along creek line.</p>
Feral predator control	Low risk to Swamp Skinks. If baits are used, ingestion of baits by lizards may be a hazard.	<p>Benefits to Swamp Skinks of predator control are likely to outweigh the risks of bait ingestion.</p> <p>Use of traps for predators rather than baits may be preferable.</p> <p>Where possible, baiting should occur over winter so that lizards are unlikely to encounter baits.</p> <p>Any time of year for cats</p> <p>Best time for rats is just before the young of the Swamp Skink are due in Nov/Dec.</p>
Rabbit control	Rabbit control may result in increased predation pressure on native prey, including Swamp Skinks.	Undertake rabbit control in conjunction with feral predator control.