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Fauna-rescue programs can successfully relocate vertebrate fauna prior to and during vegetation-clearing programs

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Abstract. Vegetation clearing is often a precursor to urban, industrial and mining developments. Vertebrate fauna are often lost and injured during this process; however, these impacts are often mitigated by implementing a fauna rescue program. Here we report on the success of a trapping and relocation program and the use of fauna rescue personnel to remove vertebrate fauna from two vegetation-clearing programs. We provide comment on the impact of various machines that are used in the clearing process and which taxa have the higher survival rates, and conclude with some management recommendations that will provide better outcomes for vertebrate fauna during vegetation-clearing programs.

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Introduction

Clearing vegetation whilst developing a site often results in injury and loss of terrestrial fauna, particularly if the site contains native vegetation, and is relatively large and undisturbed. Many of the animals injured or lost are small and not seen, as people are generally not allowed near the machinery for safety reasons. Many of the large and more mobile animals, such as kangaroos and birds, flee from the area once vegetation clearing commences. Some land developers have a strong commitment to protecting the environment and implement fauna-rescue programs of their own volition, whereas others are required to do so by commonwealth, state or local government agency conditions. There is no generic commonwealth or state government guideline relating to fauna rescue before and/or during vegetation clearing; however, often the catching and relocation of conservation-significant fauna is a required component in the fauna management plan. The commonwealth government's environment department typically requires a fauna management plan that 'implements measures to prevent the mortality of *EPBC Act*–listed threatened fauna species' (see http://www.environment.gov.au/epbc/notices/assessments/2010/5424/approval.pdf for an example) when threatened native species are at risk. A similar approach is often required as an outcome of the state government environment assessment process.

The implementation of a fauna-rescue program for non-threatened or iconic native species is not normally a requirement of commonwealth and state government environment agencies for Western Australian developments; however, there are a small number of local government authorities that require fauna rescue programs to be implemented in conjunction with vegetation clearing (e.g. City of Mandurah, Western Australia; http://www.mandurah.wa.gov.au/FloraAndFauna.htm). These fauna-rescue programs vary from having a fauna spotter/handler present during the clearing program to implementing a trapping and relocation program before vegetation clearing (Gleeson and Gleeson 2012).

Gleeson and Gleeson (2012) suggested a range of strategies to lessen the impact on fauna during vegetation-clearing programs. Preclearance surveys are designed to identify what animals are present, which animals will move of their own accord, where they might move to and whether this will result in their long-term survival, and what animals are at risk and the strategies that should be put in place to minimise mortality and injuries. Gleeson and Gleeson (2012) also commented that different machines should be used in particular situations, with a bulldozer being preferred when trees are to be felled and excavators to be used for digging and clearing shrubby vegetation.

Fauna-rescue programs may include the capture and removal of nesting birds, hand capture or trapping of small terrestrial amphibians, reptiles and mammals, hand capture and removal of arboreal mammals (e.g. possums) and encouraging large mammals (e.g. kangaroos) to move into adjacent areas safely.

There are two important aspects to considering the success of a fauna-rescue program: the number or proportion of animals successfully relocated and the survival of relocated animals. This paper presents opportunistic descriptive data arising from relocations as a guide to practice and to formulating further experimental investigations. The second aspect (i.e. the survival of relocated fauna) has not been assessed. First, we document a trapping and relocation program on the Swan Coastal Plain on the northern fringe of the Perth urban area in Western Australia. The developer had approval to clear ~14 ha of native *Acacia*/*Banksia* woodland ('Trinity project'), and of its own volition, because of its commitment to the environment, undertook a vertebrate fauna trapping and relocation program. The second fauna-rescue program is at the Chevron-operated Wheatstone LNG Project site ('Wheatstone project'), ~15 km south-west of Onslow in the Pilbara of Western Australia, where ~1000 ha of vegetation was cleared for the construction of infrastructure. The latter program enabled us to develop and refine a vegetation-clearing protocol that improves the survival and minimises injury to small terrestrial fauna.

Methods

Trapping and relocation program on the Swan Coastal Plain

The dominant vegetation in the Trinity project area (~14 ha) was an open shrubland of *Acacia saligna* and *Xanthorrhoea preissii* and there were small patches of *Banksia sessilis* closed shrubland and *Banksia attenuata* over *Calothamnus quadrifidus* heath. The Trinity project area was part of the Alkimos estate that is located on the fringe of the northern boundary of the Perth metropolitan area near the corner of Marion Avenue and Santorini Promenade. The surrounding vegetation had either been disturbed or was similar to that in this project area.

In total, 275 20-L bucket pit traps and 550 funnel traps (set in pairs) were installed along ~4 km of drift fence across the project area. The drift fence was used to direct small animals into the traps. Traps were dug into the ground between 23 and 26 November 2012, and they were cleared daily from first light from 24 November until 17 December 2012. All traps were closed and removed on the last day. When it became evident on 29 November 2012 that at least one southern brown bandicoot was in the project area, 35 baited wire cage traps were set in the western section (i.e. the more densely vegetated area) of the project area during 2–16 December 2012. The *Mus musculus*, *Rattus rattus* and *Vulpes vulpes* that were caught were humanely euthanased so that they were not released at the relocation site, as they are introduced species. All other individuals were released into suitable habitat ~2 km away.

Vegetation clearing commenced the day after the traps were removed, providing limited opportunity for vertebrate fauna outside the area to colonise the trapped area.

Catch and relocation program south-west of Onslow

The developer cleared ~1000 ha between January 2012 and April 2014. The most northerly part of the Wheatstone project area was on coastal dunes, with the area to the immediate south being coastal sand plain with low sand dunes interspersed with clay pans. There are three 'islands' in the Wheatstone project area. These are areas above the high-water mark that are surrounded by sea water during very high tides. When the water recedes, the exposed mudflats have a fringing vegetation of low samphire shrubs. The coastal vegetation is mostly scattered *Acacia tetragonophylla* shrubs over *Triodia epactia* grassland or *Tecticornia* spp. low shrubland. Inland of this the vegetation is scattered tall *Prosopis pallida* shrubs over *A. tetragonophylla* and *Vachellia farnesiana* over low grasses or *A. tetragonophylla* shrubs over *T. epactia* grassland. The vegetation on one of the isolated island areas is mostly scattered *Acacia tetragonophylla* shrubs over *T. epactia* grassland or *Tecticornia* spp. low shrubland or scattered *Acacia tetragonophylla* shrubs over *Scaevola pulchella* and *Indigofera monophylla* low shrubs over *Triodia epactia* grassland. The second isolated island area is mostly vegetated with tall scattered *P. pallida* over *A. tetragonophylla* and *V. farnesiana* over tussock grassland (Biota Environmental Sciences 2010*a*, 2010*b*).

Working in conjunction with excavators, dozers, graders and occasionally a posi-track skid steer, fauna handlers caught, by hand, all terrestrial vertebrate fauna disturbed or at risk of injury or death. All healthy animals were relocated to suitable habitat in adjacent areas, and animals injured and suffering, or unlikely to survive, were humanely euthanased. All terrestrial vertebrate fauna seen or caught in the vegetation-clearing area were recorded along with their location, and the machine type that was used during the clearing program. In all, 158 above-ground termitaria were also deconstructed using an excavator to break off small pieces that were then broken up by hand and with hammers to catch and remove all vertebrate fauna.

We compared impacts on animals of the various machines used for the vegetation clearing. In some areas more than one type of machine was used (e.g. loader and dozer), and as it was not recorded which machine type impacted on each individual, so these data were excluded from the analysis. A Chi-square analysis was used to determine significant differences among machines and taxa, using three outcomes: uninjured, dead and injured.

Results

Trapping and relocation program on the Swan Coastal Plain

In total, 960 individual vertebrate fauna were caught and most were relocated (Table 1). A fox (*V. vulpes*), a southern brown bandicoot (*Isoodon obesulus fusciventer*), rats (*Rattus fuscipes*, *R. rattus*) and most of the large skinks (*Tiliqua occipitalis*, *T. rugosa*) were caught in wire cage traps; the rest were caught in pit and funnel traps.

Catch and relocation program south-west of Onslow

In total, 17 057 mammals, reptiles and amphibians from 70 species were seen or caught during the vegetation-clearing program (Table 2). Excluding the data (4801 individuals) from termitaria, 61.06% of the animals captured were alive and relocated (Table 3). Termitaria are a special case because of the method of clearing (Thompson and Thompson 2015). In total, 90.6% of fauna caught in termitaria were alive and relocated. There was a significant difference ($\chi^2 = 373.5$, d.f. = 10, $P < 0.01$) in the survival rates among machine types used to clear the vegetation when the six primary machines (i.e. posi-track, dozer, excavator, grader, loader and swamp dozer) used in clearing were analysed. The highest number of animals survived the excavator, followed by the swamp dozer, posi-track skid steer, dozer, grader and loader (Table 3).

There was a significant difference among taxa in survivorship during vegetation clearing ($\chi^2 = 129$, d.f. = 6, $P < 0.01$). Dragon lizards had the highest survival rate, while goannas and snakes had the lowest (Table 4).

The termitaria supported a very distinct subset of the fauna in the area, with the most abundant species being *Gehyra pilbara*, *Heteronotia binoei*, *Furina ornata* and *Antaresia stimsoni* (Thompson and Thompson 2015) and their survival rate was much higher because of the protocol adopted to deconstruct each mound.

Table 1. Vertebrates caught in the Swan Coastal Plain trapping and relocation program

Taxa	Family	Species	Total
Mammalia	Peramelidae	*Isoodon obesulus fusciventer*	1
	Muridae	*Mus musculus*	98
		Rattus fuscipes	6
		Rattus rattus	2
	Canidae	*Vulpes vulpes*	1
		No. of mammals	108
		No. of mammal species	5
Amphibia	Limnodynastidae	*Heleioporus eyrei*	1
		No. of amphibians	1
		No. of amphibian species	1
Reptilia	Gekkonidae	*Christinus marmoratus*	10
	Diplodactylidae	*Strophurus spinigerus*	81
	Pygopodidae	*Delma fraseri*	7
		Delma grayii	22
		Pletholax gracilis	6
		Pygopus lepidopodus	22
		Lialis burtonis	57
	Agamidae	*Pogona minor*	35
	Scincidae	*Cryptoblepharus buchananii*	19
		Ctenotus australis	73
		Ctenotus inornatus	57
		Delma concinna	6
		Egernia napoleonis	20
		Hemiergis quadrilineata	123
		Lerista elegans	75
		Lerista distinguenda	1
		Lerista lineopunctulata	2
		Lerista praepedita	11
		Menetia greyii	17
		Morethia lineoocellata	8
		Morethia obscura	40
		Tiliqua occipitalis	7
		Tiliqua rugosa	46
	Varanidae	*Varanus gouldii*	1
		Varanus tristis	1
	Typhlopidae	*Anilios australis*	4
		Anilios pinguis	2
	Elapidae	*Brachyurophis semifasciata*	12
		Demansia psammophis	15
		Echiopis curta	8
		Neelaps bimaculatus	3
		Parasuta gouldii	12
		Pseudonaja affinis	9
		Pseudonaja mengdeni	1
		Simoselaps bertholdi	38
		No. of reptiles	851
		No. of reptile species	35
		Total no. of animals	960
		Total no. of species	41

Discussion

Had these two fauna rescue programs not been implemented, then 859 and 11 831 amphibians, reptiles and small mammals would almost certainly have been lost during the vegetation-clearing programs on the northern fringe of the Swan Coastal Plain and south-west of Onslow respectively. Fauna-rescue programs can therefore be very successful in relocating animals

Table 2. Vertebrates caught or seen during the vegetation-clearing program near Onslow

Taxa	Family	Species	Total
Amphibia	Hylidae	*Cyclorana maini*	931
		Cyclorana platycephala	1
	Limnodynastidae	*Neobatrachus aquilonius*	149
		Neobatrachus fulvus	185
		Neobatrachus sp.	23
		Notaden nichollsi	14
		No. of individuals	1447
		No. of amphibian species	5
Mammalia	Dasyuridae	*Dasykaluta rosamondae*	73
		Dasyurus hallucatus	1
		Planigale sp.	44
		Sminthopsis macroura	7
		Sminthopsis youngsoni	2
	Muridae	*Mus musculus*	40
		Notomys alexis	54
		Pseudomys desertor	1
		Pseudomys hermannsburgensis	10
	Tachyglossus	*Tachyglossus aculeatus*	14
		No. of individuals	246
		No. of amphibian species	10
Reptilia	Agamidae	*Ctenophorus femoralis*	7
		Ctenophorus isolepis	79
		Ctenophorus nuchalis	95
		Ctenophorus rubens	28
		Ctenophorus sp.	1
		Diporiphora adductus	79
		Pogona minor	63
	Boidae	*Antaresia stimsoni*	186
		Aspidites melanocephalus	23
	Carphodactylidae	*Nephrurus levis*	138
	Diplodactylidae	*Diplodactylus conspicillatus*	1025
		Lucasium squarrosum	2
		Lucasium stenodactylus	18
		Strophurus jeanae	67
		Strophurus strophurus	104
	Gekkonidae	*Gehyra pilbara*	3281
		Gehyra variegata	413
		Heteronotia binoei	791
	Pygopodidae	*Delma haroldi*	37
		Delma sp.	122
		Delma tincta	1104
		Lialis burtonis	53
		Pygopus nigriceps	156
	Scincidae	*Ctenotus grandis*	514
		Ctenotus hanloni	1544
		Ctenotus iapetus	495
		Ctenotus inornatus	387
		Ctenotus maryani	593
		Ctenotus pantherinus	400
		Ctenotus rufescens	35
		Ctenotus sp.	66
		Eremiascincus pallidus	32
		Lerista bipes	1049
		Lerista clara	574
		Lerista onsloviana	47
		Lerista sp.	23
		Menetia greyii	73
		Tiliqua multifasciata	41

(*Continued*)

that would probably be lost either during the clearing program or immediately after due to predation.

Urban development is moving north and south along the Swan Coastal Plain, with large areas of native bushland similar to that in the trapped area progressively being cleared. Planning conditions imposed on these developments require that small areas be retained for public open space. Some of these retained areas contain native vegetation, whereas others are used as parklands and playing fields. These retained areas are generally small and rarely support the full suite of vertebrate fauna that was present in the area before vegetation clearing (Harvey *et al.* 1997; How and Dell 2000). Vertebrate fauna of the greater Perth metropolitan region are progressively being lost with land clearing, and most of the vertebrate fauna that are lost during the clearing process are small and generally not seen by the machine operators. People that purchase the land for housing rarely see the land in its natural state, and are therefore unaware of the fauna that have been lost during the process of providing them with a home.

Although the general public are unlikely to express concern about the loss of the 11 831 small vertebrates that were saved during the clearing of ~1000 ha, when this is scaled up to the area that is being cleared for agriculture, mining, housing, construction of roads, rail lines and other infrastructure in the Pilbara, then the loss of vertebrate fauna is significant. However, rarely, if ever, are impacts on the non-threatened fauna seriously considered in the assessment process and mitigation strategies included in the approval conditions.

Fewer animals were lost and injured during the deconstructing of termitaria than if they were demolished during the normal clearing program with heavy machinery, and this was due to the procedures implemented to rescue animals. For termitaria, an excavator was used to progressively remove small pieces of each termitarium and then these were broken up by hand and with hammers. Most species in termitaria were slow moving so they were easily caught and relocated.

Machine type used during a vegetation-clearing program can influence animal survivorship. Although not able to be tested in this study, our observations were that the individual machine operators' method of clearing had a significant impact on survivorship. Based on an adaptive management approach, the procedure for clearing vegetation was progressively refined to enhance survivorship. A detailed protocol is available from the authors. Loaders were typically the only machine used during the first nine months of vegetation clearing, and it was during this period where most of the improvements to the procedures were made. So, although loaders had the lowest survival rate of all machines (Table 3), this percentage would be higher had all machines been used evenly across the two years of operations.

To maximise animal survivorship during the vegetation-clearing process, a 'raised blade' technique is used, such that

Table 2. (Continued)

Taxa	Family	Species	Total
	Elapidae	*Acanthophis pyrrhus*	21
		Demansia psammophis	34
		Furina ornata	431
		Pseudechis australis	44
		Pseudonaja mengdeni	41
		Simoselaps anomalus	6
		Suta punctata	149
	Typhlopidae	*Anilios ammodytes*	11
		Anilios grypus	18
		Anilios hamatus	80
		Anilios sp.	30
	Varanidae	*Varanus acanthurus*	1
		Varanus brevicauda	541
		Varanus eremius	175
		Varanus gouldii	25
		Varanus panoptes	9
		No. of reptiles	15 364
		No. of reptile species	54
		Total no. of animals	17 057
		Total no. of species	70

Table 3. Survivorship among machine types for the Wheatstone project

	Backhoe	Dozer	Excavator	Grader	Loader	Posi-track	Swamp dozer	All
Alive	2	3712	1134	224	1784	124	60	7040
Injured		951	102	49	269	25	11	1407
Dead		1534	248	126	1140	35	11	3094
Total	2	6197	1544	399	3193	184	82	11 541

Table 4. Survivorship among taxa for the Wheatstone project

	Dragons	Frogs	Geckos	Goannas	Legless lizards	Mammals	Skinks	Snakes	Total
Alive	313	816	1285	352	751	147	3587	228	7479
Injured	12	174	291	164	167	12	583	71	1474
Dead	21	313	344	235	515	38	1635	196	3297
Total	346	1303	1920	751	1433	197	5805	495	12 250

the bucket or the blade of the machine is moved across the surface ~25–50 mm above the ground, so that most of the spinifex, shrubs and small trees are broken off at ground level or pulled from the ground. In dense vegetation this results in the vegetation being rolled along in front of the blade or bucket with limited disturbance to the topsoil other than under the machines wheels or tracks. Large areas can be cleared quickly, and this procedure leaves small clumps of vegetation in the depressions in the substrate that act as temporary refuges for fauna fleeing from the clearing activity. Fauna are caught by hand, and the remaining clumps of vegetation are searched for fauna. Although we have no quantified evidence, it is highly probable that the larger snakes such as *Pseudechis australis*, *Pseudonaja mengdeni* and *Demansia psammophis* move away from the area once machines commence clearing and many are unseen and not directly impacted by the vegetation-clearing process. *P. australis*, *P. mengdeni* and *D. psammophis* were more frequently seen in areas adjacent to those being cleared, or in or near infrastructure, than they were during the vegetation-clearing program. If a short period (i.e. 5 min) is left between the removal of the vegetation and removal of the top soil, numerous animals will also come out of the surface sand that may have been disturbed. This process will often unearth fauna buried in shallow burrows such as cocooned frogs, dragon lizards and legless lizards. After the initial sweep with a raised blade, the machine operator will then remove the topsoil.

An animal's preferred retreat site and speed of movement appear to significantly influence survivorship for vertebrates in the clearing process. Animals found in shallow burrows, which move slowly or wait until the machine disturbed their retreat site before attempting to flee, appear to be at the highest risk of injury or death. This included small goannas (e.g. *Varanus brevicauda* and *V. eremius*), some small snakes (e.g. *Suta punctata*) and some legless lizards (e.g. *Pygopus nigriceps*). Only one of the dragon lizards in the project area digs and retreats to a burrow (*Ctenophorus nuchalis*), while *Pogona minor* has a relatively slow running speed compared with other dragon lizards in the area, and the rate of death and injury of these two species was higher than that of the other dragon lizards (e.g. *C. femoralis*, *C. isolepis*, *C. rubens* and *D. adductus*) present in the area, which are fast moving and do not retreat to a burrow. Mortality of legless lizards was also higher than for geckos and dragon lizards because they are fossorial and relatively slow moving, which results in their being found in the second sweep of the area when the machines are removing the topsoil or they were squashed under machinery tyres or tracks. Small mammals that retreat under spinifex or bushes (e.g. *Dasykaluta rosamondae*) or move immediately from their burrow or retreat if disturbed have a relatively high survival rate. Most of the frogs that were found alive were in a cocoon and were moved onto the surface during the vegetation-clearing process.

It is likely that in addition to the large snakes that move away from operating machinery, there are other species that moved away and were not seen during the vegetation-clearing program. This group probably included small mammals such as *Planigale* sp., *Pseudomys* sp. and *Sminthopsis* sp. Animals most likely to be squashed in burrows include cocooned frogs, burrowing mammals (e.g. *Notomys alexis*) and reptiles (e.g. *C. nuchalis*), and fossorial reptiles in the surface soil and leaf litter (e.g. *Anilios* sp., *Lerista bipes*, *Delma tincta*).

Public awareness

Although fauna-rescue programs represent a very small fraction of the cost of converting native bushland to a residential or industrial development, it is rare for land developers to initiate and fund a fauna-rescue program when it is not a condition of their approval. Companies that do undertake these projects without a direct compliance requirement should be publicly applauded because of the benefit to the environment and because it may encourage others to follow suit. Government environmental agencies do not maintain records of projects that are required to implement fauna-rescue programs before or during vegetation-clearing programs, nor is there ever an estimate of the number of animals likely to be lost during vegetation clearing in Native Vegetation Clearing permit applications or other environmental impact assessments. The impact on fauna by clearing vegetation is therefore never estimated or recorded nor given much attention in the impact assessment process.

Relocation success

We could find no discussion of the success or otherwise of relocating generic fauna assemblages caught before and during vegetation-clearing programs, although there is a growing body of literature on the success of conservation of significant, iconic fauna and single species – see reviews by Dodd and Seigel (1991), Copley (1994), Fischer and Lindenmayer (2000), Short (2009), Germano and Bishop (2009). It is both a waste of resources and providing false hope if fauna are caught before and during a vegetation-clearing program and relocated to another area, only for them not to survive and subsequently reproduce (Short 2009). In addition, there is a lack of adequate monitoring and reporting of fauna relocations (Fischer and Lindenmayer 2000; Short 2009) and we could find no reports on the success of relocating fauna assemblages that were undertaken as part of a vegetation-clearing program.

Relocation sites

As trapping and relocations rarely occur for non-threatened and non-iconic species, the issue of what is a suitable relocation site is seldom discussed. Fauna habitats typically sustain species richness and abundance that is largely determined by the resources available (productivity), predation pressure and availability of retreat habitat. Environmental consultants would not wish to release fauna into an area in which they could not survive; however, it is difficult to know whether a particular area can sustain an increase in the number of animals or whether others of its kind are present, as relocation sites are rarely surveyed. Trapping and relocating animals unknowingly to an unsuitable site for them to subsequently die probably makes us feel good because 'we have done the right thing' but is an obvious waste of resources.

What constitutes a good relocation site for a fauna assemblage (see Christie *et al.* 2011, 2012), whether it is cost effective to implement such programs and how the programs should be monitored is largely unknown for many species and assemblages, and should be the focus of further research.

Management recommendations

The loss of non-threatened vertebrate fauna during vegetation-clearing programs is of concern to a small number of local government agencies who require developers to implement procedures to reduce injury and mortality. Similarly, a small number of developers implement programs to mitigate the effect of vegetation-clearing programs, and these include implementing fauna-rescue programs. Most developers and mining companies implement fauna-rescue programs only when it is an approval condition. These programs can range from fauna rescue during the vegetation-clearing program to trapping programs of varying intensities before vegetation clearing. Trapping and relocating fauna has diminishing returns, as there are progressively fewer animals to trap as animals are removed from the area. The point at which the trapping program should cease at this stage is a judgement by the environmental consultant undertaking the work and is largely influenced by the available resources.

In order that proponents and regulators can determine the value of implementing a fauna-rescue program, it is recommended that the number of species and individuals likely to be lost during the vegetation-clearing program be estimated and reported in the environmental impact assessments and in the Native Vegetation Clearing permit applications.

It seems intuitive that fauna-rescue programs for non-threatened and non-iconic species are most cost-effective in areas that have high native fauna densities, because of the higher number of individuals per unit cost likely to be relocated. In contrast, highly disturbed areas often have a low density and diversity and may also have an abundance of introduced species (e.g. *Mus musculus*). Industry would benefit from clear guidelines on fauna-rescue requirements before and during vegetation-clearing programs as it is likely that a very large number of animals would be relocated that would otherwise perish during these programs. It is therefore recommended that state government environment agencies issue such guidelines. Monitoring of the success of relocation programs is important to ensure such programs are cost effective and the data inform subsequent management practices. The initial focus of such monitoring might be on the larger mammals and reptiles as they are potentially easier to monitor.

Machine operator skill and the technique used can significantly influence the number of animals that survive a vegetation-clearing program. An experienced fauna handler working with a receptive machine operator can significantly increase the survival rate of vertebrate fauna during a vegetation-clearing program. The first pass of a vegetation-clearing program should be done with a raised blade or bucket so that the vegetation is broken off near ground level or pulled out from the ground and is rolled in front of the blade or bucket, leaving the topsoil intact. The second pass can then remove the remaining vegetation and topsoil. The operator should minimise driving backwards and forwards on areas that have had the vegetation stripped but where the topsoil remains intact as this will allow fauna buried just below the surface to emerge, rather than being crushed under the tyres and tracks.

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