

## The biodiversity values of the TocH block of native vegetation and priority management actions

### Overview

The Victor Harbor area contains an interesting mixture of habitats: mallee, woodland, forest, dune and estuary. The remaining areas of vegetation represent only a few percent of what once existed and hence are extremely valuable. The few remaining blocks of vegetation are being subdivided or are too small to be viable. The native vegetation in the area has very high biodiversity values but is threatened by weed invasion and fragmentation. The TocH block is the largest contiguous block of intact native vegetation in the area, contains two nationally threatened plant species, and is protected from subdivision. I recommend that a management plan be developed for the block with a high priority on stopping the spread of invasive weeds and minimising the damage caused by foot traffic.

### Significance of native vegetation owned by TocH - Victor Harbor, SA

The TocH block contains two nationally threatened plant species - *Pseudanthus micranthus* and *Spyridium coactifolium* (these are listed in ROTAP - the national threatened plant list - 1995 - and discussed by Rick Davies in "Threatened plants of the Mount Lofty Ranges" - 1995). Both species are restricted to the Fleurieu Peninsula of South Australia and the TocH block has the largest populations of each species in the vicinity of Victor Harbor. The block contains more than eight plant species of regional significance, at least 120 species of native plant in total, and a wide variety of bird and reptile species. It represents a unique opportunity to conserve the biodiversity of the area and educate the community about the diversity and value of small remnants.

In the past two years I have used the TocH camp to host my level three Conservation Biology class at The University of Adelaide. The camp has used the native vegetation for projects and we have completed an inventory of the flora and avifauna. This year several students started on plans for the management of the native vegetation while one group has prepared an access plan that will restrict trampling of the native vegetation and provide an educational trail for handicapped and other visitors.

### Management actions

There are two high priority management actions.

1. The block is steep, in places, and the soil is snady, so open access has caused severe erosion along tracks. Some tracks are a foot deep and there are numerous minor tracks. Access needs to be rationalised and this would be best done using one short board walk track (accessible to wheel chairs) and a couple of reconstructed major tracks for other visitors. These tracks would form a signed nature trail and allow a huge number of visitors to experience the diversity of plants and animals without destroying what they came to see! All the other tracks (of which there are many) would be closed and use discouraged.
2. While the block is largely weed free in the centre, weed invasion is occurring from the edges, particularly bridle creeper, boneseed and veldt grass. We are preparing weed management plans for the edges of the block so that volunteers can deal with the priority problems effectively and efficiently. They will need some materials and in places herbicide (especially for the grass and bridle creeper).

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## Overall Management Objectives

As this bushland is private property the objectives must be tailored for its specific needs. These objectives are as follows:

1. Maintain and improve biodiversity (not only for present generations to appreciate, but for future generations).
2. Educate users of bushland including visiting groups and neighbours
3. Minimise human impact, including
  - trampling over vegetation causing damage to plants and leading to erosion
  - littering
  - misuse of tracks
4. Minimise impact of adjoining land use
5. Control and eradicate exotic plants and feral animals
6. Control and suppression of wildfire
7. Minimise erosion from
  - trampling
  - stormwater run-off from buildings

By following these objectives the success of an overall management plan can be achieved.

All recommendations outlined in the plan are easy to implement without a great cost. Some of the work described in the plan can be completed by visiting school groups or residents of the area.

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## Bushland Description

A small block of bushland measuring approximately 150 metres in length by 100 metres in width contains a high diversity of plants, some of which are of high conservation value. This piece of bushland, part of ToCH camp site, is set amongst a residential area. The eastern side of the block slopes steeply down toward the Hindmarsh River and the soil type is sandy.

## Flora

The bushland has a varied overstorey with the dominant tree species of brown stringybark (*Eucalyptus baxteri*), pink gum (*E. fasciculosa*) and cup gum (*E. cosmophylla*).

The upper part (adjacent to the camp facilities) is low mallee woodland / shrubland of brown stringybark and cup gum, with small open patches of heath and occasional dense clumps of kangaroo thorn (*Acacia paradoxa*). The soil is sandy and the species diversity is high in this part of the bushland, particularly in the patches of heath vegetation (low/medium shrubs, ground covers, rushes, sedges and grasses).

On the lower steep slope the dominant trees are pink gum and brown stringybark with medium to tall shrubs. The soil is sandy / sandy loam and the vegetation is taller and more dense, with a lower species diversity. The most serious invasion of bridal creeper (*Myrsiphyllum asparagoides*) and boneseed (*Chrysanthemoides monilifera*) occur on this slope, particularly at the northern end.

Table 1. Plant List (by lifeform)

### Tall Shrubs & Trees (> 2.5 m)

<i>Acacia paradoxa</i>	kangaroo thorn
<i>Banksia marginata</i>	silver banksia
<i>Banksia ornata</i>	desert banksia
<i>Dodonaea viscosa</i> ssp. <i>spatulata</i>	sticky hop-bush
<i>Eucalyptus baxteri</i>	brown stringybark
<i>Eucalyptus cosmophylla</i>	cup gum
<i>Eucalyptus fasciculosa</i>	pink gum
<i>Exocarpus cupressiformis</i>	native cherry
<i>Pittosporum undulatum</i>	sweet pittosporum

### Medium Shrubs (1 - 2.5m)

<i>Acacia longifolia</i> var. <i>sophorae</i>	coastal wattle
<i>Acacia paradoxa</i>	kangaroo thorn
<i>Allocasuarina muelleriana</i> (?)	slaty sheoak
<i>Allocasuarina pusilla</i>	dwarf sheoak
<i>Banksia ornata</i>	desert banksia
<i>Chrysanthemoides monilifera</i>	boneseed
<i>Daviesia arenaria</i>	sand-hill bitter pea
<i>Dodonaea viscosa</i> ssp. <i>spatulata</i>	sticky hop-bush
<i>Hakea carinata</i>	hakea
<i>Hakea rostrata</i>	beaked hakea
<i>Leptospermum myrsinoides</i>	heath tea-tree
<i>Olearia ramulosa</i>	twiggy daisy-bush
<i>Rhagodia</i> sp.	saltbush



Low Shrubs (0.25 - 1m)

<i>Acacia myrtifolia</i>	myrtle wattle
<i>Acacia spinescens</i>	spiny wattle
<i>Adenanthos terminalis</i>	adenanthos
<i>Astroloma conostephioides</i>	flame heath
<i>Astroloma humifusum</i> (erect form)	native cranberry
<i>Brachyloma ericoides</i>	brush heath
<i>Calytrix tetragona</i>	common fringe-myrtle
<i>Conospermum patens</i>	smoke bush
<i>Correa reflexa</i>	common correa
<i>Cryptandra tomentosa</i>	prickly cryptandra
<i>Daviesia arenaria</i>	sand-hill bitter pea
<i>Daviesia brevifolia</i>	leafless bitter pea
<i>Dillwynia sericea</i>	showy parrot-pea
<i>Grevillea lavandulacea</i>	lavender grevillea
<i>Hibbertia riparia</i>	erect guinea-flower
<i>Hibbertia sericea</i> var. <i>sericea</i>	silky guinea-flower
<i>Hibbertia virgata</i>	twiggy guinea-flower
<i>Isopogon ceratophyllus</i>	cone-bush
<i>Olearia ramulosa</i>	twiggy daisy-bush
<i>Phyllota pleurandroides</i>	heathy phyllota
<i>Pimelea octophylla</i>	woolly riceflower
<i>Rhagodia</i> sp.	saltbush
<i>Spyridium coactifolium</i>	butterfly spyridium

Ground cover (shrubs & herbs) & climbers

<i>Argentipallium obtusifolium</i>	everlasting
<i>Billardiera ? cymosa</i>	apple-berry
<i>Carpobrotus rossii</i>	pigface
<i>Cassytha glabella</i>	snotty-gobble
<i>*Cerastium glomeratum</i>	cnick-weed
<i>Cheilanthes austrotenuifolia</i>	rock fern
<i>Chrysocephalum apiculatum</i>	common everlasting
<i>Comesperma calymega</i>	blue-spike milkwort
<i>Crassula</i> spp.	crassula
<i>Drosera auriculata</i>	tall sundew
<i>Drosera macrantha</i> ssp. <i>planchonii</i>	climbing sundew
<i>Drosera whittakeri</i>	scented sundew
<i>Goodenia ? geniculata</i>	bent goodenia
<i>Helichrysum scorpioides</i>	button everlasting
<i>*Hypochaeris glabra</i>	smooth cat'sear
<i>*Hypochaeris radicata</i>	rough cat'sear
<i>Leucopogon virgatus</i>	common bearded-heath
<i>Logania linifolia</i>	flax-leaved logania
<i>Lysiana exocarpi</i>	harlequin mistletoe
<i>Millotia ? tenuifolia</i>	soft millotia
<i>Muehlenbeckia adpressa</i>	climbing
<i>Muehlenbeckia gunnii</i>	coastal lignum
<i>*Oxalis pes-caprea</i>	sour-sob
<i>Pimelea glauca</i>	smooth riceflower
<i>Platylobium obtusangulum</i>	common flat-pea
<i>Pseudanthus micranthus</i>	fringed pseudanthus
<i>Pteridium esculentum</i>	bracken
<i>Rutidosis multiflora</i>	small wrinklewort
<i>Senecio</i> sp.	senecio
<i>Stackhousia aspericocca</i>	candles
<i>Tetratheca pilosa</i>	pink bells
<i>Spyridium coactifolium</i>	butterfly spyridium
<i>Xanthosia pusilla</i>	heath xanthosia
<i>Zieria veronicea</i>	pink zieria



Grasses, rushes, sedges, lilies, orchids

<i>Acianthus exsertus</i>	mosquito orchid
<i>Arthropodium strictum</i>	vanilla lily
* <i>Briza maxima</i>	quaking grass
<i>Caesia calliantha</i>	blue grass-lily
<i>Chamaescilla corymbosa</i>	blue squill
<i>Cyrtostylis reniformis</i>	gnat orchid
<i>Dianella revoluta</i> (&/or <i>brevicaulis</i> )	flax lily
* <i>Ehrharta calycina</i>	veldt grass
* <i>Freesia</i> sp.	freesia
<i>Hypolaena fastigiata</i>	tassel rope-rush
<i>Isolepis nodosa</i>	knobby club-rush
<i>Juncus</i> sp.	
<i>Laxmannia orientalis</i>	dwarf wire-lily
<i>Lepidobolus drapetocoleus</i>	
<i>Lepidosperma carpoides</i>	black rapier-sedge
<i>Lepidosperma concavum/congestum</i>	sword-sedge
<i>Leporella fimbriata</i>	fringed hare-orchid
<i>Lomandra juncea</i>	desert iron-grass
<i>Lomandra multiflora</i> ssp. <i>dura</i>	stiff iron-grass
* <i>Myrsiphyllum asparagoides</i>	bridal creeper
<i>Pterostylis nana</i>	dwarf greenhood
<i>Pterostylis sanguinea</i>	banded greenhood
<i>Thelymitra antennifera</i>	rabbit-ear sun orchid
<i>Thelymitra</i> ?sp. (pink bud)	sun orchid
<i>Xanthorrhoea semiplana</i>	yakka / grass tree

\* - introduced (exotic) plant

? - identity or presence uncertain

Books for further information:-

Prescott, A. (1988) *It's blue with five petals* [both the Adelaide Region or Kangaroo Island versions are useful for this area - but no grasses and sedges included]

Dashorst, G.R.M. & Jessop, J.P. (1990) *Plants of the Adelaide plains and hills*. [good for matching by pictures, and includes grasses and sedges]

Jessop, J.P. & Toelken, H.R. (Eds) (1986) *Flora of South Australia* [not for the faint of heart]

Fauna

Mammals - no survey was done, however it is possible that there may be some native mammals still present in the area. The native species most likely to be present are brushtail possums (*Trichosurus vulpecular*) and bats. Feral mammals present or likely to visit the area are rabbits, cats, foxes, rats and mice.

Birds - no survey was done by the authors but a preliminary list could be obtained from H. Possingham. (Appendix 2)

Reptiles - no survey was done by the authors but it is likely that there are a number of species resident in the area.

Invertebrates - no survey was done by the authors but it is likely that there are many species resident in the area.

## Biodiversity Management

### Objectives

- determine the extent of diversity of plants and animals in the bushland
- identify plant and animal species which have a conservation rating and/or low population numbers
- monitor changes to species composition over time
- establish nest boxes to encourage native birds to nest in the bushland

### Rare Species

There are a number of species found in the bushland that have been rated for conservation significance. Most of these ratings are at the regional level, but not at a state or national level. This means that the species may be more widespread within South Australia or Australia, but restricted within the immediate area. Species with a national rating are those most limited in distribution or are in danger of disappearance. The explanations for the ratings are after Table 2.

Table 2. Plant species with a conservation rating

Scientific name	Common name	Conservation rating			Population estimate
		National	State	Regional [SL]	
<i>Adenanthos terminalis</i>	adenanthos	-	-	U	200+
<i>Allocasuarina pusilla</i>	dwarf sheoak	-	-	R	100+
<i>Argentipallium obtusifolium</i>	everlasting	-	-	U	50+
<i>Conospermum patens</i>	smoke bush	-	-	U	< 50
<i>Daviesia arenaria</i>	sand-hill bitter pea	-	U	K	< 50
<i>Logania linifolia</i>	flax-leaved logania	-	-	R	? < 10
<i>Phyllota pleurandroides</i>	heathy phyllota	-	-	U	200+
<i>Pseudanthus micranthus</i>	fringed pseudanthus	2RCa	R	R	100+
<i>Spyridium coactifolium</i>	butterfly spyridium	2VCa	V	V	200+
<i>Zieria veronicea</i>	pink zieria	-	R	R	? < 10

The National rating comes from the list collated by Briggs & Leigh (1995)

- 2 the species has a geographical range of less than 100 km
- V **Vulnerable:** taxon not presently Endangered, but at risk over a longer period (20 - 50 years) of disappearing from the wild through continued depletion, or which occurs on land whose future use is likely to change and threaten its survival
- R **Rare:** taxon is rare in Australia but which currently does not have any identifiable threat. Such species may be represented by a relatively large population in a very restricted area or by smaller populations spread over a wide range or some intermediate combination
- C **Reserved:** taxon has at least one population within a conservation reserve of some nature
- a 1000+ plants known to occur within a conservation reserve(s)

State and Regional Conservation Status (for the Southern Lofty Region of South Australia) comes from Lang & Kraehenbuehl (1987)

- E **Endangered:** rare and in danger of becoming extinct
- V **Vulnerable:** rare and at risk from potential threats in the long term
- T **Threatened:** rare and likely to become either Endangered or Vulnerable
- R **Rare:** having a low overall frequency, confined to a restricted range or scattered sparsely over a wider area
- K **Uncertain:** either Threatened or Rare but insufficient data for a more precise assessment
- U **Uncommon:** less common species but not rare

### Plant species with small populations

There were plant species whose population numbers appear to be small (Table 3). This may reflect the climatic and seasonal factors at the time when the initial assessment was made (September 1997). More species or individuals are likely to be noted with regular observations throughout the year(s).



Species with low population numbers may have low reproductive success, due to distance from potential partners. They may have insufficient genetic variability for the population to remain viable over a long period of time. There is likely to be a reduced ability to recover from catastrophic events, such as wildfire, which might wipe out the population. Species with very small populations are likely to disappear from a small patch over time, if there are no nearby sources of the species to recolonise. All of these factors lead to biodiversity loss. Monitoring species with low population numbers may show up changes which are occurring, and indicate a need for management intervention.

Table 3. Plant species with small population size.

Scientific name	Common name	Population estimate	Conservation rating [SL]
<i>Anthropodium strictum</i>	vanilla lily	?	-
<i>Banksia marginata</i>	silver banksia	< 50	-
<i>Caesia calliantha</i>	blue grass-lily	< 20	-
<i>Comesperma calymega</i>	blue-spike milkwort	? < 10	-
<i>Conospermum patens</i>	smoke bush	< 50	-
<i>Daviesia arenaria</i>	sand-hill bitter pea	< 50	U
<i>Grevillea lavandulacea</i>	lavender grevillea	< 30	K
<i>Hakea carinata</i>	hakea	< 30	-
<i>Helichrysum scorpiodes</i>	button everlasting	< 20	-
<i>Hibbertia virgata</i>	twiggy guinea-flower	?	-
<i>Laxmannia orientalis</i>	dwarf wire-lily	? < 10	-
<i>Logania linifolia</i>	flax-leaved logania	? < 10	-
<i>Pimelea octophylla</i>	woolly riceflower	< 20	R
<i>Pterostylis sanguinea</i>	banded greenhood	?	-
<i>Stackhousia aspericocca</i>	candles	?	-
<i>Tetralthea pilosa</i>	pink bells	? < 10 [2 seen]	-
<i>Zieria veronicea</i>	pink zieria	? < 10 [1 seen]	R

#### Nest Boxes

Because of the nature of the vegetation, hollows were not apparent. Although there was no evidence of mammals, birds were in abundance. To encourage bird breeding, nest boxes could be a consideration. As the bushland is in a residential area, the boxes should be cat proof, to ensure birds are protected.

#### Recommendations:

- add to the inventory of species by inviting skilled people to search for and list plants and animals.
- determine the status of plants and animal species with conservation rating and/or small population numbers
- monitor plant species with conservation rating and/or small population numbers - set up grids for counts (four 20 x 20m grids have been placed to date).
- develop interpretive material (see Visitor Management below).
- manage nest-boxes to ensure bees do not establish themselves in the boxes, as they are prominent in the bushland. Feral birds could also utilise the nest-boxes so, again, they must be monitored on a regular basis.

#### Visitor Management

The ToCH camp at Victor Harbour is a popular short stay destination, primarily catering for school and youth groups, and receives its peak visitation during the warmer months. The bushland is used for bushwalking and bird watching by some groups but generally the users of the area would not be appreciative of its ecological significance.

#### Objectives

- provide / allow for visitor use and enjoyment of the park while protecting its ecological significance and value.
- increase visitor understanding of the remnant vegetation's ecological significance.



Serious weeds are those which are present in high numbers and are invading vigorously to the extent of smothering, and competing for space and resources with the native species.  
The two most serious weeds of this bushland are:-

- Chrysanthemoides monillifera* (boneseed) - large infestation, particularly in north east sector
- mature shrubs - cut out (and remove where possible to reduce reinfestation from fruits)
  - hand-pull seedlings and small shrubs (leave where pulled if there are no fruits)
  - spray dense infestations with low concentration of glyphosate
  - monitor and remove seedlings over subsequent years

- Myrsiphyllum asparagoides* (bridal creeper) - large infestation, particularly in north east sector of the bushland where many of the shrubs are becoming smothered
- spray dense infestations with low concentration of glyphosate - avoid spraying native species as much as possible
  - hand-pull or dig small infestations in areas of low disturbance
  - monitor and remove seedlings over subsequent years

There are a number of species which are limited in their invasion but require immediate management action to reduce likelihood of spread in future.

- Ehrharta calycina* (veldt grass) - small but spreading invasion on north side of the bushland
- hand-pull or dig small infestations in areas of low disturbance
  - spray dense infestations with low concentration of glyphosate

- Freesia* sp. - small patch near south-east corner
- hand-dig bulbs if small patch or scattered
  - spray dense infestations with low concentration of glyphosate

- Oxalis pes-caprea* (soursob) - small but spreading invasions adjacent to lawn area near the dormitories, and on the north side of the bushland
- hand-pull plants if small patch or scattered
  - spray dense infestations with low concentration of glyphosate
  - treatment should be done before flower begins, when the bulbs are exhausted.

- Pittosporum undulatum* (sweet pittosporum)
- large shrub (adjacent to volleyball court) has been cut down
  - some seedlings were removed from adjacent bushland edge
  - monitor for more seedlings and remove

Minor weeds are those which are present in low numbers or are a widespread but minor component of the bushland. They particularly invade areas which are disturbed by trampling. Species observed were exotic grasses, including *Briza maxima* (quaking grass), and herbaceous plants such as *Cerastium glomeratum* (chickweed) and *Hypochaeris* spp. (cat's ear). The extent of these species should be monitored in future but are not a high priority for removal. The spread of these species is likely to be limited by reducing extensive disturbance i.e. by reducing tracks and trampling, and use of minimum disturbance techniques for weeding.

#### Recommendations

- implement a plan for removal of serious and potentially serious weeds by minimum disturbance techniques where possible (see *Stop bushland weeds* Robertson, 1994, as a source of techniques and to identify weeds)
- monitor spread of other exotic species, and remove sporadic occurrences to circumvent later problems

To the north, south and east of the ToCH bushland lie human residences with established gardens containing exotic plant species. Some of these exotic species were observed to be already invading the edges of the patch, and others are likely. Some invasive exotic plants along boundary are:-

<u>Common Name</u>	<u>Scientific Name</u>
african boxthorn	<i>Lycium ferocissimum</i>
aunt eliza	<i>Chasmanthe floribunda</i>
boneseed	<i>Chrysanthemoides monilifera</i>
cape marigold	<i>Dimorphotheca pluvialis</i>
grasses	
nasturtium	<i>Tropaeolum majus</i>
rice millet	<i>Piptatherum miliaceum</i>
soursob	<i>Oxalis pes-caprae</i>

To the east of the ToCH bushland is the steep bank leading down to the river which can be accessed by the public. The level of weed infestation in this area poses a serious threat to the maintenance of biodiversity in the remnant patch.

The western side of the ToCH camp is bordered by a 13m wide bitumen road, beyond which lies another narrow strip of remnant bushland. Although this area is also suffering weed invasion in the understorey, it possesses great value as a nearby source of seed for the ToCH plant communities.

Storm water run-off from the roads and from the ToCH camp area carries with it seeds and nutrients. As the bushland lies on a slope the water run-off can pass through and deposit seeds and fertiliser residue in the soil. The danger posed by exotic seeds washed into the area is obvious but additional nutrients can change the chemical composition of the soil so that the growth of weed species is favoured over that of native vegetation.

#### Recommendations

- educate / inform neighbours of the conservation significance of the bushland and invoke their aid in choosing non-invasive garden plants.
- formation of a "Friends" group which could provide assistance with weed control, establishing interpretive trails, maintenance and public awareness.
- seasonally slash grassy vegetation and weed growth before it sets seed on the northern and southern boundaries as this should allow the native seedlings a chance to compete against weed species.
- fencing of the ToCH bushland would be useful as a means of confining human access into the area to certain permanent gates which should help to control the areas accessed by the majority of traffic. However, fencing should only be a high priority if the bushland is vulnerable to trampling by livestock.
- improved storm water run-off management in the form of drains or curbing installed on the southern boundary. Nutrient run-off poses a risk on the northern boundary and from within the ToCH grounds. Education of those neighbours and ground keepers whose actions pose a threat and the maintenance of good relations with these groups are perhaps the best and least expensive management methods in such a situation.

#### **Weeds**

##### Objectives

- identify and map invasive exotic (weed) species presence and extent.
- develop a plan for removal of serious and potentially serious weeds, by minimum disturbance techniques where possible.
- minimise movement of exotic species into the bushland from adjacent properties.
- monitor the changes in spread of exotic species over time, and adjust the weed management plan in line with these changes.

Exotic (not-indigenous) plants may have been introduced to an area for a number of reasons, particularly as garden plants or pasture, but become invasive in bushland. The most obvious weeds have been described, and suggestions made about methods of control.



## Feral Animals

### Objectives

- eradicate feral animals including rabbits

Visual evidence of rabbits are of warrens to the north of the bushland, approximately half way down, and a second warren three quarters of the way down on the east side can be seen. Although these warrens are small it is recommended that they be controlled. The eradication of the rabbits would have a minimal impact on the vegetation and would ensure further protection of the fragile vegetation from rabbits in the future.

### Recommendations

- The Animal and Plant Control Commission suggested Martin Weidenbac, an authorised officer in Goolwa, to eradicate the rabbits.
- As both warrens are small, Weidenbac recommends utilising a fumigant called Phostoxin or Choropicrin (tear gas) and to follow up by ripping the warrens, using shovels, to prevent recolonization of a burrow. However the fumigation works best in moist conditions so it needs to be completed soon. Weidenbac quoted \$40-50 to complete the work. He can be reached:

c/o- Alexandria Council

Goolwa 5214

tel: 08- 8555 3722

Further information about rabbit control can be found from the Anti-Rabbit Foundation.

## Fire Management

### Objectives

- protect human life and the assets of properties adjoining the patch of remnant vegetation.
- maintain the diversity of native flora and fauna communities
- foster sound land use planning with regard to potential fire hazards.
- manage fire so as to protect the area from degradation by erosion and subsequent weed invasion.

### Prescribed Burning

Prescribed burning is the practice of burning sections of native vegetation under controlled conditions. The use of fire as a management tool in Australia has been quite widely accepted, however, recent research has revealed that inappropriate use of fire can have severe environmental consequences.

Australian native vegetation is commonly perceived to be adapted to fire, however, native vegetation is extremely diverse and different communities tend to be adapted to different fire regimes. Some vegetation communities benefit from prescribed burning as a means of maintaining diversity by preventing the establishment of competing weed species and low intensity burning is generally used to reduce fuel loads as a form of wild fire hazard reduction. However prescribed burning is not appropriate in all situations and there are several factors to consider, such as the season, intensity, frequency, pattern of burning and vegetation composition.

Plant species differ in their reaction to fire according to the intensity of the blaze. Some species require an intense fire in order to release their seed, others need intense temperatures to ensure seed germination while other species which may occur in the same community will be unable to survive a high intensity fire.

Heavy rainfall after fires may cause severe erosion, thus it is necessary to consider such factors as soil type, slope gradient, texture of ground surface and expected post-burn weather conditions (Buchanan 1989).

The burning of large swathes of native vegetation is detrimental to flora and fauna populations. Fauna may lack escape routes or refuges and risk local extinction. Plant species recolonise quite slowly from other nearby remnants and may be effected by such factors as grazing from vertebrates in adjoining areas. Most bushland areas have been invaded by exotic weeds and grasses, especially those situated in highly human modified regions. Many weed species are able to colonise areas of disturbed habitat



more quickly than native plant species and it is often the case that the burning of native vegetation is responsible for the invasion of the bushland by weed species.

### Recommendations

Based on recent studies it appears that prescribed burning is not a beneficial option for the small patch of remnant bushland adjoining the Toch camp at Victor Harbour. Burning regimes on Murray Mallee vegetation have been demonstrated as being disadvantageous to maintaining diversity (Playfair 1994). As several species recorded in the Toch patch belong to Mallee communities, prescribed burns may prove detrimental to their survival potential.

Recent work by Possingham et al. (1995) suggests that simple rules do not exist for determining how flora and fauna populations will respond to fire. For patches of less than 3000 hectares in size, maintaining vegetation diversity through prescribed burning practices appears unfeasible. As the Toch patch falls into this category prescribed burning is NOT recommended on the grounds that

- the patch size is insufficient for the benefits of burning to outweigh the disadvantages to biodiversity levels
- the sandy composition of the soil and slope of the patch indicate the potential worsening of erosion problems following a burn.
- The presence of weeds in the patch, especially those in the north-east corner, may be better controlled by methods other than fire management as the use of fire could encourage subsequent weed invasion further into the interior of the patch.
- the vegetation type and composition suggests that prescribed burning will not foster increased levels of diversity within this patch of bushland.

### Protection from Wildfire

The Toch camp and bushland are enclosed by bituminised roads to the south and east and by compacted dirt roads to the north and west. The width of these roads can be said to constitute firebreaks. The small size of the bushland does not necessitate the clearing of additional firebreaks within the patch. The bushland exists in an urban matrix where humans cause the majority of fires, especially on roadsides where cigarettes are often disposed of inappropriately.

As Toch camp is surrounded by an urban environment the local fire authorities will deal with any fire threatening to move into the park. The proximity of human housing usually ensures a quick and diligent response to any reported wildfire.

### Recommendations

- To guard against the possible spread of fire into the bushland from the roadside the clipping of branches overhanging the road could be undertaken to discourage "spotting" or the movement of fire by burning fragments being blown before the fire front.
- Visitors should be discouraged or prohibited from smoking or igniting fires within the confines of the patch.
- Should a wildfire start within the bushland it is recommended that the area not be left to burn, but rather the fire should be extinguished immediately from the boundary. The small size of the bushland should allow fires to be extinguished from the boundaries without requiring vegetation clearance for fire access tracks.

### Drainage

#### Objective

- reduce soil erosion

Water run off near the accommodation huts is a major concern.

### Recommendations

- Rather than allowing the water to run off downhill into the park it would be better to redirect it across the face of the slope and slow the rate of flow, or to collect it in tanks for later use. This will prevent leaching of the soil and soil erosion.

## Bibliography

- Briggs, J.D. & Leigh, J.H. (1995) *Rare or threatened Australian plants* CSIRO, Collingwood Vic.
- Buchanan, R.A. (1989) *Bush Regeneration: recovering Australian landscapes* Open Training and Education Network, Sydney.
- Cooke, B. (Ed.) (1993) *Australian Rabbit Control Conference*, Anti-Rabbit Research Foundation of Australia.
- Dashorst, G.R.M. & Jessop, J.P. (1990) *Plants of the Adelaide plains and hills*. Kangaroo Press, Kenthurst, NSW
- DENR (1996) *Deep Creek and Talisker Conservation Parks Management Plan*, Natural Resources Group, Department of Environment and Natural Resources.
- Jessop, J.P. (Ed) (1993) *A list of the vascular plants of South Australia*. Botanic Gardens & State Herbarium, Adelaide.
- Jessop, J.P. & Toelken, H.R. (Eds) (1986) *Flora of South Australia. Parts I - IV*. SA Government Printing Division, Adelaide.
- Lang, P.J. & Kraehenbuehl, D.N. (1987) *Plants of particular conservation significance in South Australia's agricultural regions: Interim report*. DEP, SA: (updated March 1996 ratings).
- Playfair, R.M. (1994) *A Native Vegetation Survey of the Burra Hills Region of South Australia* Geographic Analysis and Research Unit, S.A. Dept. of Housing and Urban Development.
- Possingham, H.P., Comins, H.N. & Noble, I.R. (1995) Fire and flammability niches in plant communities *Journal of Theoretical Biology* 174(1) pp. 97-108
- Prescott, A. (1988) *It's blue with five petals*. Ann Prescott, South Australia.
- Robertson, M. (1994) *Stop Bushland weeds: a guide to successful weeding in South Australia's Bushland*. Nature Conservation Society of SA Inc., Adelaide.

## Appendix

### Toch Bushland Plant List - Preliminary Draft by H. Vonow ix. 1997

Scientific name	Common name
<i>Acacia longifolia</i> var. <i>sophorae</i>	coastal wattle
<i>Acacia myrtifolia</i>	myrtle wattle
<i>Acacia paradoxa</i>	kangaroo thorn
<i>Acacia spinescens</i>	spiny wattle
<i>Acianthus exsertus</i>	mosquito orchid
<i>Adenanthos terminalis</i>	adenanthos
<i>Allocasuarina muelleriana</i> (?)	slaty sheoak
<i>Allocasuarina pusilla</i>	dwarf sheoak
<i>Argentipedium obtusifolium</i>	everlasting
<i>Arthropodium strictum</i>	vanilla lily
<i>Astroloma conostephiodes</i>	flame heath
<i>Astroloma humifusum</i> (erect form)	native cranberry
<i>Banksia marginata</i>	silver banksia
<i>Banksia ornata</i>	desert banksia
<i>Billardiera ? cymosa</i>	apple-berry
<i>Brachyloma ericoides</i>	brush heath
* <i>Briza maxima</i>	quaking grass
<i>Caesia calliantha</i>	blue grass-lily
<i>Calytrix tetragona</i>	common fringe-myrtle
<i>Carpobrotus rossii</i>	pigface
<i>Cassytha glabella</i>	snotty-gobble
* <i>Cerastium glomeratum</i>	chick-weed
<i>Chamaescilla corymbosa</i>	blue squill
<i>Cheilanthes austrotenuifolia</i>	rock fern
* <i>Chrysanthemoides monilifera</i>	boneseed
<i>Chrysocephalum apiculatum</i>	common everlasting
<i>Comesperma calymega</i>	blue-spike milkwort
<i>Conospermum patens</i>	smoke bush
<i>Correa reflexa</i>	common correa
<i>Crassula</i> spp.	crassula
<i>Cryptandra tomentosa</i>	prickly cryptandra
<i>Cyrtostylis reniformis</i>	gnat orchid
<i>Daviesia arenaria</i>	sand-hill bitter pea
<i>Daviesia brevifolia</i>	leafless bitter pea
<i>Dianella revoluta</i> (&/or <i>brevicaulis</i> )	flax lily
<i>Dillwynia sericea</i>	showy parrot-pea
<i>Dodonaea viscosa</i> ssp. <i>spatulata</i>	sticky hop-bush
<i>Drosera auriculata</i>	tall sundew
<i>Drosera macrantha</i> ssp. <i>planchonii</i>	climbing sundew
<i>Drosera whittakeri</i>	scented sundew
* <i>Ehrharta calycina</i>	veldt grass
<i>Eucalyptus baxteri</i>	brown stringybark
<i>Eucalyptus cosmophylla</i>	cup gum
<i>Eucalyptus fasciculosa</i>	pink gum
<i>Exocarpus cupressiformis</i>	native cherry
* <i>Freesia</i> sp.	freesia
<i>Goodenia ? geniculata</i>	bent goodenia
<i>Grevillea lavandulacea</i>	lavender grevillea
<i>Hakea carinata</i>	hakea
<i>Hakea rostrata</i>	beaked hakea
<i>Helichrysum scorpioides</i>	button everlasting
<i>Hibbertia riparia</i>	erect guinea-flower
<i>Hibbertia sericea</i> var. <i>sericea</i>	silky guinea-flower
<i>Hibbertia virgata</i>	twiggy guinea-flower
* <i>Hypochaeris glabra</i>	smooth catsear
* <i>Hypochaeris radicata</i>	rough catsear
<i>Hypolaena fastigiata</i>	tassel rope-rush
<i>Isolepis nodosa</i>	knobby club-rush



<i>Isopogon ceratophyllus</i>	cone-bush
<i>Juncus</i> sp.	dwarf wire-lily
<i>Laxmannia orientalis</i>	black rapier-sedge
<i>Lepidobolus drapetocoleus</i>	sword-sedge
<i>Lepidosperma carpoides</i>	fringed hare-orchid
<i>Lepidosperma concavum/congestum</i>	heath tea-tree
<i>Leporella fimbriata</i>	common bearded-heath
<i>Leptospermum myrsinoides</i>	flax-leaved logania
<i>Leucopogon virgatus</i>	desert iron-grass
<i>Logania linifolia</i>	stiff iron-grass
<i>Lomandra juncea</i>	harlequin mistletoe
<i>Lomandra multiflora</i> ssp. <i>dura</i>	soft millotia
<i>Lysiana exocarpi</i>	climbing
<i>Millotia ? tenuifolia</i>	coastal lignum
<i>Muehlenbeckia adpressa</i>	bridal creeper
<i>Muehlenbeckia gunnii</i>	twiggy daisy-bush
<i>*Myrsiphyllum asparagoides</i>	sour-sob
<i>Olearia ramulosa</i>	heathy phyllota
<i>*Oxalis pes-caprea</i>	smooth riceflower
<i>Phyllota pleurandroides</i>	woolly riceflower
<i>Pimelea glauca</i>	sweet pittosporum
<i>Pimelea octophylla</i>	common flat-pea
<i>*Pittosporum undulatum</i>	fringed pseudanthus
<i>Platylobium obtusangulum</i>	bracken
<i>Pseudanthus micranthus</i>	dwarf greenhood
<i>Pteridium esculentum</i>	banded greenhood
<i>Pterostylis nana</i>	saltbush
<i>Pterostylis sanguinea</i>	small wrinklewort
<i>Rhagodia</i> sp.	senecio
<i>Rutidosia multiflora</i>	butterfly spyridium
<i>Senecio</i> sp.	candies
<i>Spyridium coactifolium</i>	pink bells
<i>Stackhousia aspericocca</i>	sun orchid
<i>Tetratheca pilosa</i>	rabbit-ear sun orchid
<i>Thelymitra ?sp. (pink bud)</i>	yakka / grass tree
<i>Thelymitra antennifera</i>	heath xanthosia
<i>Xanthorrhoea semiplana</i>	pink zieria
<i>Xanthosia pusilla</i>	
<i>Zieria veronicea</i>	

# Appendix 2 Terrestrial Bird Species

Species seen in stone reserve, pine reserve or nearby

Species in boldface use the scrub, or its edges frequently

Species	comments	dec 94
Black-shouldered Kite	common nearby	x
Brown Goshawk	occasional	
Marsh Harrier	formerly around Inman swamps	
Australian Kestrel	common nearby	
Feral Pigeon		
Spotted Turtle-Dove		x
Peaceful Dove	becoming more common	x
Crested Pigeon		x
Funereal Cockatoo	common	x
Galah		x
Sulphur-crested Cockatoo	uncommon nearby	x
Little Corella	mainly river valleys	x
Rainbow Lorikeet		x
Musk Lorikeet		x
Purple-crowned Lorikeet		x
Adelaide Rosella		x
Red-rumped Parrot		x
Horsfield's Bronze-Cuckoo		
Southern Boobook		
Laughing Kookaburra		x
Sacred Kingfisher	declining rapidly, once along rivers	
Welcome Swallow		x
Tree Martin		x
Fairy Martin	once on Inman	
Richard's Pipit	coastal fields	
Black-faced Cuckoo-shrike		
Blackbird		
Crested Shrike-tit	more often in blue and red gums	x
Golden Whistler	common	x
Rufous Whistler	uncommon	x
Grey Shrike-thrush	common	x
Grey Fantail		x
Willie Wagtail		x
Superb Fairy-wren		x
White-browed Scrubwren	in scrub along rivers	
Weebill	uncommon	x
Brown Thornbill	?locally extinct	
Yellow Thornbill	uncommon, mainly along rivers	x
Yellow-rumped Thornbill	abundant in scrub and edges	x
Striated Thornbill	common	x
Varied Sittella	rarely seen in cemetery	
Red Wattlebird	common	x
Little Wattlebird	increasing, prefers gardens	x
Yellow-faced Honeyeater	uncommon, ?seasonal	x
White-plumed Honeyeater	mainly blue and red gum	x
Black-chinned Honeyeater	regionally threatened, red and blue gums	x
Brown-headed Honeyeater	common	x
White-naped Honeyeater	uncommon, ?seasonal	x
New Holland Honeyeater	abundant	x
Eastern Spinebill	common but primarily in scrub	x
White-fronted Chat		
Mistletoebird	erratic	x
Yellow-rumped/Spotted Pardalote	? winter visitor	
Striated Pardalote	mainly in blue and red gum	x
Silvereye		x
European Goldfinch		x
House Sparrow		x
Common Starling		x
Magpie-lark		x
Dusky Woodswallow	uncommon	
Australian Magpie		x
Grey Currawong	low numbers	x
Little Raven		x

Significant species - probably use ToCH

