

SITE ASSESSMENT  
OF THE  
GORDON BAT COLONY

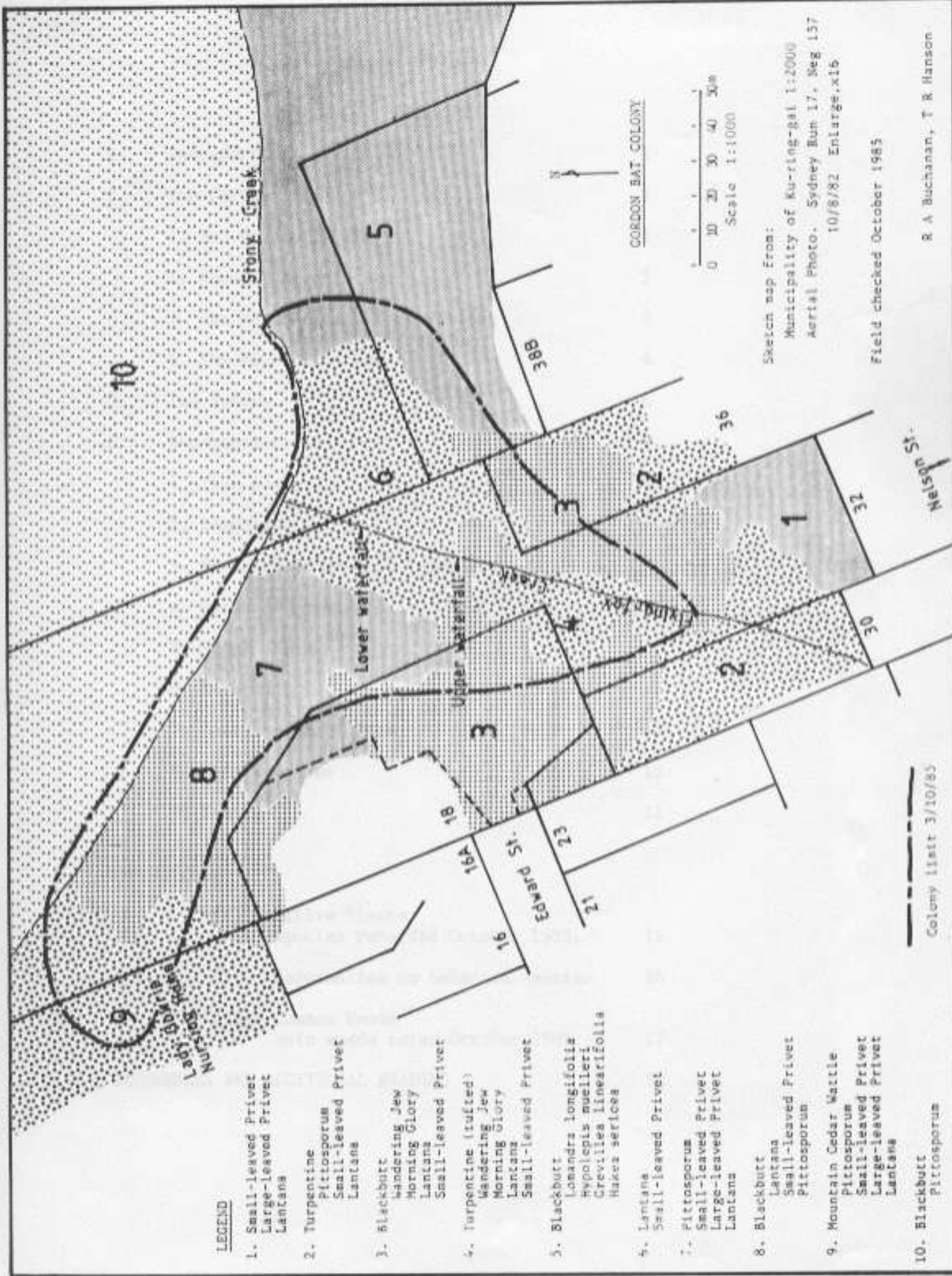
weed control  
and  
restoration of native vegetation

by Robin Buchanan B.A.(Hons.)  
Ecological Consultant

Commissioned by  
the Ku-ring-gai Bat Colony Committee  
November, 1985.

**LEGEND**

1. Small-leaved Privet  
Large-leaved Privet  
Lantana
2. Turpentine  
Pittosporum  
Small-leaved Privet  
Lantana
3. Blackbutt  
Wandering Jew  
Morning Glory  
Lantana  
Small-leaved Privet
4. Turpentine (tufted)  
Wandering Jew  
Morning Glory  
Lantana  
Small-leaved Privet
5. Blackbutt  
Lomandra longifolia  
Hypolepis muelleri  
Crevillea linearifolia  
Hakea sericea
6. Lantana  
Small-leaved Privet
7. Pittosporum  
Small-leaved Privet  
Large-leaved Privet  
Lantana
8. Blackbutt  
Lantana  
Small-leaved Privet  
Pittosporum
9. Mountain Cedar Wattle  
Pittosporum  
Small-leaved Privet  
Large-leaved Privet  
Lantana
10. Blackbutt  
Pittosporum



GORDON BAT COLONY

0 10 20 30 40 50m  
Scale 1:1000

Sketch map from:  
Municipality of Ku-ring-gai 1:2000  
Aerial Photo. Sydney Bun 17. Seg 157  
10/8/82 Enlarge, x16  
Field checked October 1985

Colony 15ett 3/10/83

R A Buchanan, T R Hanson

## CONTENTS

A.	Introduction	1
B.	The Gordon Site	1
	1. Bat Habitat	1
	2. General Description	2
	3. The Vegetation Before Weeding	3
	4. The Vegetation Now	4
C.	The Future	6
D.	Recommendations	7
	1. Time Scale	7
	2. Drainage	7
	3. Re-establishment of Vegetation	7
	4. Order of Work	10
	5. Maintenance	10
	6. Recording	11
	7. Containment of Bats	11
	8. Land Purchase	11
	9. Tracks	11

## APPENDICES

(i)	Native Plants Species recorded October 1985.	12
(ii)	Information on Selected Species	16
(iii)	Common Weeds main weeds noted October 1985.	17

REFERENCES AND ADDITIONAL READING	18
-----------------------------------	----



Photo 1. Dense shrub layer overtopped by Turpentine.



Photo 2. Some Turpentine are favoured roosting sites.





Photo 3. Bats use fine branches in the shrub layer when they are accessible. Coachwood along Stony Creek.



Photo 4.  
Flying Fox Creek.



Photo 5. The junction of Flying Fox Creek  
and Stony Creek.



Photo 6. Area 5. Fairly open vegetation.

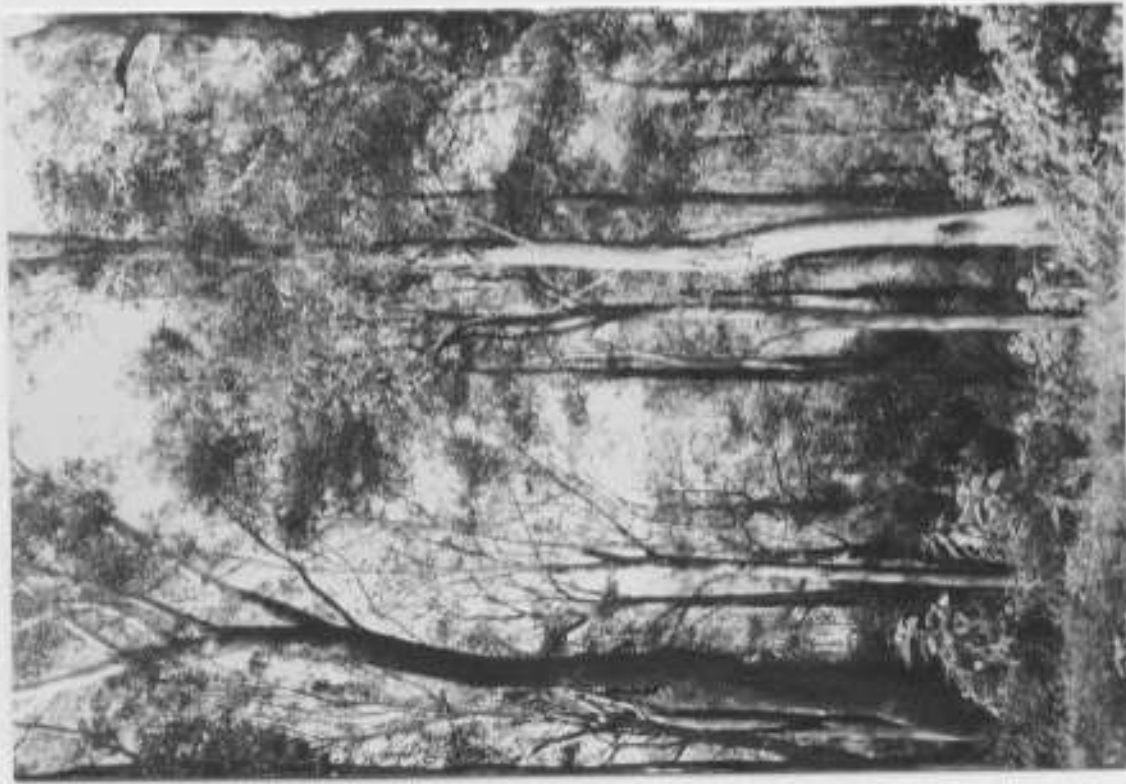


Photo 7. Area 3. Tall open forest.  
The end of Edward Street.



Photo 8. Area 4. Tufted Turpentine.

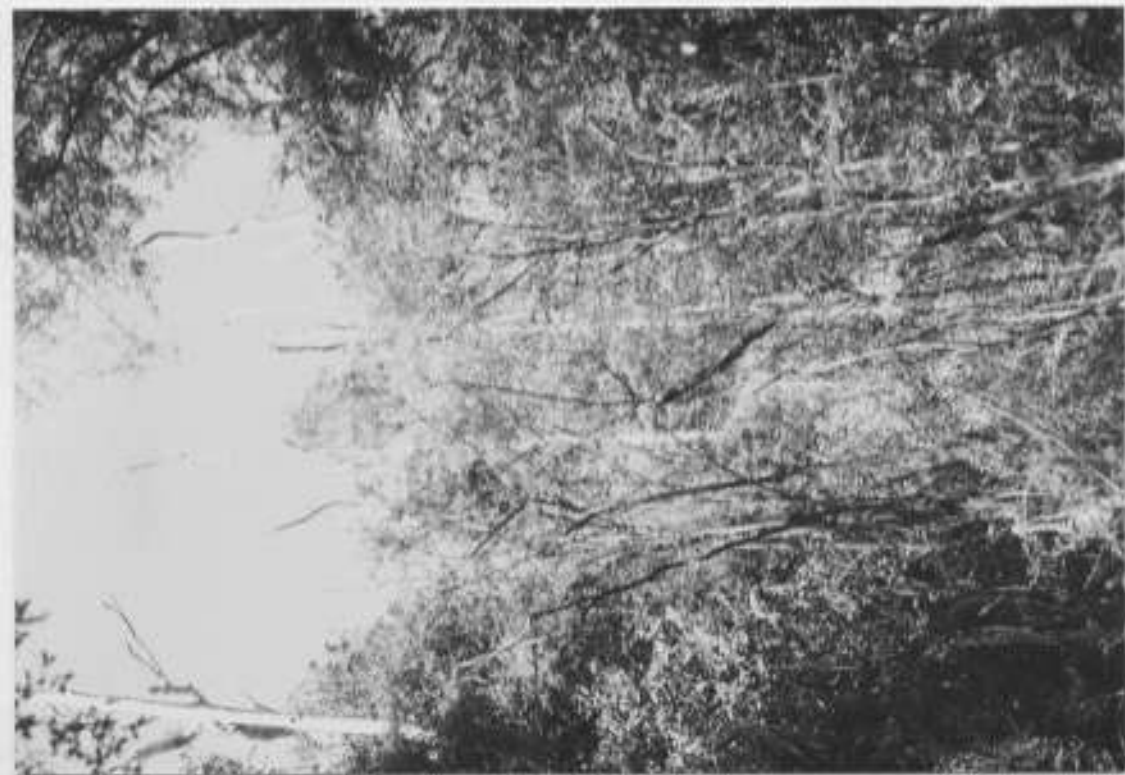
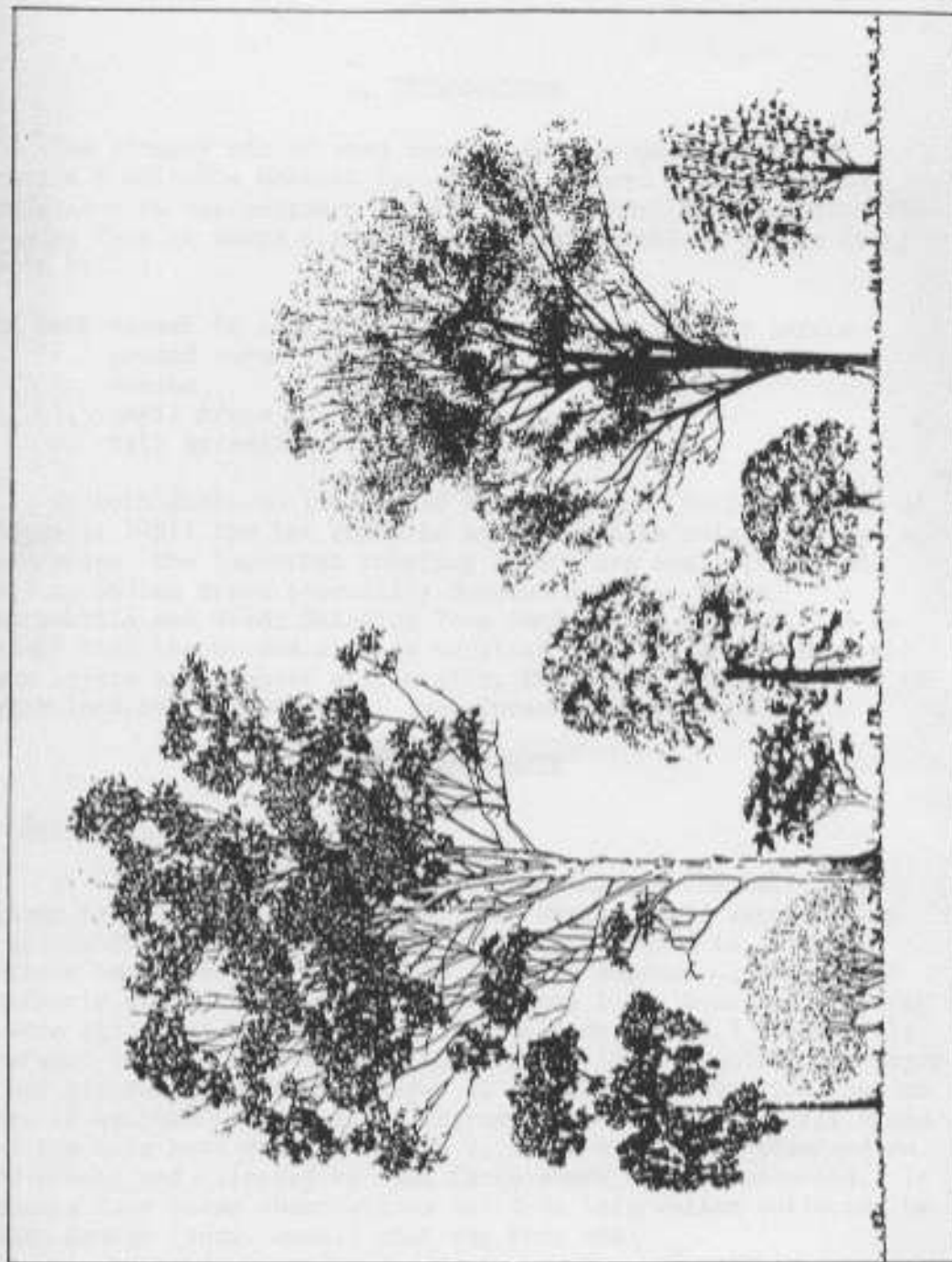


Photo 9. Dead trees near the junction of  
Flying-fox and Stony Creeks.



Photo 10. Blackbutts are continuing to die.  
(Brown leaves in centre of photo.)





Blackbutt  
>30m  
Layer 4

Turpentine  
15-20m  
Layer 3

Pittosporum  
6m  
Layer 2

Ferns  
Layer 1

GORDON BAT COLONY  
VEGETATION BEFORE WEED INVASION

## A. INTRODUCTION

The primary aim of weed control and revegetation is to provide a suitable habitat for the bat colony. Plant species indigenous to the northern suburbs will be used to revegetate the area so that it forms a continuum with the bushland of the Stony Creek Valley.

The bats appear to need vegetation consisting of four layers

1. ground cover
2. shrubs
3. small trees
4. tall spreading trees

At both Jamberoo Valley and Wingham Brush (National Trust of Australia 1981) the bat colonies are present in rainforest and at both sites the important roosting layers are small trees and tall spreading trees especially Moreton Bay Figs *Ficus macrophylla* and Giant Stinging Tree *Dendrocnide excelsa*. It is likely that the Gordon site is marginal habitat, as although all four layers are present at the site, the valley flora consists of wet sclerophyll forest (tall open-forest).

## THE GORDON SITE

### 1. Bat Habitat

At Gordon the main layers for roosting are the tall trees (layer 4) and short trees (layer 3). During field work days in September/October 1985 the bats were concentrated in layer 3. Maximum temperatures ranged from 15 to 24 degrees C. with light southerly winds. On the warmer days some lower branches of layer 4 were also used but on the one cold (15 degrees C.) and heavily overcast day the bats were using slightly lower vegetation - layer 3 and protruding shrubs of layer 2. It has been reported that on days of extreme heat (over 40 degrees C.) with dry westerly winds all the bats have vacated Layers 2, 3 and 4 and were observed on the ground and clinging to rock faces where seepage occurred. It appears from these observations and from information collected by Helen George (pers. comm.) that the bats use:

Layer 1 (ground) - in high temperatures, protection from desicating winds.

Layer 2 (shrubs) - in high temperatures, protection from sun and desicating winds and on cold days, protection from chilling winds.

Layer 3 (small trees) - layer most commonly used.  
Average spring /summer conditions.  
Photos 1 & 2.

Layer 4 (tall trees) - second most commonly used layer.  
In early morning, to warm in sun and also to cool in summer breezes.

Layer 2 (shrubs) would probably be used more frequently if it was more open so that the bats could fly through it. Individual protruding shrubs or shrubs with easy access such as those along Stony Creek are used now. (photo 3)

The bats appear to favour approximately horizontal branches (photos 1 & 2) but branches at 60 degrees or more from the horizontal are also used. Very fine branches, such as those in photo 3, are used as well as branches up to 6 - 7 cm diameter. Dead branches and trees are used for roosting.

## 2. General Description

The colony occupied 1.4 ha on 3rd October 1985 (see map). The valley of Flying Fox Creek is sheltered from both hot summer north-westerly winds as well as cold south to south-westerly winds as it faces north-east. Such a valley also receives early morning sun but is sheltered from high insolation during the middle part of the day. Stony Creek flows easterly towards Middle Harbour.

The underlying bed rock is Hawkesbury Sandstone. The soils are heavier (Hammondville Association) than usually found on Hawkesbury Sandstone, as the soils in Flying Fox Valley are influenced by the heavy clay, nutrient rich soils of the surrounding Wianamatta Shales. The presence of the native Lillypilly *Acmena smithii* and Rasp fern *Doodia aspera* indicate a higher than usual nutrient level as do the presence of the introduced vines, Ivy *Hedera helix*, Climbing Fig *Ficus pumila* and Climbing Asparagus *Asparagus setaceus*. Higher nutrient levels than normal have probably been caused by;

1. Downslope movement of nutrients from the Wianamatta Shale
2. Fertilizers used on gardens surrounding the valley
3. Nutrients washed in from the Edward Street drain
4. Bat droppings.

Two large road drains empty into Flying Fox Valley at the end of Edward Street. Enormous volumes of water are spilt across Areas 3 and 7 as no definite channel is present and water is spread laterally by roots and vines. Quite severe sheet erosion is evident after heavy rain.

The flow of water in Flying Fox Creek is severely restricted by dense weed growth (photo 4). This has led to permanent boggy conditions in the vicinity of the creek and some large trees have died as a consequence. The flow in Stony Creek is unimpeded (photo 5).

There appears to have been a small colony present in 1963 (H. George pers. comm.) but the main influx of bats did not occur until after 1965 when a bushfire burnt their previous colony site. The only private land potentially affected by the colony is No.36 Nelson Street and Lady Gowrie Nursing Home.

### 3. The vegetation before weed invasion

see diagram (at front) and weed species list appendix (iii).

The vegetation in Flying Fox Valley would have consisted of four layers of native vegetation before weed invasion. In some areas the vegetation is so altered that the description below is only an educated guess.

Layer 1 Ground cover (0 - 0.5m) varying densities of ferns, grasses and herbs. Dead Grass Trees *Xanthorrhoea* sp. are present in Area 6 and 7, an indication that the ground received more sunlight in the past.

The presence of epiphytes such as Bird's Nest Fern *Asplenium australasicum* and Elkhorn *Platycerium bifurcatum* is probably fairly recent as the plants observed were quite young but they may represent a new generation replacing those removed earlier during settlement.

Layer 2 Shrubs (0 - 6 m) This layer would have been much more open than it is now. The presence of fairly large Lillypilly (13 cm diameter at breast height), Christmas Bush *Ceratopetalum gummiferum* (15 cm dbh), Pittosporum *Pittosporum undulatum* (24 cm dbh) and Scaly Tree Fern *Cyathea cooperi* (6 m high) in Flying Fox Valley indicate that there was a well developed understorey of large soft leaved shrubs. Coachwood *Ceratopetalum apetalum* is now confined to Stony Creek but it may have been present as may have Creek Sandpaper Fig *Ficus coronata*. Pittosporum probably would have been the most abundant shrub. Additional species which characterise slightly less moist conditions such as *Pultenea flexilis* probably would have been present on the upper slopes and near Lady Gowrie Nursing Home. Black She-oak *Allocasuarina littoralis* and Forest Oak *Allocasuarina torulosa* may also have been common in these areas.

The native Flame Tree *Brachychiton acerifolium*, Cabbage Tree Palm *Livistona australis* and Bangalow Palm *Archontophoenix cunninghamiana* are recent additions to the flora.

Layer 3 Small trees (15 - 20 m) This layer would have been substantially denser than it is now. The main species is Turpentine *Syncarpia glomulifera*. This species was heavily logged in the early days of settlement and as it is fairly slow growing compared to Blackbutt it may not have reached its full height. Mountain Cedar Wattle *Acacia elata* is also an important component in this layer behind No.18 Edward Street and towards Lady Gowrie Nursing Home. This species may have also been present in Flying Fox Valley.

Layer 4 Tall trees (30 m +) This layer would have been denser than it is now. Blackbutt *Eucalyptus pilularis* is the main species with Sydney Red Gum *Angophora costata* a minor component. The vegetation in Area 5 is less altered than on the rest of the site. It is also substantially different (photo 6). Blackbutt is still the dominant species but Layer 3, Turpentine, is only present in a broad band along Stony Creek. Black She-oak



and *Pittosporum* form a sparse tall shrub layer. Smaller shrubs consist of sclerophyllous species such as *Hakea sericea*, *Leucopogon lanceolatus* and *Grevillea linearifolia*. The most abundant species in Layer 1 are Bracken *Pteridium esculentum*, *Lomandra longifolia* and *Hypolepis muelleri*.

#### 4. The Vegetation Now

See Map

The vegetation is now severely invaded by weeds in Layers 1 and 2. The most common weed species are Wandering Jew *Tradescantia albiflora* in Layer 1 and *Lantana camara*, Small-leaved Privet *Ligustrum sinense*, Large-leaved Privet *Ligustrum lucidum* in Layer 2. The most widespread vine is Morning Glory *Ipomea indica*. The presence of these species has led to a much denser shrub layer than is natural. Morning Glory has generally not penetrated into the trees.

Unlike the shrub layer the two tree layers are much thinner than in a healthy community. Most of the live Blackbutts have thin canopies and many Blackbutts and Turpentine are dead.

The colony and adjoining vegetation has been divided into 10 areas. There are no definite boundaries as the change in vegetation is generally due to a change in the ratio of the species present rather than in a change of species. Those weeds listed above and the native species *Pittosporum*, Blackbutt and Turpentine are present in all areas.

In the map legend the main understorey species are inset.

AREA 1 Dominated by Small-leaved Privet, Large-leaved Privet and *Lantana*. Other weed species include Wandering Jew, *Ochna*, Climbing Asparagus and Morning Glory. The only prominent native plant is *Pittosporum*, Layers 3 and 4 are absent. Not used by the bats during the time of survey.

AREA 2 Dominated by Turpentine (mostly healthy). Some Red Mahogany *Eucalyptus resinifera* and Blackbutt is also present. The most common understorey species are the native *Pittosporum* and the weeds *Lantana* and Small-leaved Privet. The latter is particularly abundant near the creek. The Lillypilly occurs in this area, near No.23 Edward Street.

On No.36 Nelson Street the understorey has been cleared and consists of 10cm high Honeysuckle *Lonicera japonica*, Wandering Jew and Small-leaved Privet.

Only the northern edge was used by the bats during the survey period.

AREA 3 (photo 7) Dominated by Blackbutt. Most canopies are thin and considerable growth from epicormic buds is present. Wandering Jew forms a thick carpet over the ground while *Lantana*, Small-leaved Privet and Morning Glory are all very abundant. Other weed species include *Fatshedera* and Wild Tobacco *Solanum mauritianum*. The four layers of vegetation are present except on

No.36 Nelson Street, where the understorey has been cleared and now consists of 10cm high Honeysuckle, Wandering Jew and Small-leaved Privet.

A considerable amount of the area was in use by the bats during the survey area.

AREA 4 Dominated by severely misshapen Turpentine - tufted (photo 8). Tall Blackbutts are absent. Understorey severely infested by Wandering Jew, Morning Glory, Lantana and Small-leaved Privet. The latter is particularly common near the creek. Ivy is also present near the creek where it has climbed high up some trees.

The entire area was used by the bats during the survey period.

AREA 5 (Photo 6) Dominated by Blackbutt. Although only the margin of this area was used by the bats during the survey the Blackbutts are also in a poor state of health. Black She-oak forms the next layer with an understorey of sclerophyllous shrubs such as *Hakea sericea*, *Grevillea linearifolia*, *Acacia ulicifolia* and *Leucopogon lanceolatus*. The ferns Bracken and *Hypolepis muelleri* are also abundant.

Camphor Laurel *Cinnamomum camphora*, Lantana, Small-leaved Privet and Fishbone Fern *Nephrolepis cordifolia* are present near the house boundaries and Small-leaved Privet and Lantana are abundant near Stony Creek.

On 21st November 1985 the colony had spread in a broad band along Stony Creek well to the east of the mapped area. The bats were again concentrated in the Turpentine.

AREA 6 Lantana and Small-leaved Privet dominate the area. The Blackbutt and Turpentine layers are almost completely dead and broken down. The few remaining protruding Turpentine were crowded with bats during the survey period. Wandering Jew is dense and Honeysuckle occurs near the lower waterfall. Some *Pittosporum* is present.

AREA 7 *Pittosporum* and Small-leaved Privet dominate the area although some Blackbutts with sparse canopies still remain. Large-leaved Privet, Lantana and densely growing Wandering Jew are also present. Madeira Vine *Anredera cordifolia* is growing along Stony Creek.

Protruding Turpentine, *Pittosporum* and the lower branches of Blackbutts were densely covered with bats during the survey period.

AREA 8 Blackbutts dominate this area although their canopies are sometimes sparse. Turpentine and Mountain Cedar Wattles are very important roosting sites even when they are dead. Some of the shrub layer is dominated by *Pittosporum*, but Lantana, Small-leaved Privet and Large-leaved Privet are very

common. Wandering Jew of varying density is present throughout the area.

AREA 9 The Blackbutt layer is almost absent and the tallest layer (15 to 20 m) is represented by Mountain Cedar Wattle, most of which is dead or dying. Pittosporum is the dominant shrub but Lantana and Small-leaved Privet are very common. Ivy and Climbing Fig also are present as is Wandering Jew and Spider Plant *Chlorophytum cosmosum*.

The edge of this area was used by the bats during the field survey.

AREA 10 Blackbutts again dominate this slope with Pittosporums the main understorey species. Weeds such as Lantana, Small-leaved Privet and Wandering Jew are abundant along Stony Creek.

The area near the creek was in use by a small number of bats during the survey period.

### C. THE FUTURE

The native vegetation is dying and will be replaced within the next 15 to 30 years by a tall shrub layer consisting of Lantana, Small-leaved Privet, Large-leaved Privet and one native species, Pittosporum. Morning Glory and Wandering Jew will also remain very common. The trees, Blackbutt, Turpentine, Sydney Red Gum and Red Mahogany will no longer be present. Area 2 may take slightly longer to deteriorate to this condition as it is dominated by hardy Turpentines but other areas such as Area 6 and 7 are close to this scenario now. Dead trees are present all over the site, sometimes in abundance (photo 9), and trees are continuing to die (photo 10).

The cause of this change from native trees to dense introduced shrubs appears to be caused by:

1. increased amounts of water from surrounding streets and houses
2. increased nutrient status due to contamination of water input
3. impeded drainage along Flying Fox Creek
4. input of nutrients from bat droppings
5. damage to trees by bats.

The above factors, especially the first three, favour weed growth and cause severe stress for some native species. The subsequent weed growth causes increased stress.

The long term future of Blackbutt in Flying Fox Valley is very doubtful even if it is planted and kept free of competition from weeds as:

1. it requires deep well drained soil of light texture (Forestry Commission of N.S.W. 1966). Many areas are no longer well drained.
2. it appears to be sensitive to any environmental change and is dying along many creeks and valleys in Ku-ring-gai Municipality (Buchanan 1983).
3. it grows from October to April (Specht and Brouwer 1975) - the months of highest bat numbers.

Turpentine appears to be fairly resistant to constant water input, water pollution and weed growth and Sydney Blue Gum also appears to tolerate these conditions (Buchanan 1983).



## D. RECOMMENDATIONS

### 1. Time Scale

A satisfactory four layered structure will need to be established within the next 10 to 20 years.

### 2. Drainage

An aesthetic and natural appearing channel should be dug at the end of the Edward Street drain to direct the storm water from the outlet to Flying Fox Creek. No channel exists at present. Flying Fox Creek should be cleared so that it flows freely.

If boggy conditions persist along the creek, species such as *Melaleuca linariifolia* and *Melaleuca styphelioides* could be planted.

The additional water from surrounding residential areas should be used to advantage by planting a native soft-leaved flora which may in fact be more suitable habitat for the bats than the original flora.

### 3. Re-establishment of Vegetation

The Bradley Method of Bush Regeneration has proved to be the most effective in restoring native vegetation. Removal of weeds using hand tools is commenced in the least weed affected areas and the germination of and spread of existing native plants gradually leads to the growth of a healthy, native plant community. Disturbance of the soil is kept to a minimum and natural leaf litter is replaced. All plants must be identified before the weeds are removed.

It is recommended that the principles of the Bradley Method are adhered to overall, however, in specific areas where native vegetation is negligible, modified techniques including the use of herbicides, can be used. It will be necessary to plant recommended species and use commercially available eucalyptus mulch.

Herbicides which have a short half life should be used. "Round-up" or "Zero" should prove satisfactory for most species but the method of application will vary from spraying or watering-on for extensive areas of Wandering Jew, wiping on eg. careful application on a specific weed growing amongst natives, or injection into large weeds such as Privet or Camphor Laurel.

Before an area is cleared of weeds it should be established if additional eucalyptus mulch is needed. Sufficient suitable plant stock, preferably raised from local parent plants, should be ready for planting when an area is clear of weeds.

A mixture of Blackbutt, in well drained sites, and Sydney Blue Gum *Eucalyptus saligna* should be planted to re-establish layer 4 while Turpentine and the rapidly growing wattles, Mountain Cedar Wattle *Acacia elata*, *Acacia decurrens* and perhaps

also *Acacia melanoxylon* should be used to re-establish Layer 3 throughout the site.

Many additional native species have been recommended for planting, especially in Layer 2. Some of these are marked as only being suitable for replanting along the creek or in high nutrient soils. If soils and conditions are suitable, some species listed in Layer 2 may in fact grow tall enough to contribute to Layer 3.

All additional species recommended for planting occur naturally in Ku-ring-gai Chase or the northern suburbs of Sydney.

AREA 1

Clear and replant. Fairly dry area.

AREA 2

Mostly the Bradley Method (Bradley 1971, National Trust, no date). Some replanting along the creek.

AREA 3

Careful clearing as many native species still exist in Layers 1 and 2. Additional planting.

AREA 4

Careful clearing as native species still exist in Layers 1 and 2. Replant, especially along the creek.

AREA 5

The Bradley Method. Minor planting may be needed along Stony Creek and behind the residential boundary.

AREA 6

Clear and replant. Many species marked as suitable for planting near the creek or in nutrient rich soils could be used in this area.

AREA 7

Some areas suitable for the Bradley Method, eg. under the *Pittosporums* near Stony Creek; other areas will need clearing and replanting. Hardy species such as *Pittosporum*, Blackwattle *Callicoma serratifolia* and Christmas Bush should be used in drier areas.

AREA 8

Some areas suitable for the Bradley Method. Clear and replant. Some species from drier areas such as *Pultenea flexilis* and *Grevillea linearifolia* may be suitable as well as those listed for AREA 7.

AREA 9

Mostly clear and replant. As for AREA 8.

AREA 10

Bradley Method with some supplementary planting along Stony Creek.

Species which grow in winter/early spring and autumn when the bat numbers are reduced such as Lillypilly (Ashton and Frankenberg 1976) and Pittosporum (pers. obs.) would be useful in Layer 2.

#### 4. Order of Work

The Recommended order of work is as follows:

##### 1. AREA 2

- i) if summer, it does not interfere with the bats
- ii) good training ground for weed identification and Bradley Method
- iii) upper part of catchment so that fewer propagules are washed down to other areas
- iv) little planting required ie. additional time for plant stock to grow.

##### 2. AREA 1

- i) if summer, it does not interfere with the bats.
- ii) good training ground for clearing and replanting techniques
- iii) upper part of catchment so that fewer propagules are washed to other areas.

##### 3. AREA 4, 6, 7, 8, and edge of 9

- i) these areas are most important as they support large bat numbers
- ii) if staff are experienced, these areas should be considered first
- iii) if winter, these areas should be considered first.

##### 4. AREA 3

This is the next most important area to the bats after AREAS 4, 6, 7 and 8.

##### 5. AREAS 5 and 10

In summer after AREAS 2 and 1 are complete.

#### 5. Maintenance

Follow-up weeding will be necessary as soon as regrowth appears and initially should be carried out in preference to beginning new areas. In the first few years all areas will need to be closely monitored and maintenance weeding done regularly as Wandering Jew, Morning Glory and Honeysuckle all regrow from any remaining live stem fragments and the two Privet species can germinate in large numbers.

## 6. Recording

A list of the species planted, type of stock (tube, advanced etc), location planted and date should be kept and the growth rate (height and spread) should be recorded.

The health of existing trees and regrowth following restoration should be carried out by taking photographs from a fixed point in a fixed direction with a specific lens. Some recommended points are the end of Edward Street, from the upper waterfall, from the rear of No.18 Edward Street.

The bats' response to clearing, replanting and new growth must be noted so that further work on the site can be modified to suite the bats.

## 7. Containment of Bats

Vegetation which prevents roosting could be established on the residential boundaries, for example behind No.18 Edward Street. A band of ground covers and no other vegetation would certainly prevent roosting but a band of densely planted shrubs of even height would provide minimal roosting sites and be more aesthetic.

## 8. Land Purchase

The rear section of No. 36 Nelson Street should be purchased at a suitable time and added to the reserve as the colony uses this section of private land. Meanwhile, the owners should be encouraged to retain the dense stand of trees on their property.

## 9. Tracks

The tracks servicing the area at present pass through the centre of the colony. Use of these tracks causes considerable disturbance to the bats. A track to view the colony and to join with the track along Stony Creek should be constructed around the head of Flying Fox Valley through Areas 2, 3 and 5 or pass behind No.18 Edward Street through Areas 7, 8 and 9.



## APPENDIX (1)

NATIVE PLANTS

SPECIES RECORDED OCTOBER 1985

## LAYER ONE

Terrestrial Ferns

<i>Adiantum aethiopicum</i>	Common Maidenhair
<i>Adiantum hispidulum</i>	Rough Maidenhair
<i>Blechnum cartilagineum</i>	Gristle Fern
<i>Calcitra dubia</i>	False Bracken
<i>Doodia aspera</i>	Prickly Rasp Fern
<i>Histiopteris incisa</i>	Bat's Wing Fern
<i>Hypolepis muelleri</i>	Harsh Ground fern
<i>Pellaea falcata</i> ?	Sickle Fern
<i>Pteridium esculentum</i>	Bracken Fern

Epiphytic Ferns

<i>Asplenium australasicum</i>	Bird's-nest Fern
<i>Davallia pyxidata</i>	Hare's-foot Fern
<i>Doodia caudata</i>	Small Rasp Fern
<i>Platyserium bifurcatum</i>	Elkhorn
<i>Pyrrhosia rupestris</i>	Rock Felt Fern

Grasses Poaceae

<i>Entolasia stricta</i>	
<i>Microlaena stipoides</i>	Weeping Grass
<i>Oplismenus aemulus</i>	
<i>Poa affinis</i> ?	

Others

<i>Acianthus</i> sp. (Orchidaceae)	
<i>Commelina cyanea</i> (Commelin.)	Wandering Sailor
<i>Dianella caerulea</i> (Lili.)	Flax Lily
<i>Dichondra repens</i> (Convolv.)	Kidney Weed
<i>Cyperus</i> sp. (Cyper.)	
<i>Gahnia</i> sp. (Cyper.)	Saw - sedge
<i>Geranium</i> sp. (Gerani.)	Geranium
<i>Lepidosperma laterale</i> (Cyper.)	
<i>Lomandra longifolia</i> (Xanthorrhoe.)	Spiny-headed Mat-rush
<i>Pratia purpurascens</i> (Lobeli.)	Whiteroot
<i>Pseuderanthemum variabile</i> (Acanth.)	Pastel Flower
<i>Schelhammera undulata</i> (Lili.)	Lilac Lily
<i>Veronica</i> sp. (Scrophulari.)	Speedwell
<i>Viola hederacea</i> (Viol.)	Ivy-leaf Violet

ADDITIONAL SPECIES THAT COULD BE PLANTED IN LAYER ONE

Terrestrial Ferns

Pteris tremula Tender Brake

Others

Centella asiatica (Api.) Indian Pennywort  
Hydrocotyle acutiloba (Api.) Broad-leaf Pennywort

LAYER TWO

Small Shrubs and Shrubs

Acacia linifolia (Mimos.) Flax-leaf Wattle  
Breynia oblongifolia (Euphorbi.) Large-leaf Hop-bush  
Dodonaea triquetra (Sapind.)  
Polyscias sambucifolia (Arali.)

Large Shrubs and small trees

Ferns

Cyathea cooperi Scaly Tree Fern

Others

Acacia decurrens (Mimos.) Sydney Green Wattle  
Acmena smithii (Myrt.) Lillypilly  
‡ Archontophoenix cunninghamiana (Palmae) Bangalow Palm  
\* Allocasuarina littoralis (Casuarin.) Black She-oak  
‡ Brachychiton acerifolium (Stercu.) Flame Tree  
Callicoma serratifolia (Cunoni.) Black Wattle  
Ceratopetalum apetalum (Cunoni.) Coachwood  
Ceratopetalum gummiferum (Cunoni.) Christmas Bush  
Glochidion ferdinandi (Euphorbi.) Cheese Tree  
‡ Livistona australis (Palmae) Cabbage-tree Palm  
Omalanthus populifolius (Euphobi.)  
Pittosporum undulatum (Pittospor.) Pittosporum

ADDITIONAL SMALL SHRUBS AND SHRUBS THAT COULD BE PLANTED

IN LAYER TWO

@ Austromyrtus tenuifolia (Myrt.) Narrow-leaf Myrtle  
@ Bauera rubioides (Bauer.) River Rose  
Clerodendrum tomentosum (Verben.) Velvet Spider Bush  
Grevillea linearifolia (Prot.)  
Lomatia myricoides (Prote.)  
Notelaea longifolia (Ole.)  
Pultenea flexilis (Fab.) Graceful Bush Pea  
Rapanaea variabilis (Myrsin.)

Trema aspera (Ulm.)	Native Peach
@ Tristania nerifolia (Myrt.)	Water Gum
Trochocarpa laurina (Epacrid.)	

ADDITIONAL LARGE SHRUBS AND SMALL TREES THAT COULD BE PLANTED

IN LAYER TWO

Abrophyllum ornans (Escalloni.)	
+ Alphitonia excelsa (Rhamn.)	Red Ash
Backhousia myrtilifolia (Myrt.)	Grey Myrtle
+ Cryptocarya glaucescens (Laur.)	Jackwood
+ Cryptocarya microneura (Laur.)	Murrogun
+ Doryphor sassafras (Monimi.)	Sassafras
Elaeocarpus reticulatus (Elaeocarp.)	Blueberry Ash
@ Ficus coronata (Mor.)	Creek Sandpaper Fig
@ Melaleuca linariifolia (Myrt.)	
@ Melaleuca styphelioides (Myrt.)	
+ Rhodamnia rubescens (Myrt.)	
@ Schizomeria ovata (Cunoni.)	Crabapple
@ Stenocarpus salignus (Prote.)	Scrub Beefwood
Synoum glandulosum (Meli.)	Scentless Rosewood
Tristaniopsis laurina (Myrt.)	Water Gum
+ Wilkiea huegeliana (Monimi.)	Wiry Wilkiea

Vines and Creepers

Eustrephus latifolius (Philesi.)	Wombat Berry
Glycine clandestina (Fab.)	Twining Glycine
Hardenbergia violacea (Fab.)	Coral Pea
Hibbertia dentata (Dilleni.)	Twining Guinea Flower
Kennedia rubicunda (Fab.)	Dusky Coral Pea
Morinda jasminoides (Rubi.)	Jasmine Morinda
Smilax glycyphylla (Smilac.)	Thornless Smilax
Stephania japonica (Menisperm.)	Snake Vine

ADDITIONAL SPECIES THAT COULD BE PLANTED

IN LAYER TWO

Cissus antarctica (Vit.)	Water Vine
Cissus hypoglauca (Vit.)	Five-leaf Water Vine
Clematis aristata (Ranuncul.)	
Clematis glycinoides (Ranuncul.)	Forest Clematis
Geitonoplesium cymosum (Philesi.)	Scrambling Lily
Hibbertia scandens (Dilleni.)	Climbing Guinea Flower
Pandorea pandorana (Bignoni.)	Wonga Vine
Parsonsia straminea (Passiflor.)	Common Silkwood
+ Passiflora herbertiana (Passiflor.)	Native Passionfruit
Sarcopetalum harveyanum (Menisperm.)	Pearl Vine
+ Smilax australis (Smilac.)	Austral Smilax

### LAYER 3

Acacia elata (Mimos.)	Mountain Cedar Wattle
* Eucalyptus gummifera (Myrt.)	Red Bloodwood
* Eucalyptus resinifer? (Myrt.)	Red Mahogany
Syncarpia glomulifera (Myrt.)	Turpentine

### ADDITIONAL SPECIES THAT COULD BE PLANTED IN LAYER THREE

Acacia melanoxylon (Mimos.)	Blackwood
Allocasuarina torulosa (Casuarin.)	Forest Oak

### LAYER 4

Angophora costata (Myrt.)	Sydney Red Gum
Eucalyptus pilularis (Myrt.)	Blackbutt

### ADDITIONAL SPECIES THAT COULD BE PLANTED

Eucalyptus saligna (Myrt.)	Sydney Blue Gum
----------------------------	-----------------

### KEY

- \* All dead in main colony.
- @ Plant along creeks.
- + Plant only on nutrient rich soils.
- # Not natural to the site.



APPENDIX (ii)

INFORMATION ON SELECTED SPECIES

Blackbutt *Eucalyptus pilularis*

Growing Period - October to April inclusive (Specht and Brouwer 1974).  
Growth data (N.S.W.) Forestry Commission of N.S.W. 1966

Age in years	Moist Site mean height in metres	Dry Site height in metres.
10	-	15.5
10	22.5	17.3
15	28.3	19.5
15	27.1	23.1
19	33.8	23.4
19	30.6	28.3

Sydney Blue Gum *Eucalyptus saligna*

Growth data Walters 1973 - Hawian data

Original Spacing in metres	Age in years	Mean Height in metres
2.4 x 2.4	5	23.1
	10	28.0
3.0 x 3.0	5	21.9
	10	27.4
3.6 x 3.6	5	22.8
	10	28.9
4.2 x 4.2	5	23.1
	10	30.8

Trees in all stands attained 80% of their present height during the first five years - growing at 4.2 metres a year but only 1.2 metres in the last 5 years.

Lillypilly *Acmena smithii* (Ashton and Frankenberg 1976)

- extremely shade-tolerant and regenerates readily under dense forest canopy.
- seed easily killed by desiccation
- slow development of seedlings in first year renders them susceptible to drought and browsing
- after second year they are extremely persistent owing to the development of a lignotuber
- longevity of seed not great, approximately 15 months
- growth in flushes
- growth commences in early or mid winter and reaches maximum in spring. In midsummer shoot growth ceases and flowering takes place.

Pittosporum *Pittosporum undulatum* (Gleadow 1980)

- moderately shade tolerant
- growth severely retarded by grasses and herbs
- main growth in winter (pers. obs.)

## APPENDIX (111)

## COMMON WEED SPECIES

NOTED IN OCTOBER 1985

## LAYER ONE

Ferns*Nephrolepis cordifolia*

Fish-bone Fern

Others*Argeratina riparia* (Aster.)

Mist Flower

*Asparagus densiflorus* (Lili.)

Asparagus

*Bidens pilosa* (Aster.)

Cobbler's Peg

*Chlorophytum cosmosum* (Lili.)

Spider Plant

*Ehrharta* sp. (Po.)*Hedychium gardnerianum* (Zingiber.)

Ginger

*Oxalis* spp. (Oxalid.)

Oxalis

*Polygonum capitalum* (Polygon.)

Japanese Knotweed

*Rumex sagittatus* (Polygon.)

Turkey Rhubarb

*Setaria palmifolia* (Po.)

Palm Grass

*Sida rhomifolia* (Malv.)

Paddy's Lucerne

*Tradescantia albiflora* (Commelin.)

Wandering Jew

*Tropaeolum majus* (Tropael.)

Nasturtium

## LAYER TWO

*Cinnamomum camphora* (Laur.)

Camphor Laurel

*Fatsia lizei* (Arali.)*Lantana camara* (Verben.)

Lantana

*Ligustrum lucidum* (Ole.)

Large-leaved Privet

*Ligustrum sinense* (Ole.)

Small-leaved Privet

*Ochna atropurpurea* (Ochn.)

Ochna

*Rhapheolepis indica* (Ros.)*Rhus succedanea* (Anacardi.)

Rhus

*Senecio petasitis* (Aster.)

Large-leaved Senecio

*Solanum mauritianum* (Solan.)

Wild Tobacco

Vines*Anredera cordifolia* (Basell.)

Madeira Vine

*Araujia hortorum* (Asclepiad.)

Moth Plant

*Asparagus setaceus* (Lili.)

Climbing Asparagus

*Cardiospermum grandiflorum* (Sapind.)

Balloon Vine

*Ficus pumila* (Mor.)

Climbing Fig

*Hedera helix* (Arali.)

Ivy

*Ipomoea indica* (Convolvul.)

Morning Glory

*Lonicera japonica* (Caprifoli.)

Japanese Honeysuckle

*Parthancissus quinquefolia* (Vit.)

Virginia Creeper

*Passiflora edulis* (Passiflor.)

Passionfruit

## REFERENCES

- Aston D. H. and Frankenberg J. (1976) Ecological Studies of *Acmena smithii* (Poir.) Merrill and Perry with special reference to Wilson's Promontory  
Australian Journal of Botany 24, pp453 - 481.
- Bradley J. (1971) Bush Regeneration Mosman Parklands and Ashton Park Association
- Buchanan R. (1983) Municipality of Ku-ring-gai Bushland Management Survey. volume 1. Results and discussion.
- Forestry Commission of N.S.W. (1966) Technical Paper No.11  
Major Plantation Species of New South Wales.
- Gleadow R. M. (1980) The Ecology of the Invasion of *Pittosporum undulatum* into Eucalyptus Forests in South-Central Victoria.  
Honours Thesis, University of Melbourne.
- National Trust of Australia (N.S.W.) no date  
The Bradley Method of Bush Regeneration
- Spect R.L. and Brouwer Y.M. (1975) Seasonal Shoot Growth of Eucalyptus Species in the Brisbane Area of Queensland (with notes on shoot growth and litter fall in other areas of Australia)  
Australian Journal of Botany vol. 23, pp 459 - 474.
- Walters, G.A. (1973) Growth of *Saligna Eucalyptus* - a spacing study after 10 years  
Journal of Forestry 71 (6) pp346 - 348.

## ADDITIONAL READING

- Buchanan R. Common weeds of Sydney Bushland  
Inkata Press 1981
- Dept. of Agriculture N.S.W. Agfacts  
Caring for Australian Bushland in Urban Areas  
Adamson D., Monaghan N. M., Smith L. W.



This report was typed and reproduced by Nancy Pallin  
on equipment supplied by  
Paddy Pallin Pty. Ltd.