

## Removal and revegetation of the Boboyan Pine Plantation, Gudgenby

### Gudgenby Bush Regeneration Group

The Gudgenby Bush Regeneration Group or (GBRG) was formed in May 1998 to involve the community in a Park Care Group with the job of rehabilitating 380ha of land that had supported a pine plantation in the southern part of Namadgi National Park, ACT. The Group meets every month on the second Saturday to do weeding, planting trees or general maintenance to improve the environment and habitat for native wildlife. Current membership stands at around 22 and we have between 8 and 12 active members who attend most work parties. Regardless of the weather we always get some work done; only snow or fallen trees across the road prevent the work party from proceeding.

The Boboyan Pine Plantation, a plantation of *Pinus radiata* was established in 1966 in the Gudgenby River valley some 50 km south of Canberra. This area had previously been cleared and used for grazing. The plantation growth rate was very variable and some areas were replanted in 1969. Even so, many trees were of poor quality and of little commercial value. In 1979 the plantation was included into the Gudgenby Nature Reserve and later into Namadgi National Park in 1984. However, a year previously a large bushfire had swept through the plantation causing considerable damage to about half of the pines adding further constraints to the viability of the plantation.

Namadgi National Park is significant for its unique landscapes and cultural values as well as providing a major source of water supply for the city of Canberra. It also contains some areas of relatively undisturbed ecosystems which are of high conservation and social value. In view of the relative closeness of wilderness areas, the 1986 Plan of Management for the Park recommended the removal of the pines and replacement with suitable native trees and shrubs. It was to take several years before the process would commence.

The National Parks Association of the ACT Inc considered that the pines were inappropriate within the National Park and pressed for their early removal. Lobbying over the years for the removal of pines and the rehabilitation of the plantation had been unsuccessful; the response being that when the pines were mature they would be harvested. However, in 1995 the ACT Government made a commitment to harvest or remove the plantation and rehabilitate the site. The felling of the pines commenced in 1997 and by 2005 all had been removed and the whole area seeded or planted to local native species. The area is now known as the Gudgenby Bush Regeneration Area.

Harvesting was planned to take place over three years so that site preparation and revegetation could follow progressively. The plantation was divided into compartments; some areas contained harvestable timber while others were considered non-commercial and were clear-felled. The pine slash in these areas was left on the ground and later burnt to provide an ash bed into which seed could be broadcast.

A quantity of local seed of appropriate species, gathered from within the vicinity was collected by contractors on behalf of the ACT Parks and Conservation Service. Seedlings have been propagated over time for the project by the ACT Government Nursery, Greening Australia, Growing Friends of the Botanic Gardens, Greencorps at the Glendale depot and myself at my property.

### Formation of the group

The first meeting of the Gudgenby Bush Regeneration Group took place on 26<sup>th</sup> May 1998. It was attended by 10 interested people although this number did increase to about 20 members in later

years. Some of those original attendees at that meeting are still members of the group after 13 years. We very much appreciate their dedication and their knowledge of how the project progressed over time.

With the committee formed, the official business of naming the group and setting up the aims were decided.

The specific objectives are:

- To revegetate the Boboyan Pine Plantation to local indigenous species
- To control pine and pine wildlings and, if possible, to eradicate *Pinus radiata* from the Gudgenby Valley
- To retain the existing natural vegetation, particularly along drainage lines and natural forest inclusions
- To advance the recovery of natural shrub and tree cover where possible.

In the winter of 1998 GBRG initiated the first of many work parties. The areas seeded were on the slopes west of Hospital Creek and the slope on the western side of Bogong creek. Seeds were broadcast and seedlings planted from July to early November of that year. Species sown consisted of *Acacia dealbata*, *A. rubida*, *A. melanoxylon*, *Eucalyptus rubida*, *E. dives* and *E. pauciflora*. Seedlings of *E. stellulata* were planted along Hospital Creek. As summer approached, the job of tackling pine wildlings and weeds (mainly blackberries and briars) commenced.

The first work party in 1999 was held at Greening Australia in Aranda where group members were shown how to prepare pots and sow seeds to produce seedlings for planting in the following year. About 1800 forestry tubes containing either eucalypts or acacia seeds were set up.

In the winter of 2000, Monique Allan a local gymnast sponsored an Olympic Landcare project near the Yankee Hat carpark. With the assistance of GBRG, 2000 trees were planted. This project was fenced to protect the young seedlings from kangaroos and rabbits.

Seeding and planting took place during 2000 near Frank and Jacks Hut. In 2001, more planting and broadcasting occurred east of Bogong Creek and along the Old Boboyan Road which had become open and grassy after the fires in 1983. As always in the warmer months, weeding kept everyone busy. Occasionally, volunteers from other conservation groups would join us for the day.

The last of the pines were finally felled in winter 2004 and the pine slash was burnt in April the following year. In August 2005 seeding by GBRG, Park Service personnel and contractors completed the task of sowing the bare areas.

Most of the growth has occurred adjacent to the burnt pine logs. Although some seedlings can be found in grassy or bare areas between the slash, they are much smaller than those that have grown directly in the ash beds. Once this regeneration pattern was observed, members targeted the logs by broadcasting seed mixed with sand onto the ash and bare soil directly adjacent to the logs. Eventually the pine logs break down completely but provide a moister, sheltered environment and protection from frost inhibition for the emerging seedlings. While this gives a clumped distribution, it provides an improved germination rate and increased chance of survival.

Ranger Steve Welch, who was the first of many rangers to guide this project, suggested at one of the early committee meetings that names should be given to the pine compartments rather than use the then current system of numbers. Although there was some interest at that meeting it was not until later that colloquial names were given to points of interest within the plantation so that members

would be able to identify specific areas. Generally these names have acknowledged persons who have been involved with GBRG and have contributed so much to the program. Steve Welch, Eleanor Stodart, Syd Comfort, Virginia Logan, Amanda Carey and Ann Connolly will always be remembered for their enthusiasm and ultimate goal of seeing the last remaining pine removed. Sadly both Eleanor and Amanda did not live to see that happen. Eleanor passed away in October 2003 and Amanda in November 2005. In May 2004, a tree planting ceremony was held in memory of Eleanor. A grove of Black Sallies (Eleanor's favorite tree) was planted on the banks of Hospital Creek. Due to the drought we had to return to the site later and re-plant.

Let me explain the origin of some of our place names:

Car Key Corner –members were broadcasting seed here through a succession of snow showers in August 1999 when Eleanor lost her car keys – her carload had to get lifts home and her son had to drive her out next day (with spare keys!) to collect the car.

Connolly's Crossing – Ann Connolly was Project Manager when preparations were being made for felling to start, and she was very thorough in trying to ensure that everything was done according to best practice. She even insisted that rocks should be placed in the pipe for this new crossing over Bogong Creek, so that fish would have rest stations when swimming through the pipe.

Syd's Blackberry Patch – Syd Comfort found the first blackberry seedlings here in 2000. He worked assiduously to remove them and again in 2001

Virginia's Drop Down – Virginia Logan was Manager of Namadgi National Park when the regeneration project began. She told how, on her first visit to the site, she drove straight down this very steep hill before realising it was there. She emerged the right way up, but this section of track has now been closed and planted.

Croajingalong Slope is named for the scout group who worked there with Steve Welsh.

Black Dingo Corner is named for the black dingo which came up from Bogong Creek to check us out when we were having lunch at the corner.

Clive's Rough Edge – named in recognition of Clive Hurlstone's contribution to the group and particularly for his wish to remove the straight line of trees we were planting on Croajingalong Slope.

### **Monitoring program**

In addition to the rehabilitation work, a monitoring program was established to record growth rates and to determine what methods worked best so that techniques could be modified to suit appropriate local conditions. The Gudgenby valley experiences over 100 frost days and snow also occurs on about 10 days of the year. Rainfall is about 780mm a year but obviously during the past few years, there has been considerable variation due to drought conditions. In this environment, the climate has a major bearing on the growth of vegetation and on this rehabilitation project.

In May 2007 we decided to put a rain gauge in the 2000 Landcare enclosure to record rainfall. For the 6 months between May and October we had 227ml of rain. In November we were horrified to see that someone had stolen our rain gauge! This was replaced to a secret location in early January of 2008 and for that year we 521ml of rain. 561ml of rain fell in 2009 and for 2010 rainfall was 990ml. The drought had certainly broken.

An NHT grant in 2000 enabled the group to set up eleven 400m<sup>2</sup> netted exclosures in the Hospital Creek compartment so that grazing and browsing by native mammals could be monitored as well as providing a potential seed source for that area. In addition to the 11 netted exclosures, an ANU honours student Chris Webb used different types of wire fences enclosing plots and unfenced plots to carry out research into the effects of browsing damage by macropods and rabbits and offered recommendations on how this might be controlled.

In October 2006, a survey of some of these exclosures was conducted by a group of Goulburn TAFE students enrolled in the Conservation and Land Management course.

The aim of the survey was to;

- 1) Provide a species list of the vegetation present in and outside each of the exclosures surveyed
- 2) To compare species present inside the exclosure and outside the exclosure, and
- 3) To assess what impact grazing animals had on the vegetation outside the exclosures.

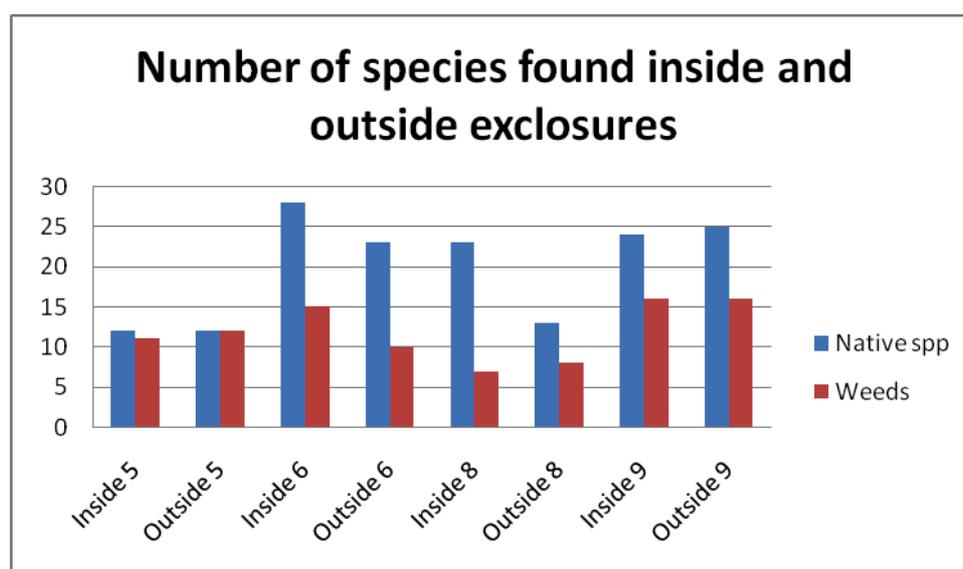
Due to time limits, only four exclosures located in Hospital Creek were chosen by the group to survey. All of the exclosures (except one used as a control) were planted in May 2000 with a mixture of acacias and eucalypts. Approximately twenty seedlings were placed in each one. Some exclosures were provided with leaf litter from nearby woodland to see if this provided a greater diversity by introducing propagules. Only one exclosure was left untreated and unplanted as a control.

All the vegetation species present in the exclosures was recorded. A quadrat outside each exclosure of the same size (20m x 20m) was pegged out and similarly surveyed. This “outside exclosure” quadrat was chosen randomly to provide a comparative analysis with respect to grazing pressures.

### Results:

Of the eight quadrats (4 exclosures and 4 “outside exclosures”) surveyed a total of 94 plant species were recorded. Of the 94, there were 58 native species and 28 exotic species, with the remaining 8 plants identified to genus level only.

The following graph illustrates vegetation recorded in the exclosures:



### Exclosure 5

Exclosure 5 was the control and had received no treatment. There were far less species present than other exclosures in the survey. Establishment of grasses (both native and exotic) is apparent and these appear to have outcompeted other herbaceous species.

### Exclosure 6

Exclosure 6 was the most species rich with 45 species found. The amount of bare soil was less than 5%, and estimated weed coverage was 30%. Twenty four acacias and 5 eucalypts were also present providing a canopy cover for understorey species. Outside the exclosure, 20 trees (mostly *E. pauciflora*) were also present.

### Exclosure 8

Exclosure 8 was planted in May 2000 and was spread with leaf litter in 2002. The number of species present was 30 with 23 natives and 7 weed species. However, weed cover inside was 50%, compared with outside of 45%. Trees outside the exclosure were fewer, but health and growth rates were better than inside

### Exclosure 9

Exclosure 9 had 44 species present with 24 natives and 16 weed species. Bare soil amounted to 40% with weed coverage only 20%. Inside the exclosure 2 *E. rubida* and 2 *E. dives* were present with a *Cassinia*. The 6 eucalypts found outside the exclosure were also well established. The area surrounding this exclosure had been heavily grazed with rabbit, fox and kangaroo scats identified.

Grazing of rabbits, wombats and kangaroos was evident outside the exclosures from both scats and the height of grasses and herbaceous plants. However the difference between the numbers of tree and herb species in and out of the exclosures was only minimal. Snow Gums (*Eucalyptus pauciflora*) were the most common trees (39) found in the study area followed by Candlebark Gum (*E. rubida*). Both species are frost and snow hardy.

From the 8 quadrats surveyed there were 9 herbaceous species of the 94 that were only found **within** exclosures. These were: Billy Buttons (*Craspedia variabilis*), Matted Bossiaea (*Bossiaea busifolia*), Common Stock's Bill (*Erodium crinitum*), Spiny-headed Matrush (*Lomandra longifolia*), Hairy Panic (*Panicum effusum*), Rock Tussock (*Poa saxicola*), Poa Tussock (*Poa sieberiana*), Kangaroo Grass (*Themeda Australis*), and Bedstraw (*Galium ciliari*).

The exclosures appear to provide some protection from grazing and browsing by fauna. However, drought conditions have had a negative effect on regeneration and survival of many native species. A survey after all this rain may provide a better overview as there may be more regeneration from soil seed sources. Competition from weeds is apparent. However, once trees are established they appear to provide resources and shade necessary for native herbaceous plants to germinate and grow, as the soil has been severely disturbed by previous practices used in management of the pine plantation.

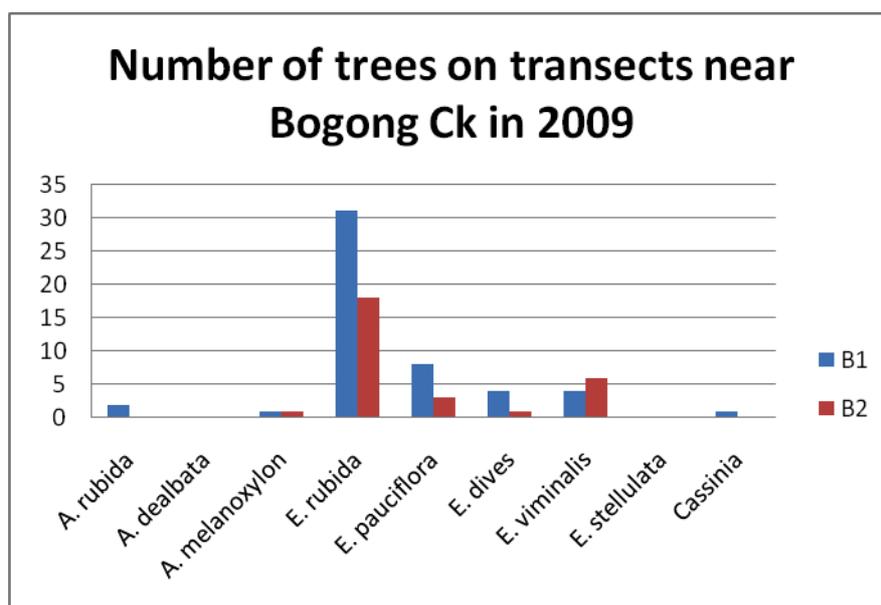
### Transects

In addition to the exclosures, eleven transects were also set up to monitor germination and growth. Two in the Bogong Creek area, two near Frank and Jack's Hut, four on the slopes above Hospital Creek, and three on the Old Boboyan Road. Each transect is fifty metres long with markers at each end. Seedlings, trees or shrubs up to two metres either side of the transect are counted thus making a transect area of 200m<sup>2</sup>.

Both Bogong Creek and Hospital Creek have 7 years of data. As stated previously, the species used either as seedlings or seeds are *Acacia rubida*, *A. dealbata*, *A. melanoxylon*, *Eucalyptus rubida*, *E. pauciflora*, *E. dives*, *E. viminalis*, *E. stellulata* and *Banksia marginata*. Not all of these species have necessarily been sown at every location in the regeneration program so not all transects contain the same trees. Obviously some species have been sown to reflect the aspect of the site and type of landform element.

### Data from Bogong Creek

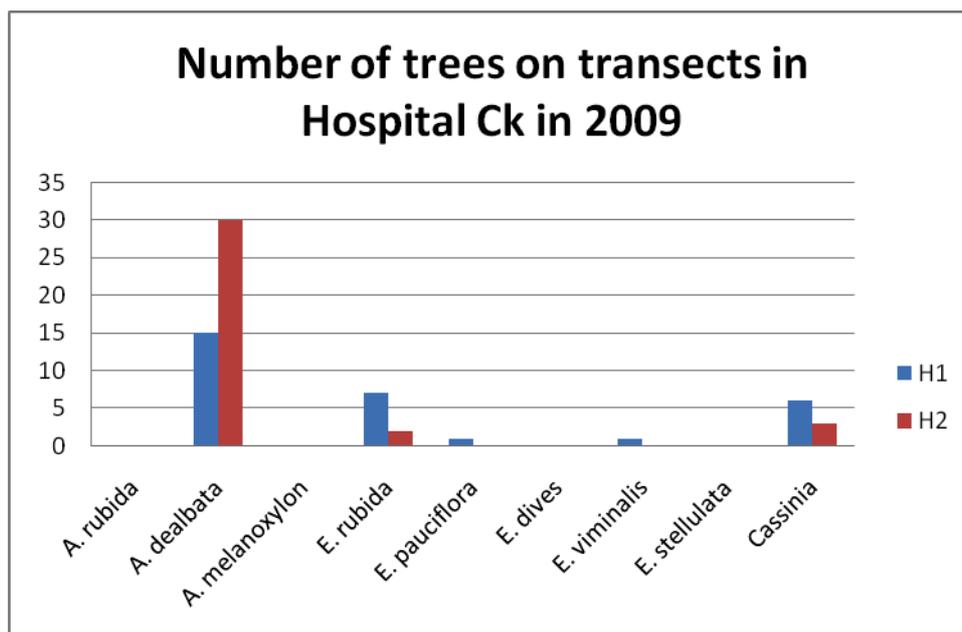
Transect data of B1 and B2 has been collected from 1999 to 2009. The amount of bare earth present on the transect fluctuated from 50% in the early years to improved ground cover later and in 2009 there was 10-15% of bare earth.



Germination rates were very variable. Five species of Eucalypts were represented in the first count in 1999 but only one species of Acacia was found. However, data collected in 2009 indicates that while there were fewer trees many had grown to be over one metre and 10 eucalypts over 4 metres in height. The two *A. dealbata* identified in 1999 did not survive, but two *A. rubida* and one *A. melanoxylon* were present in 2009. At the last data collection in 2009, *E. rubida* is the most common eucalypt and is represented on the transects by over 49 trees with a height range from under 300 mm to over 4 metres. Few of the acacia species appear to have persisted.

### Data from Hospital Creek

Data has been collected from transects H1 and H2 over several years with only early germination rates recorded in the other two transects. Acacias were not used in the initial sowing but were spread separately about 3 months later. Germination rates were poor in the early years, although *E. rubida* grew well in H4. Recent examination of the transects in Hospital Creek indicate that the Acacias have grown well and dominate the tree cover, with *E. rubida* the most frequent eucalypt. The area is well established and is successfully revegetating the upper part of the slopes.



### Evaluation of the regeneration growth

A good example of what can be achieved is demonstrated by the regeneration on the slopes of Hospital Creek and to the west of Bogong Creek. A variety of shrubs and trees have grown between 5-8 metres in height providing a good environment for understorey species to develop. These were the earlier plantings but have shown that even through drought some good growth has occurred.

We have found that the eucalypts have germinated much better than the acacias. Reasons for this may be due to a variety of variables. As a general rule, acacias would be expected to be the pioneer species and provide a more equitable environment for later species. They are often colonizers of soil that has been disturbed or germinate after fire. Acacias, once established, benefit soil by fixing nitrogen and binding erosion susceptible soils. Chris Webb's honours thesis concluded that browsing by macropods can cause significant damage and is a major threat to the regeneration project (Webb, 2001). Acacia seedlings suffered the most damage in his study while *E. rubida* seedlings were not significantly affected by browsing. Among the four species of seedlings used in his study, *A. melanoxylon* was the species most severely damaged, followed by *A. dealbata*, *A. rubida* and *E. rubida*. This may indicate why fewer acacias have been found in the transects. *Eucalyptus rubida* has provided the better germination rates overall, followed by *E. pauciflora*. From the records, *E. stellulata* has only been planted as seedlings or sown in specific sites where conditions favour its growth.

So what have we learned?

- Seeds, mixed proportionally with sand, and scattered soon after the pine trash was burnt produced the best germination results.
- Seeding near pine logs offered protection for young seedlings.
- When sowing in more open areas, light surface cultivation of the soil is generally sufficient to allow germination to take place.

- Planting seedlings in rip lines does not necessarily provide for good coverage. While this method has worked in some parts of the regeneration site, in other parts many seedlings died due to lack of water. Low survival rates, soil erosion and line scars and lack of follow-up watering for seedlings have resulted in poor regeneration.
- Grazing and browsing by kangaroos, wallabies and rabbits is a major problem. Young seedlings frequently show signs of grazing and physical damage.
- Spraying and weeding of blackberries in particular is a vital part of the program as they have the potential to out-compete young eucalypts and acacias.

Some parts have required in-fill seeding when growth has been patchy. Amanda slope, for example, has been broadcast with seeds on several occasions but it is an exposed, steep slope with a northerly aspect and, combined with drought conditions has proved a difficult site to revegetate. However, it now has a good cover of trees.

Possibilities for lack of germination may be due to the proportion in the seeding mixture, subsequent drought, poor scarification of the seed or insufficient cultivation of the soil at the time of sowing. Overall, regeneration has been mostly successful and is encouraging birds and wildlife to return. Rain in spring provides a show of flowers, although most trees have not yet reached the stage of producing flowers.

### **Activities**

In July 2008, GBRG celebrated its 10<sup>th</sup> Anniversary. We had a morning tea party at the Forestry Hut, just inside the gate of the Yankee Hat Carpark. Some former members joined in our festivities and were amazed at the progress of tree growth despite the drought. In the afternoon we planted 20 banksias in Hospital Creek to commemorate the occasion.

On our December workparty we always celebrate the season by having a bring-a-plate lunch – often at Frank and Jack’s hut. We always enjoy these occasions and extra people always attend. Not everyone is able to make that monthly commitment so it is good to catch up at least once a year. In the afternoon we usually take a walk to view the regrowth and regeneration. It is important that we are able to see that the work we have engaged in over the years is coming to fruition.

So what are we doing now the pines have been removed?

The spring and summer months are always dedicated to weeding. At first we only targeted blackberries and briars but we now include St John’s Wort, Nodding thistle, Patersons curse and others. Winter tasks have included removing barbed wire and some fences from the interior compartments. These fences are no longer necessary since the removal of the pine plantation and constitute a real danger to the local fauna. We have learned that while barbed wire is not a friendly medium to work with, there is enormous satisfaction in seeing it bundled up at the side of the road waiting for collection.

We are always looking for pine wildings as, even after all this time, some have escaped our attention. Removing pines from Bogong Creek was a big task using hand saws. However, the satisfaction of seeing them felled is reward enough. Other trees such as willows and apple are also removed as we discover them.

Erosion of former tracks has also proved a problem, especially on steep sites. Using sand filled bags and planting out trees, we have been able to stabilize some areas although there are still more tracks we need to repair.

Another project we have undertaken is the investigation into whether peat is present in the Hospital Creek Swamp and whether the swamp could be rehabilitated. Under the guidance of rangers, we used a manual peat corer to examine the soil composition. Three holes were sunk, the deepest being 1.44 metres. At 90cm this hole looked promising as the core looked peaty but at 1.0 metre it was clay again and so it stayed for the rest of the core sample. We were disappointed with the result, which indicates the swamp may not contain peat, but we will take samples in other areas.

The depths may not seem great but coring into clay was no easy task for the hardworking corer brigade. However, given the muddy conditions, it was a great deal of fun for onlookers. One member sat on the peat corer while 2 other members pulled the handle around. The major lesson learnt was that we should have had a normal soil corer as well as a peat corer on the day.

We are always interested in the local wildlife and the rangers continue to amaze us with what they discover on their patrols. We have been shown a bower birds nest, ( blue toothbrush in centre, blue biro and paper in background) a wasps nest (which we dug up after fumigation), lizards, snakes and other mammals, all of which help us to realize how good it is to know that the new habitat is encouraging native species of birds and animals to return after the relatively sterile environment of the pine plantation.

### **Future goals**

The Group recognizes that even though the pine plantation has been removed, there is still work to do. We are entering a different phase of the project and we need to set some new goals.

Most group members feel a strong attachment to the area and would like to continue to hold monthly workparties in the vicinity rather than wind down completely. We have broadened our horizons a little and of the 11 workparties held each year, 3 will be held outside the regeneration area in the broader Gudgenby Valley. This may involve rehabilitation work along the Gudgenby River, around the Gudgenby Cottage or along the approaches to the carpark.

Other tasks may involve the collection of seed and propagation of understorey species for planting in areas where they could be watered during establishment. Further data collection on the transects and a quantitative study of the exclosures would provide data for analysis so that a more scientific evaluation could be reported. We would also like to provide future revegetation groups with some ideas on how to obtain the best results based on our experience.

In conclusion, I would like to acknowledge rangers Steve Welsh, Ann Connelly, Amanda Carey, Daren Roso, Bernard Morris, Dave Whitfield, Ollie Orgill and Louisa Roberts who have guided the project over the years, passed on their skills and helped out whenever they could. Eleanor Stodart, Clive Hurlstone, and Michael Goonrey have contributed in their roles of president, with Syd Comfort, John Waldren and Chesley Ingram as treasurer of the Group. Martin Chalk has collected and monitored water data for the past 8 years and also been a member of the committee. Without the enormous amount of work that went on behind the scenes to get the project started and without the consistent efforts and commitment by so many people over the years, this project would never have succeeded. Thanks should also be given to the regular members whose tireless efforts have made a very great difference to the landscape.