



## CLIEDEN CAVES REVEGETATION PROJECT

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(This paper replaces that listed in the program as *Rehabilitation of Cliefden Caves* by Peter Dykes)

### Background

Tree planting was the prompt for this project. Over the past decade, about eight separate plantings of trees (about 200 per site) have occurred on *Boonderoo* property, which is known to cavers as *Cliefden*, after the original property in the district. Several of these plantings have been done by members of member clubs of the NSW Speleological Council in co-operation with the owner of *Boonderoo*, Anthony Dunhill. However, none of them has been done with a specifically karst related outcome in mind.

Also in recent years, members of both the Federation and the Speleo Council have expressed the desire to obtain funding for cave and karst related activities, without the need to dip into their own pockets. Peter Dykes, Convenor of the Speleo Council's *Cave Numbering and Documentation Committee*, has long had an interest in obtaining grant funding to assist in the documentation of karst in NSW.

In 1995, the Speleo Council established a *Heritage Grants Committee*, convened by Chris Dunne, to pursue such applications. A proposal to seek a *Heritage Grant* from the NSW Heritage Council in 1995-96 was not pursued as, at that time, another organisation had already obtained a grant for a *Study of Carbonate Rocks in NSW*. Subsequently, the Heritage Grants scheme ceased and our applications have been directed to two newer schemes: the NSW Government's *Environmental Trusts* (ET) and the Commonwealth government's *Natural Heritage Trust* (NHT). These schemes have a strong focus on projects with environmental and vegetation outcomes.

In 1997 and 1998 we lodged ten applications under these schemes, eight with an emphasis on karst related vegetation. Projects mooted in these applications are seen as a means to piggy-back work on the wider documentation of karst areas. Two of our applications have been approved. For Cliefden, we were granted an amount of \$5,000 in early 1998.

### The Cliefden Context

This grant from the Environmental Trusts' *Rehabilitation and Restoration Trust* was to assist in the fencing out and revegetation of a significant karst outcrop at Cliefden, known as *The Island*. Cliefden Caves is an especially significant karst in the valley of the Belubula River, a tributary of the Lachlan River in the Murray-Darling Basin, in the Central West of NSW.

It covers parts of five adjoining pastoral properties, the main one being *Boonderoo* mentioned above. Cliefden lies within the Lachlan Karst Region for purposes of karst documentation and is formed in Ordovician limestone.

The limestone along the Belubula River was first reported by Surveyor George Evans in 1813. Although his visit coincided with a drought, he described the tree cover in the vicinity as *park-like* (ie. scattered woodland). The district was settled from the 1820s, with grazing of sheep, cattle, horse and goats being the main land use since that time.



During the late 1800s, the caves at Cliefden were a popular destination for the more adventurous in the region. As a result, some caves suffered severe impacts. In the 1950s, the area became popular with speleological groups. To alleviate problems between visiting groups, the then property owner Bruce Dunhill (Anthony's father) asked Orange Speleo Society (OSS) to instigate a system to control cavers and their access to the caves. This control evolved into the present system of permits and gated caves which has succeeded both in protecting the caves and in promoting good relations with all five property owners at Cliefden.

Grazing pressure and other human activity over 175 years have had profound impacts on the endemic flora of the region, especially the karst specific species and communities at Cliefden, which remain poorly conserved. A study undertaken in 1995 [ ? ] for the Walli Limestone Landcare Group by Professor David Goldney and students from Charles Sturt University, in Bathurst, looked at different flora communities within the area. Whilst several species could be found in different communities, the study found there existed a karst specific community.

Fortunately, there are several small but significant remnant vegetation sites at Cliefden. These occur where the karst is steep and rugged so that they have been inaccessible to stock. The only other reasonably intact, karst specific flora communities in this region are thought to be those at Borenore Caves and a smaller site on a reserve adjoining the limestone quarry at Molong. However, these are both many kilometres to the north of Cliefden, and the species which make up those communities are somewhat different.

In consultation with owner Anthony Dunhill, the karst outcrop known as *The Island*, an area of about 15 hectares, was selected as a project site. It is significant within the Cliefden karst, and distinctive in that it is bounded on one side by the Belubula River and on three other sides by an alluvial flood plain. It is plainly a cutoff spur from a former river meander.

*Island Cave* is located at the foot of a steep bluff in the southwest corner of the outcrop and has four entrances. The cave is usually very dry and dusty, but becomes *active* following major rain events. There are several minor caves and karst features in the outcrop.

The existing vegetation consists of several kurrajongs and acacias in the southwest of the outcrop, native groundcovers and ferns amongst the rocky sites, and is otherwise dominated by briar, thistles and other introduced weed and grasses.

The outcrop was formerly fenced around, however, only 750 metres of this fence remains in good condition. A further 750 metres was in derelict condition and partially buried as a result of soil erosion from the slopes above.

### *Project Description*

The aim of the *Cliefden Caves Vegetation Restoration and Rehabilitation Project* is to remove grazing stock from *The Island* and revegetate with locally endemic, karst specific species, thus recreating as closely as possible the natural plant community. The team co-ordinating the project comprises: Chris Dunne, Peter Dykes, Bruce Howlett and Denis Marsh.

The grant application included a budget of \$10,000 for the project. The *Environmental Trusts* contribution of \$5,000 was to finance the purchase of fencing materials, the collection and propagation of seeds, and for tubes, stakes and tree guards to enable planting out.



The remaining \$5,000 identified in the budget mainly covers *in kind* contribution of labour by members of Speleo Council member societies for the removal of derelict fencing, erection of new fencing, collection and propagation of seed, and the planting of seedlings, together with the property owner's *in kind* contribution of labour and the use of machinery, etc.

The initial phase of the project was removal of the derelict fencing, which was achieved by two one-day work trips, mostly by members from OSS. Although new fence-posts were placed, heavy rain during the Spring and the subsequent planting of a lucerne crop on the adjoining paddock over Summer made site access difficult. Consequently it was not possible to string wire and complete fencing during 1998. A joint trip by member clubs is planned for early February 1999 to complete this task.

Meanwhile, building on the earlier work of Goldney et al., Peter Dykes, who is a specialist in vegetation ecology, has carried out additional work to develop a *vegetation model* as a guide to our intended planting, ie. what species to place where, numbers and ratios of species, etc.

In this study, it was observed that natural community consists of scattered White Box and Kurrajong on the limestone itself, some Yellow Box on the margins and on the alluvium, and also occasional Cyprus Pine elsewhere on the karst. However, the major component of the karst specific community is the shrubs. Hop Bush (*Dodoneae*) and Quondong (*Santalum*) dominate. One species of *Acacia* is only found on *The Island*. Other species include: *Clematis*, *Indigofera*, *Westringia*, *Cassia*, *Eremophilla* and *Hardenbergia* (some species of which are locally and regionally rare).

OSS member Greg Lee, who has a background in horticulture, has made several visits to identify and collect suitable seed, which he is now propagating off site. Ultimately, it may be necessary to augment this with the purchase of some local nursery stock - there are two local nurseries within 15 kilometres of Cliefden.

The final phase of the work will be the planting of seedlings in Autumn 1999. This will again involve member clubs of the Speleo Council. Although this will mark the formal conclusion of the project in terms of the grant, it is expected that additional plantings will be carried out over several years. By this time we anticipate that earlier plantings will be regenerating naturally.

### *Project Outcomes*

Although not mentioned in our grant application, the impetus for the project was that this was not to be just another tree planting exercise. This would be an attempt to recreate a natural ecosystem by reintroducing and protecting a poorly conserved, karst specific, flora community.

By revegetating in this manner, it is intended to recreate several natural processes, which may all interact and are not mutually exclusive:

- The increase in canopy and litter cover will reduce erosion and soil desiccation (ie. drying out), leading to an increase in soil moisture retention, and an increase in the amount and quality of water infiltrating the limestone.
- The increase in the amount of organic matter in the soil will enhance the CO<sub>2</sub> cycle so important to karst processes.



- The exclusion of stock will reduce (and even reverse) soil compaction, which, together with improved soil structure from increased organic matter in the soil, may reopen former infiltration channels into the karst.

If these processes can be successfully recreated, then it may be inferred that there will be positive effects flowing through to any underlying caves, such as rejuvenation of speleothems and the like. To this end, a monitoring program within *Island Cave* will assess likely effects over time.

Finally, Walli Limestone Landcare Group will be invited to inspect the site giving us the opportunity to raise its member's awareness of karst vegetation issues and the unique attributes of the karst environment.

### *Wider Sphere*

Our 1998 application to the Commonwealth government's *Natural Heritage Trust* (NHT) included the Cliefden project as a state government funded component of a larger karst vegetation and documentation project across the Lachlan Karst Region. *The Island* at Cliefden would have been highlighted as a *Demonstration Site* within the region to show the benefits and practicalities of restoring the natural karst specific ecosystem.

Our NHT application for the Lachlan Region and a similar one for the Blue Mountains Karst Region were unsuccessful.

However, our application for the Macquarie Region, well to the north of Cliefden, has recently won us a grant of \$27,330. A *Demonstration Site* at Bakers Swamp in that region will be given similar treatment to the Cliefden site.

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### Acknowledgments:

- Anthony Dunhill and his family have made us welcome at Cliefden over many years and Anthony has been behind all eight plantings conducted on his property.
- OSS has staged some of these, particularly those near the cavers' hut.
- Chris Dunne, inspired by the two earliest plantings by *Men of the Trees*, initiated two of the major tree plantings (500 trees) which sparked the Cliefden project.
- Peter Dykes deserves credit for his conceptualisation of our several project grant applications and congratulations on our winning the two grants obtained.
- Peter's push and Chris's fine tuning of the applications and support also deserve credit, as do the contributions of several others.

