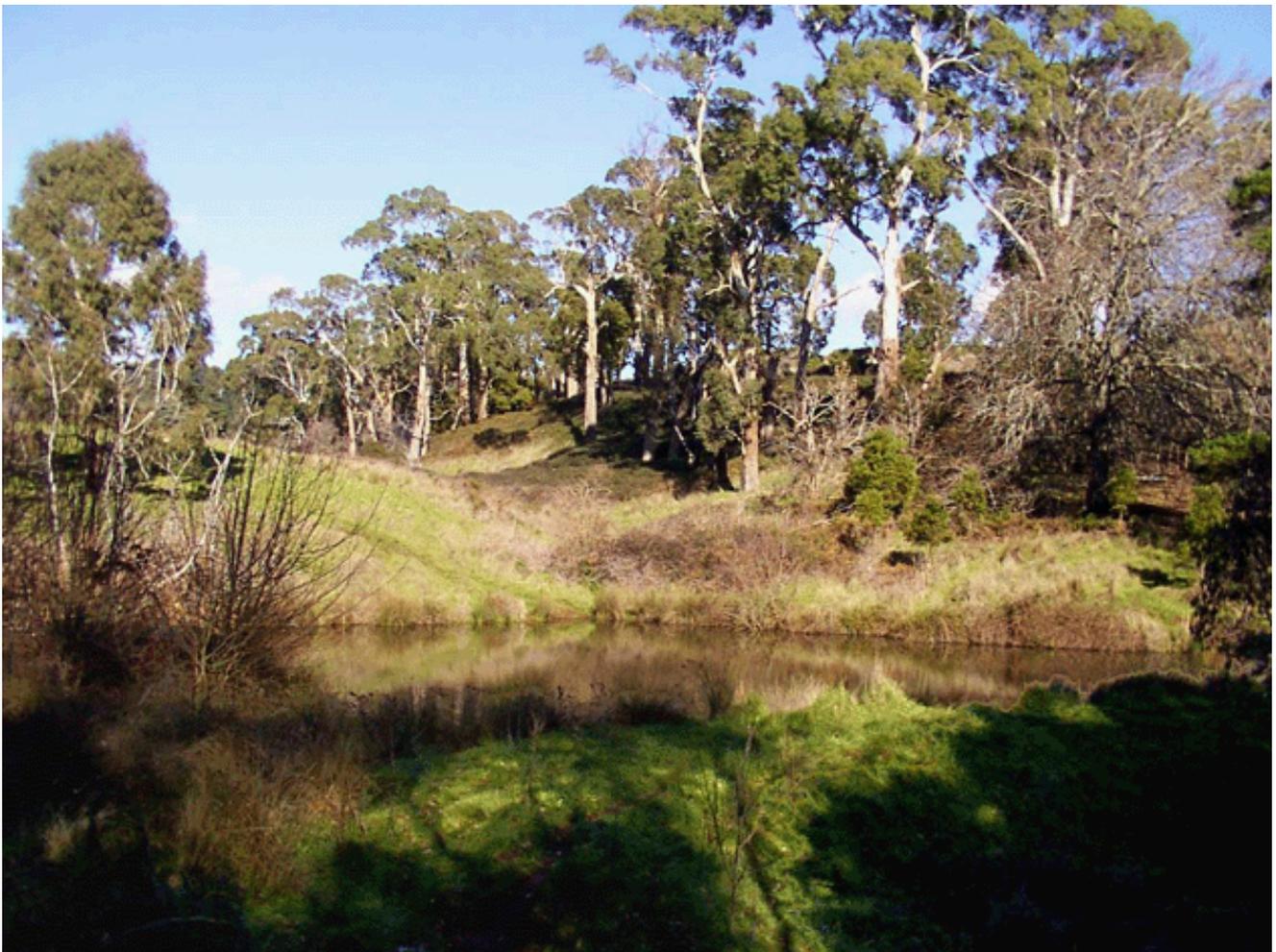


UPPER SPRING CREEK RESTORATION PROJECT MANAGEMENT PLAN

Report to Daylesford Regional Landcare Group

July 2001



View south over spring fed dam in "parkland" paddock Wombat Park with mature deciduous Turkey Oak and remnant Manna gum open forest on steep escarpment below Daylesford Secondary College

HOLMGREN DESIGN SERVICES
the source of permaculture vision and innovation



16 Fourteenth Street, Hepburn, Victoria, 3461
Phone/Fax 03 53483636
Email: holmgren@netconnect.com.au
Website: www.spacountry.net.au/holmgren

TABLE OF CONTENTS

EXECUTIVE SUMMARY	page1
BACKGROUND	page2
SITE ASSESSMENT	page3
• Planning controls and land tenure	
• Hydrology	
• Vegetation	
• Wildlife Values	
STRATEGIC ISSUES	page11
• Water quantity and quality	
• Fire hazard	
• Native flora and fauna conservation.	
• Heritage values	
• Community access, amenity and education	
• Productive land use opportunities	
• Strategic overview of revegetation	
MANAGEMENT AND REVEGETATION ZONES	page 19
• Upper Boundary Line	
• School Paddocks	
• Wombat Park Manna gum escarpment	
• Wombat Park Dam and Springs	
• Cape Broom Gully (Spring Ck Reserve)	
PLANS	page 25
• Locality Plan	
• Landuse (Airphoto)	
• Planning Zones	



EXECUTIVE SUMMARY

Despite the perception of the creek as being highly degraded by weeds the project area has diverse and high environmental values.

The absence of a public stream reserve in the upper section emphasises the importance of management by private landowners.

The project area and management decisions by landholders and other stakeholders have the potential to have substantial impact on downstream water quality and flows to Hepburn Reservoir, Hepburn Pool and the Mineral Springs Reserve

The existing vegetation is very varied and includes elements with great biodiversity and heritage values.

The relationship of the site to both St Michael's and Daylesford Secondary College offers significant opportunities in environmental education.

Perceptions about fire hazard are key drivers in current management action although the hazards are less than in some other local gullies.

Well designed and managed mixed plantations of valuable timber trees offer potential to address weed, fire and water quality and other management issues while providing long term increasing values at several sites within the project area.

Alternative weed control techniques including well managed use of goats have potential at some sites.

Six distinct management zones have been identified and recommendations developed for each.

- Upper Boundary Line
- School Paddocks
- Wombat Park Manna gum escarpment
- Wombat Park Dam and springs
- Corridor forest (Wombat Park & Spring Ck Reserve)
- Cape Broom Gully (Spring Ck Reserve)

More detail is given for works in the School Paddocks and Manna Gum Escarpment zones since these are most relevant to Group objectives for the years 2001-2002.

Further consultation with stakeholders and more detailed investigation and design work is needed to deal with the complex issues and opportunities highlighted by this management plan.

A number of recommendations made in the body of the report have implications for Hepburn Shire Council, Central Highlands Water and Dept of Natural Resources & Environment which might be thought outside the scope of a tree planting plan but fully within the scope of the integrated catchment management philosophy which underlies State and Federal Landcare policies and funding.

BACKGROUND

The Daylesford Regional Landcare Group received funding (National Heritage Trust) for the Upper Spring Creek Restoration Project in 2000-2001.

The project site follows one of the major tributary branches of Upper Spring Creek known as Bund Ck. along the east side of Wombat Park Estate from the Midland Hwy to the junction with Spring Ck below the Hepburn Reservoir, a distance of approximately 1.5km.

The locality map shows the project area and its relationship to the Hepburn Reservoir catchment as well as the Hepburn Pool and Mineral Springs Reserve.

Community and stakeholder liaison lead to initial works of weed control, fencing and some tree planting at the head of the drainage system, and also identified the need for further investigation of the management options for the more complex and sensitive parts of the site. This management plan was commissioned to guide works and community education aspects of the project.

Due to time and budget constraints, comprehensive discussions with land and other stakeholders has not been possible before preparing this report but Ian Esmore, in his role as secretary of the Daylesford Regional Landcare Group, has provided extensive briefing based on his management and liaison of the project.

The site was inspected both alone and with adjacent landholder Mrs Isabel McKenzie (Wombat Park).



Planted blackwoods in long grass behind Secondary College with mature gums and Wombat Park parkland paddock in background

SITE ASSESSMENT

An extensive interpretive site assessment is included in this report with accompanying plans and photos to aid understanding of the complex human/nature interactions. These have and continue to shape this important, but little known, part of our local environment.

Planning controls and land tenure

The zoning plan shows that despite the proximity to the town areas zoned for future residential and low density residential development, the majority of the project area is within Rural or Public Reserve Zones.

Two anomalies of the current zoning are

- St Michael's School land directly behind and down to the creek are zoned residential.
- The midland highway corner of the heritage listed parkland paddock of Wombat Park is zoned residential.

Hydrology

The hydrology of this creek is quite unusual in many ways which have substantial implications for management of environmental values.

The upper part of the drainage line from Midland Hwy to the dam on Wombat Park is a shallow drainage depression with deep free draining red volcanic soils. A larger catchment surface including the East street, light industrial and residential precinct is an occasional source of large storm flows but most water within the upper drainage system moves as subsoil flows, discharging at springs on the slopes. (See locality plan)

The dam on the creek within Wombat Park captures two large permanent springs on the slopes to the east in the parkland paddock while contribution from the boundary drainage line is more seasonal. (See Air photo)

The dam marks the start of a more deeply incised stream course with further contribution from mines before leaving the volcanic soils onto clay and shale base just upstream of the Hepburn Reservoir access track crossing. At least two mine tunnels contribute perennial flow in this section. One mine outflow on the west bank next to the crossing is captured at a pit which feeds a 100 mm dia. gravity supply line which runs around the contour to the Hepburn Reservoir. By this system the creek contributed to the catchment of the town water supply. The pipeline is currently broken about half way along allowing this flow to return to the creek course.

There is evidence of an earlier system of water races which not only intercepted the mine water but was also fed by an earth dam now breached higher on the creek. This embankment or bund is possibly the source of the name Bund Creek and appears to be just within the upper extent of the Spring Ck Reserve.



View upstream from Reservoir access track over unfenced section of Spring Creek Reserve close to where pipeline intake from mine tunnel collects water previously directed to Hepburn Reservoir

Below the access track crossing the creek flows in a larger U shaped valley which, like Doctors Gully and others around Hepburn, is a product of erosion to bedrock during the gold rush. The springs and mines feeding the creek within the project area are the major contributors to the summer base flow through Hepburn Pool and Mineral Springs Reserve a further two km downstream.

In addition to these flows, an outlet of another pipeline from Leitches Ck to the East St sawmill dam apparently contributes overflow via another pipe down the project drainage line thus contributing further water to the creek. Sections of this pipeline are visible within Wombat Park and are marked on the Land Use (air photo) Plan



Hepburn Reservoir 45 megalitre capacity on Upper Spring Ck

Hydrologic Links to Mineral Springs

The cessation of flows and loss of gas in the Hepburn Springs early this century was conclusively proven to be caused by interception and dewatering in gold mines along the north south reef lines between the Springs Reserve and the project area.¹ The large area of flat and gently sloping free draining volcanic soils at the head of the creek catchment area sheds very little water. Much of this water emerges in the springs (and mine tunnels) sustaining the stream flow but some may also enter bedrock aquifers where the shallow coverage of volcanic soil over sedimentary bedrock offer ideal conditions for deeper groundwater recharge. Official reports remain vague to say the least on the recharge areas for the mineral water.

Vegetation

The upper section of the shallow drainage line has been agricultural land for a long time. As part of this project the old blackberry covered fence line has been bulldozed and replaced with a new fence.

The boundary plantings of Douglas Firs (*Pseudotsuga menziesii*) form a western border to the Wombat Park estate "parkland" paddock. The estate and in particular the parkland paddock has a very high heritage value possibly rating as the best example of this 19th Century "English estate" landscape in Australia. However the boundary planting of Douglas firs has large gaps from tree deaths and the crowns in the remaining trees are in poor condition, possibly due to the adverse effects of either very wet seasonal conditions (possibly from augmented water flows) and/or adverse effects of fertilisers.

View North from Midland Hwy along new boundary fenceline with old Douglas Firs on Wombat Park



¹ Historical records interpreted by DNRE hydrologist Andrew Shugg.

Below the newly cleared area the drainage line enters Wombat Park. The steep slope of the school hill, about 300 m long and about 1.3 ha in area is covered in forest trees with a dense understory of blackberries. The slope is about 30% but in places is as steep as 60%. The eucalypts are Manna gums (*E. viminalis*) mostly 1 to 1.5 m dia. and 30 to 40 m tall. Most appear healthy although many have large hollows and no doubt rotten centres. Fallen limbs and logs are probably abundant but covered in blackberry. A handful of similar aged Blackwoods (*A. melanoxylon*) are the other notable old remnant native trees. Younger gums are limited to a handful of middle aged trees but blackwood regeneration through the blackberries has resulted in a wide range of ages. The foliage variation on the blackwoods suggests some mixed genetics from planted garden blackwood rather than pure local provenance. Natural regeneration of hawthorn from bird distributed berries has been constant over many decades leading to dense stands around some gums. The combination of hawthorn and blackwood has in places all but shaded out the blackberry.



*Mature Manna Gums
with established
hawthorns and new
blackwood emerging
from blackberries*

Sheep grazing has maintained some open patches of grass but there is little evidence of native *Poa* tussocks which are abundant further down the creek. The gully line itself is almost pure blackberry without any trees.

On the upper slopes of the school hill, plantings (mostly local native species of trees and shrubs about 14 years old) initiated by college teacher, Geoff Park have created a wildlife corridor of canopy vegetation suitable for many native birds from the remnant gum slope to the top of the hill north of the Secondary College. This belt also reduces northerly wind to the school and probably reduces the risk from grass fire although may contribute to fire hazard in a major bushfire.

A more recent plantation of blackwood on the pasture slope to the south of this belt was one result of design proposals made to the school by this consultant in the early 90's. Losses and slow growth rates due to a combination of grass competition and wallaby browsing are evident.

The next section of the creek environment around the dam at the confluence with the major Wombat Park Spring outflows is as complex in its vegetation cover as it is in topography. On the west bank the mature canopies of oaks and elms have created blackberry free ground.



Mature Turkey Oak creating a circle of clear ground with thick blackberries under gums behind

In more open areas mixed blackwood, European ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Oaks (*Quercus* spp) and Elderberry (*Sambucus nigra*) are emerging from bracken, blackberry and pasture and *Poa* tussock patches.

Below the dam as far as the Hepburn Res. access road, the gully is more incised and is covered with a mixed aged mature stand of Manna gums, Peppermints (*E. radiata*) and Blackwoods with a few original planted pines and deciduous trees.

Although the native trees are very large they appear generally younger and healthier than the old gums upstream of the dam. Blackberries form an almost continuous ground cover but are much weaker due to dense canopy than on the slope above the dam. Continuing regeneration of blackwood and deciduous trees, especially sycamore, will see the complete shading out of blackberry in time. A few mature Native Cherries (*Exocarpos cupressiformis*) shade out blackberries in the lower section. To the west of this section of the creek in Comelli's paddock blackberries, gorse and poor pasture grasses form a mosaic.

On the steep east slope running up to the Wombat Park garden and house is a open forest of large gums with an understory dominated by *Poa* tussock, introduced herbaceous and pasture, with minimal blackberry.



Established Peppermints and Blackwood forming dense canopy with weak groundcover of blackberry



Open Gum Forest with Poa tussock ground cover on Wombat Park slope between house and creek

Burning and follow up spraying has removed blackberries which previously covered much of this area but the cost in loss of massive gums with hollows has been significant.

Below the Reservoir crossing the nature of the vegetation changes dramatically reflecting poorer clay/shale soils with a history of continuous burning and grazing since the gold rush on what was part of the "town common". In more recent decades cape broom and blackberry have dominated the stream course while gorse has formed a dense understory under a more stunted regrowth peppermint and manna gum canopy along the banks with an occasional Silver wattle (*A. dealbata*), Native Cherry and *Bursaria spinosa*. The unmanaged remnants of a pine plantation within the water reserve have produced some pine regeneration on the east side while on the upper west side an open area of tall ungrazed grass and broom appears to have no trees.

The last fire two years ago was hot but typical of fuel reduction burns in this type of vegetation. Damage to the base of trees on the slopes resulted in many tree falls and some mature gums were killed by the canopy scorch. Along the creek bed, the odd young blackwood and deciduous tree was killed and a dense almost pure stand of cape broom is now well established with blackberry set to dominate the canopy within a decade.



View upstream over two year old dense cape broom growth in gully with fire damaged gums and peppermints on dry slopes

Wildlife Values

The great diversity of topography, soil type, and vegetation structure combined with abundant water, provides very high wildlife habitat values. Naturally some of those features also provide habitat for less desirable wildlife such as rabbits and foxes.

The old gums with large and high hollows must be regarded as the most valuable habitat in the project area simply because this type of habitat usually only forms in trees over 100 years of age. In addition, the fertility of the soil probably makes the foliage particularly attractive to koalas. Large logs, especially hollow ones, provide additional habitat value. The dense forest areas provide ideal black wallaby habitat and several were noted during the site investigation.

Koalas have been observed in the gums on the open forest slope but not in the trees on the steep slope probably because blackberries currently inhibit access.

A past sighting of a platypus in the spring dam is an indicator of reasonable water quality and habitat and occasional sightings in other parts of the Spring Creek system indicate the capacity of these animals to adapt to stream courses dominated by blackberries and other exotic vegetation.

The abundance of exotic and noxious vegetation should not be regarded as unfavourable to wildlife especially when compared with creeks dominated by agricultural pasture. For example, large hawthorns are the preferred habitat for Ringtail possums to build their nests (probably due to safety from predators), while deciduous tree bark is one of their favoured forages especially in winter/spring. Haws (the berry fruits) are a favourite forage of the relatively uncommon Gang Gang cockatoo. Blackberry and more so gorse are the preferred habitat for many small nesting birds including thornbills and wrens.

Although grazing may be reducing some wildlife values, by maintaining blackberry edges between forest and pasture increases the forage habitat interface for wrens and other small birds and prevent tussock grass habitat being lost to blackberry.

STRATEGIC ISSUES

Water Quantity and Quality

The importance of the quantity and quality of the Hepburn Mineral Springs to our community could hardly be overstated. It is unfortunate that the hydrological science provides no conclusive predictions on the effects of particular land management activities, since the precautionary principle suggests we should not do anything which runs the risk of reducing the flows or quality of the mineral springs.

The Hepburn Reservoir is no longer part of the town water supply system mainly due to persistently high E. coli levels. The springs on Wombat Park which feed the main branch of the reservoir catchment were fenced to exclude stock but the problems persisted. Livestock access to paddock dam and the major spring feeding it in the project area, may have been the sources of contamination. Because the dam is steep sided it is also a likely trap for livestock and wallabies which could die and directly contaminate the water.



Sheep tracks leading to the steep sided dam,

While contributions to town water supply are a future possibility, the quality of creek water flowing downstream to the Hepburn Pool and Springs Reserve is also important. The Hepburn Pool is a local icon of community struggle for common sense against the extreme risk management culture of local and state bureaucracies. The inability to maintain water quality in the pool to a set standard was one of the reasons for the inability of the authorities to approve the pool for swimming.

Given that the pool is used regularly in the summer for this purpose, management of the upper catchment in a state which maintains or enhances water quality in summer seems a sensible objective. The use of the pool by the local community, especially for swimming, is an ideal informal process for raising awareness and monitoring of creek water quality from the upper catchment.

Three major factors determine summer water quality in the pool.

1. Stream flow

A constant gentle flow through reduces algal growth, debris accumulation and flushes any contamination from swimmers or animals. In the past when the Hepburn Reservoir was capturing almost all the base flow for town supply use, swimmers used to open the valves at the Reservoir to add water to the pool. Today flows to the pool have been consistent despite very dry seasons.

2. Sediment erosion

The construction of the sediment dam as part of the original project was critical when the catchment was much more poorly vegetated. The increasing well vegetated state of the catchment in recent decades (especially weeds) has probably resulted in major reductions in sediment flow to the pool but a major clearing of gorse and other noxious weeds at the head of Kidds Gully some years ago resulted in a massive amount of red soil and yellow clay sediment flowing through the pool and all the way to Breakneck Gorge. Increasing urban development without any storm water interception systems threatens to increase sediment loads in the system. While the Pool remains most sensitive to the Kidds Gully catchment, works in the project drainage line, especially earthworks to remove blackberries have the potential to produce sediment flows. Phosphorous rich volcanic soil is probably the most important source of phosphorous which in turn leads to algal blooms including lethal blue green algae. Although there is no record of blue green algae in the Hepburn Pool, minimising red soil sediment flows is clearly much more than an aesthetic issue of reducing muddy water.

Just as important a contributor of episodic sediment is fuel and weed control burning in the lower part of the project area including nutrient rich ash to the pool.

3. Dissolved nutrients and chemical residues

Access of livestock to the drainage line within the project area, use of herbicide especially over water flows and burning of the lower public water course section of the project area would be significant sources of undesirable nutrients and chemical residues to the Pool.



Hepburn Pool on Spring Ck rebuilt and maintained by community labour

These factors affecting quality of water in the Hepburn Pool also affect the amenity of the Hepburn Springs Reserve where a flow of clear water without excessive algal growth is a critical factor in the ambience and amenity of the Park especially given the Argyle Gully branch of the Reserve doesn't maintain summer flows.

Given the complex interactions and effects outlined above any changes in water flows as a result of changes (including repairs to infrastructure and cessation of diversions) by Central Highlands Water or Council should not be done in isolation without considering the impact on the Hepburn Pool and Mineral Springs Reserve and potential stakeholders.

Maintenance and ,if possible ,improvement in downstream creek water quality should be the primary measure of land use and management options within the Project Area.

Fire hazard

The threat of bushfire is a major issue for our community due to the topography and fire prone vegetation surrounding the town. How to deal with the fire hazard issue, especially in the gullies, continues to be a very contentious and at times polarised issue.

While this report cannot review all the complex technical, environmental and social issues involved, it must be recognised that management of the project area has in the recent past been more driven by organisational and landholder perceptions of fire hazard than any other issue.

The pine plantation and native forest area adjacent the project area recently burnt is identified on the wildfire hazard reduction overlay of the local planning scheme. Fuel reduction burning of this area provides protection to the Reservoir access road and Wombat Park house site.

The drainage line vegetation itself represents a relatively minor fire hazard for the following reasons.

- No closely sited houses
- The permanent flows of water maintaining vegetation moisture levels in dry conditions
- The relative decline in mounds of dry blackberry canes due to moist and shaded conditions and increasing canopy of fire retardant deciduous trees.

The steep slope with mature gums below the schools represent a more substantial hazard for the following reasons

- Closer to ungrazed grass paddocks and schools
- Dense accumulation of dry blackberry canes exposed to drying air movement and dry summer soil conditions.

Although threat to human life and property is naturally the main concern, the threat of fire to the values of existing vegetation is particularly important because.

- The remnant old gums are easily destroyed by even small slow moving fires.
- Mature planted exotic trees have considerable heritage value
- The long term slow reduction in fire hazard in dense canopy mixed forest along the middle section of the gully would be radically set back by a hot fire and would damage the canopy, kill young blackwoods and deciduous trees and lead to a renewed cycle of broom and blackberries.

Vehicular access necessary for vegetation and fire management should be planned and constructed as an integral part of works.



Looking across grass and cape broom on west side of Spring Ck to gum peppermint and pine forest on gully slopes in Hepburn Reservoir Reserve

The Landcare Group should encourage its members, DNRE, the CFA and other stakeholders with responsibility for bushfire safety to consider how some of the strategies outlined in this report more compatible with water quality objectives might be used to complement standard fuel reduction burning techniques.

Native Flora and fauna conservation.

While it is natural to assume that planting more native species is the highest priority for improving ecological values, any planting should be in accord with other important values especially catchment and fire hazard. Large scale plantings, especially of dominant canopy eucalypts may not be the best way to improve flora and fauna values.

Many factors in this and similar environments are contributing to an ecological shift to a denser forest vegetation more analogous to rainforest than the open grassy vegetation which characterised the pre European landscape.

- Less frequent fires
- Increased fertility due to farm fertilisers, urban storm water and other factors
- Increased catchment runoff due to clearing, soil changes, urban storm water and other factors
- Presence of vigorous exotic wet forest pioneer species such as blackberry and hawthorn which are widely distributed by native and introduced birds.

Extensive research work by the consultant and local experience in lower Spring Ck in managing these new co-evolving ecosystems suggests the only way that blackberry can be sustainably reduced to a limited component and significantly reduced fire hazard is by dense canopy shade from deciduous trees.

However, a more limited range of local regional native species is ecologically well suited to these environments and should be the focus for any attempts to increase the diversity of native vegetation in the project area. Unfortunately, virtually all the suitable species are highly palatable to wild and grazing animals and often require a higher standard of protection than eucalypts.

Suitable native species include

- Blackwood
- Native Cherry
- Silver wattle (pioneer planting in open areas)
- Musk Daisy bush (*Olearia agrophylla*)
- Tree Violet (*Hymenanthera dentata*)
- Prickly Currant Bush (*Coprosma quadrifida*)
- Hazel Pomaderris (*Pomaderris aspera*)
- Austral Mulberry (*Hedycarya angustifolia*)
- Banyalla (*Pittosporum bicolor*)

Heritage values

The value of Wombat Park as part of the local landscape and historic heritage is very high. Given the extensive and harmonious heritage of integration of remnant native vegetation and extensive exotic plantings, works in the project area should aim to protect planted trees and maintain the mixed revegetation approach which both reflects the historic heritage and the latest understandings of ecological functionality outlined above.

Community access, amenity and education

While much of the Spring Ck system is on public land, most of the project area is private land without a watercourse reserve.

Hepburn Reservoir has the potential to be better used by the community and visitors as a recreational resource given its town supply function appears unlikely to be resumed in the near future. If this was to develop the lower part of the project site could become a demonstration site of what can be done with an extreme example of a degraded gully environment.

The upper section of the project area with its diversity of vegetation and history of planting and water works along the creek within Wombat Park already has spectacular amenity and environmental education values which provide an opportunity for an interpretive trail along the gully as part of a greater program to use Wombat Park generally as an environmental and farm educational resource. While the current landowners may not wish to pursue this direction for the property, this potential should be recognised by the community for this part of the creek especially for potential partnership with the adjacent schools for an integrated environmental studies program.

Productive land use opportunities

The main current use of the project area is water supply for stock in the Wombat Park parkland paddock and limited grazing value as well as access to grazing in Comelli's hillside paddock.

Plantation forestry using appropriate high value species is a potential alternative use of the drainage line and adjacent slopes which would provide the best results in terms of water quality and would be broadly compatible with the heritage landscape of Wombat Park. A number of native and exotic species have potential to produce very high value sawlogs on this site as well as the adjacent slopes and shade out blackberry growth completely once established.

Potential species for commercial planting include

- Blackwood (*Acacia melanoxylon*)
- Bunya Pine (*Araucaria bidwillii*)
- Cypress (*Cupressus macrocarpa* and other variants)
- Californian Redwood (*Sequoia sempervirens*)
- Elm (*Ulmus procera*)

Carefully designed mixed plantings and silvicultural regimes would be required to produce good quality timber from plantations which could be thinned continuously rather than clear felled.²

Strategic Overview of Revegetation

An integrated view of the issues raised and a realistic assessment of the work required to maintain vegetation in a desired state in such fertile and moist environments suggests a key strategic division between fundamentally different revegetation strategies which might be applied to differing parts of the project site. The choice is between

- dense multilayered forests dark enough to largely exclude grass and blackberries.
- open grassy forests managed with grazing and

"Rainforest" Strategy

- Best suited to drainage lines, springs and sites with good moisture and fertility
- Predominately fire retardant and deciduous canopy species plus blackwood as co-dominant native with understory trees and shrubs mostly evergreen soft leaved, low fire hazard, palatable "rainforest" species
- Best protection of water quality while maintaining access for people and wallabies
- Long term exclusion of fire grazing and herbicide.
- High long term timber and other aesthetic values
- Managed timber plantation versions of this system would be possible

² For example designs suited to this environment see Holmgren, D. [Trees On The Treeless Plains](#) :Revegetation Manual For The Volcanic Landscapes of Central Victoria Holmgren Design Services 1994

Grassy Forest Strategy

- Best suited to drier slopes above the drainage lines including less fertile areas.
- Predominantly indigenous canopy but could include wide spaced exotic trees (eg elm on more fertile ground, high pruned pines on poor soil.) to form timber plantation versions.
- Once trees established, regular grazing used to control grass growth and inhibit blackberry invasion.
- Strategic use of goats and fuel reduction burning may be appropriate to establish and/or maintain grassy understory
- More labour intensive techniques may be needed to establish native tussock grass component.

Edges between these systems should be defined where possible by contour access tracks and fences.

MANAGEMENT AND REVEGETATION ZONES

The project area has been tentatively divided into a number of management and revegetation zones reflecting a combination of natural factors, landuse, ownership and planning controls.

1. Upper Boundary Line
2. School Paddock
3. Wombat Park Manna gum escarpment
4. Wombat Park Dam and springs
5. Corridor forest (Wombat Park & Springs Reserve)
6. Cape Broom Gully (Spring Ck Reserve)

Upper Boundary Line

The newly cleared and reconstructed fence line adequately defines a zone where boundary tree plantations on either side of the fence line would be an obvious and appropriate design solution.

The criteria for these plantations should be

- In keeping with the heritage values of the site
- Preserving reasonable solar access to adjacent land zoned residential
- Good blackberry suppressing potential and low fire hazard
- Potential high value timber from salvage after maturity
- Close spacing (2m) for rapid establishment and grass and weed suppression
- Fencing from stock for at least 15 years.
- Good follow up weed control will be essential until trees are at least 2m tall

Tree planting on the east side could be either this planting season (as late as November for evergreen stock) but on the west side decisions on the future of the Douglas firs in poor shape may require delaying until next year.

Tentative suggestions for this belt would be

East Side: alternating double row of elm and blackwood

West Side: alternating double row of Californian Redwood and Blackwood

Given the less sensitive nature of this unit and the public contributions so far including this consultancy report, any further design and planting works should be left to the respective landholders.

School Paddock

This site is particularly well suited to a long term mixed timber species plantation because

- most of the land is zoned rural
- the schools and parish are ideally placed to take a long term view
- sequential establishment and ongoing management would fit with school environmental programs.
- The well established tradition of school plantations

The pattern of mixed past and current plantings in this area should be incorporated into a carefully designed mixed plantation with the following values

- Specialty value timber species well suited to the site.
- Long term reduction in fire hazard and weed control problems
- Mixed indigenous and exotic species.
- Capable of continuous thinning for timber with increasing value in standing forest.
- Harmonious integration with adjacent Escarpment forest.

Suggested species combinations

- Blackwood (selected provenances)
- Silver wattle (selected provenances)
- Cypress macrocarpa (selected provenances)
- Californian Redwood (moist bottom areas)
- Turkey Oak and other oaks.
- Elm

Flowering native shrubs could be incorporated and planted to form edges to the plantation to

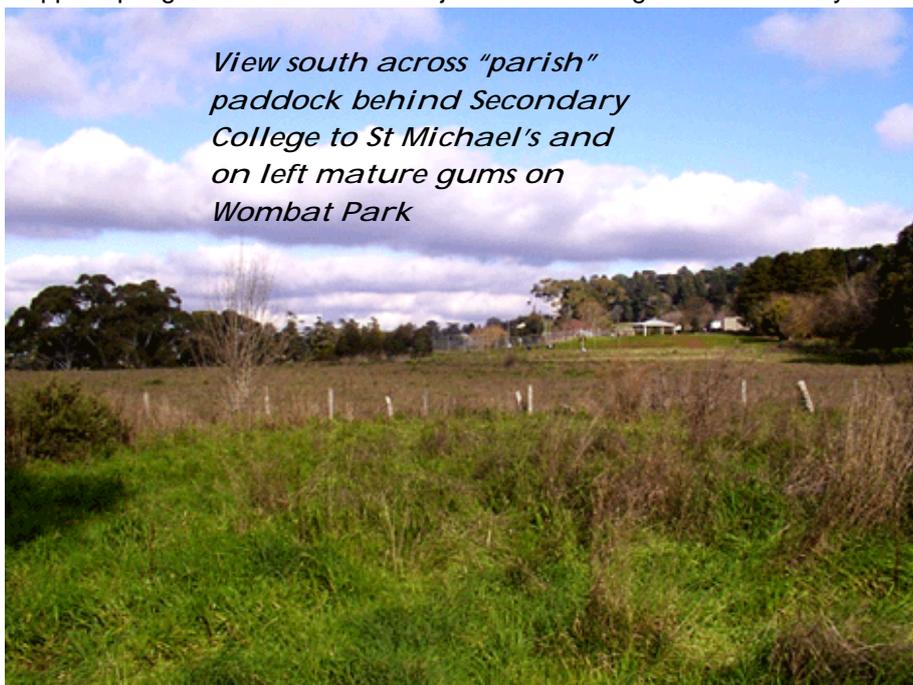
- exclude blackberry and grass growth when trees are high pruned
- provide aesthetic integration
- attract native birds
- setback large trees from residential land and school fences.

Suitable species could include

- Banksia marginata*
- Hazel pomaderris*
- Musk Daisy Bush*
- Tree Violet*
- Prickly Currant Bush*
- Mint Bush.* (Prostanthera lasianthos)
- Austral Mulberry*
- Banyalla
- Fern Leafed Grevillea (Grevillea asplenifolia)
- Sticky wattle (Acacia howittii)
- Willow leafed Hakea (Hakea salicifolia)

*indicates locally indigenous species

A four wheel drive access route from the flat northern area to the steep southern slope already exists.



This proposal would

- contribute to long term control of both weeds and fire hazard
- consolidate the forest habitat corridor between the creek and the Second College hill
- provide a small forest canopy link along the drainage line
- be of high community education and amenity value,

Therefore it should be a candidate for primary focus and management by the Landcare group.

The tenure of this land, and the participating groups need to be clarified as part of ongoing consultation and further design and specification work is recommended to develop this concept before further tree planting or works on this site.

Wombat Park Manna gum escarpment

Management of this zone should aim to

- reduce fire hazard to high value remnant gums and adjacent land uses
- maintain water and soil protecting values
- restore indigenous open forest structure and possibly native Poa tussock pasture

There are no easy solutions to achieving these objectives but the following techniques are suggested as having the best chance of long term success if carefully applied

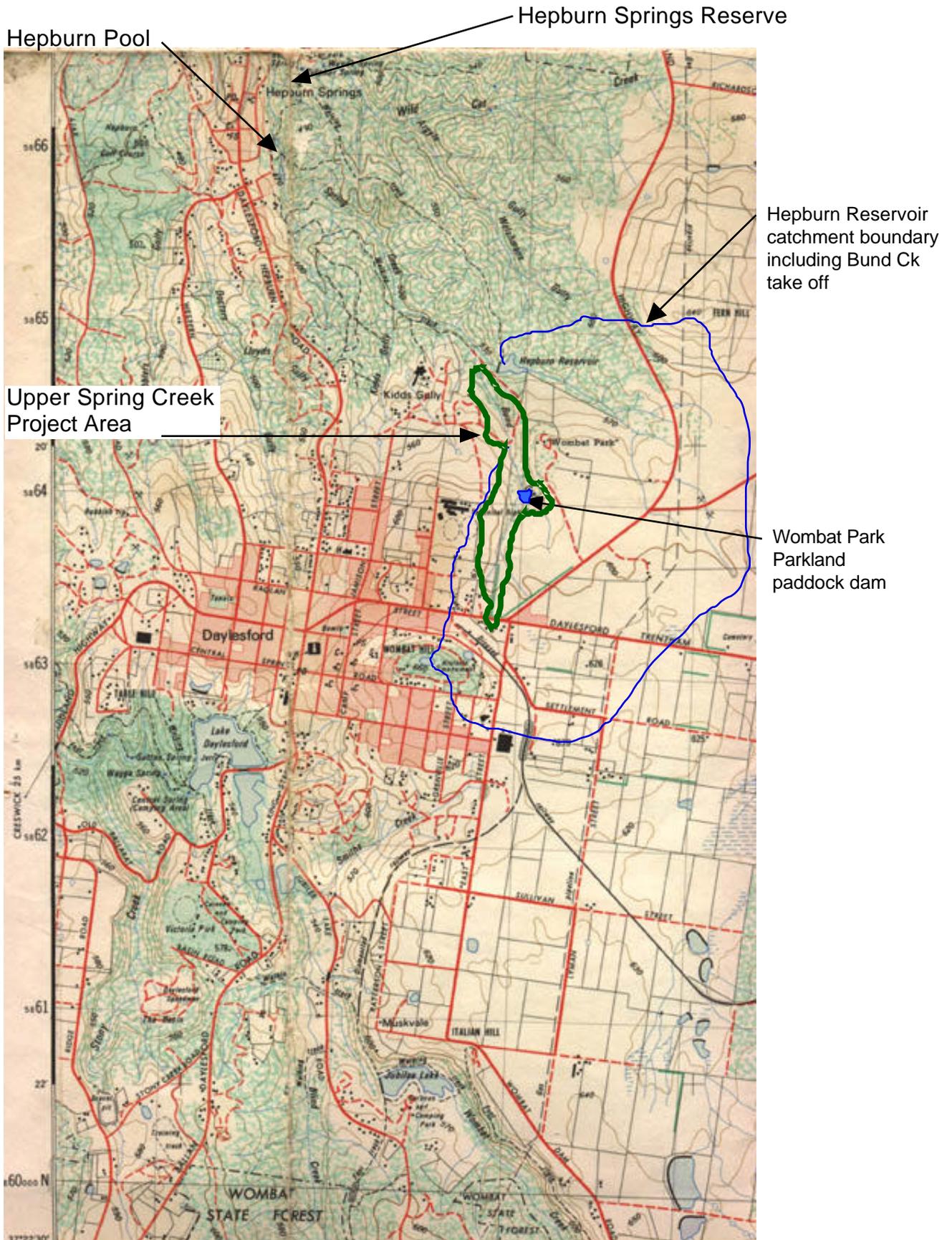
Goats offer the best management tool for converting this area to a grassy forest because of

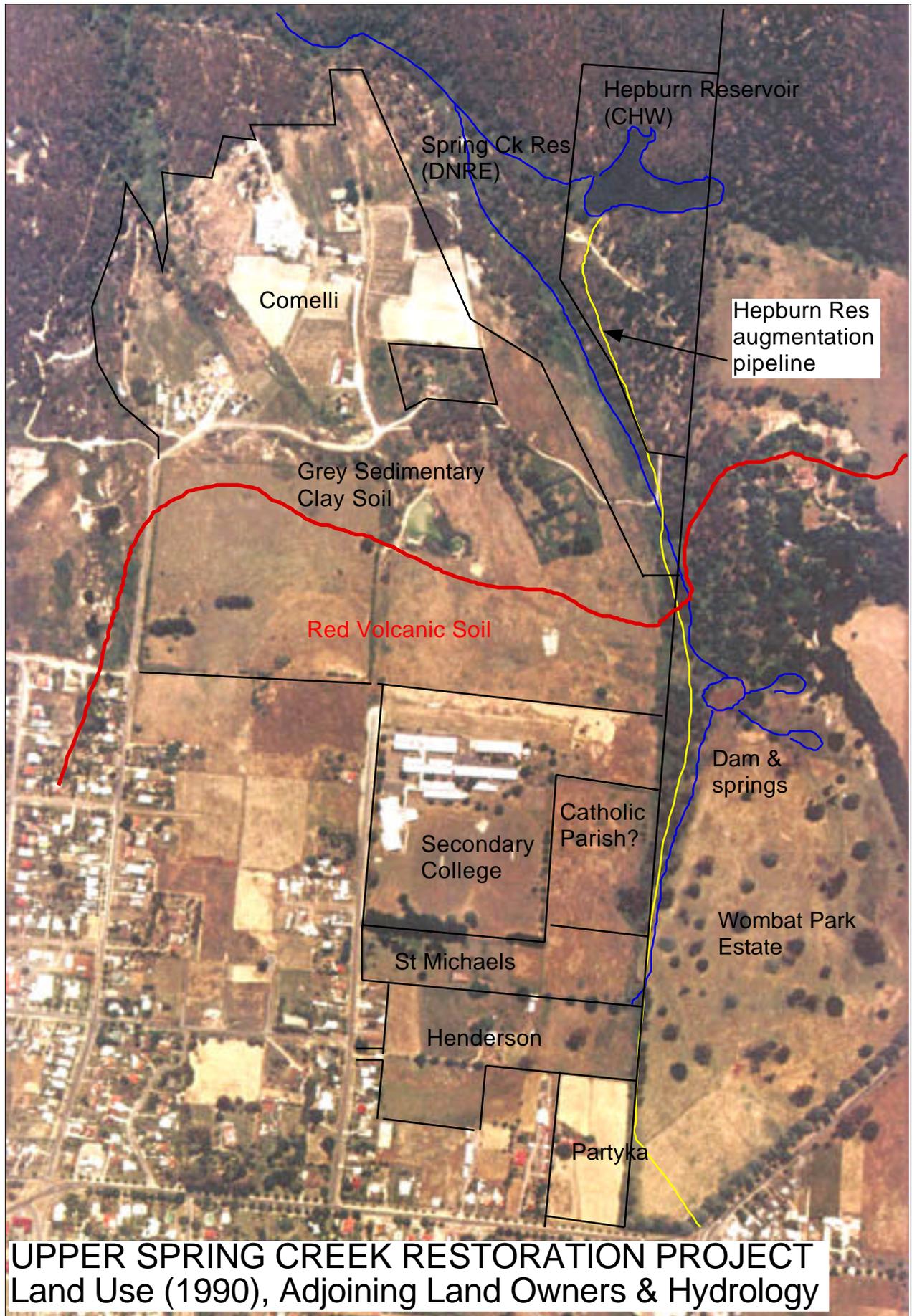
- existing livestock management and fencing capabilities of land owners
- few young trees which will need protection from ring barking
- minimal soil disturbance
- fire damage risk to old trees and hollow logs can be avoided

Some caveats and conditions need to be considered.

- Temporary electric fences could be used to contain goats on the slope with any trees smaller than 100 mm dia. protected by trunk guards.
- Large hawthorns should be retained for their habitat value while smaller ones may be

UPPER SPRING CREEK RESTORATION PROJECT Locality Map





UPPER SPRING CREEK RESTORATION PROJECT
Land Use (1990), Adjoining Land Owners & Hydrology

UPPER SPRING CREEK PROJECT AREA Planning Zones, Land Titles & Topography

