

Community Garden Warrnambool Weed Management Report – Parts A & B (May 2014)

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View across to the north within the Warrnambool Community Garden.

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WEED MANAGEMENT PLAN FOR WARRNAMBOOL COMMUNITY GARDEN

PART A – Community garden plot areas

1. Introduction

Warrnambool Community Garden has been experiencing increasing problems with weed management on its site. Landtech Consulting has been commissioned to provide advice on how to deal with these weed issues in a systematic way.

The community garden site and surrounds has historically existed as a neglected area of Warrnambool City Council land that has entrenched and pervasive weed issues, especially within the old quarry site (see Figure 18). Kikuyu is the main weed issue in the garden plot areas and dominates much of the site, especially in areas of disturbance. As it grows from fragments and has a creeping, smothering habit, it is easily spread, especially when equipment such as whippersnippers are used to clear it from garden plot areas.

In upslope and surrounding areas of the garden specifically in the large gully/old quarry area (see Figure 18) there exists entrenched wind and bird dispersed weeds that continue to dominate the site and provide a potential source of new weed infestations into the garden plot areas.

The other main source of weeds in the garden plot area originate from ground disturbance and weed seed stored in the soil, as well as inputs from soils and plant material brought onto the site from gardeners own home gardens. Being a site that is not sheltered in any way via windbreaks, much weed seed is blown onto the site and able to germinate on freshly dug and un-mulched garden beds, exposed ground in surrounding areas, and un-mulched pathways.

Weeds of the garden plot areas include but are not limited to: Plantain, Fleabane, Soursob, Mallow, Couch-grass, Kikuyu, Fumaria, Cleaver, Lily of the Valley, Wild Canola, Mustard weed, Dock, Ox-tongue Thistle, Chickweed and Milk Thistle. Weeds identified in the old quarry area above the garden plot site include Kikuyu, Lily of the Valley, Mirror Bush, Blackberry, Cape Wattle, Fennel, Italian Buckthorn, Cotoneaster, and Pinus sp.

This report will focus on two main areas of the community garden; the garden plot areas and the unused old quarry parts of the site. Suggested actions will be detailed as short, medium, and long term suggestions.



Figures 1 and 2 – Main community garden plots on the left, upslope weed infested former quarry site on the right.

PART A - Gardening part of the site



Figure 3 – Overview image of community garden growing area.

The main garden plot area was founded on organic and permaculture principles and while the focus may be to follow these principles, significant annual and perennial weeds continue to invade and dominate areas of the site. It would be useful therefore to consider management of these weed issues listed in the introduction in the short and longer term. The following management suggestions are suggested practices and policies to be incorporated into future management of the community garden area.

2. What to consider when looking at the inputs and outputs used on site (policies and practices)

The major consideration when controlling weeds in any garden or bushland situation is the sources of those weeds. At present it doesn't appear that woody weeds are being spread into the main garden area from the upslope gully area. The only weed present in the main garden bed area is Lily of the Valley, a pernicious weed that would have been spread via whippersnipping and mowing edges of the upslope gully area. This weed should be controlled as a priority as it can quickly spread from pieces and dominate a site.

The main inputs and outputs affecting weed infestation on the site is as follows:

People – various weeds are brought onto the site via soil in boots and on clothing. It is suggested that when coming onto the site garden users are aware of weed seeds on clothing and on boots especially if they have come from a weed infected site or home garden. Excess soil in tread of boots should be removed before users enter the site. Garden users who are removing weeds in the seeding stage from garden beds would be encouraged not to move over areas not infested with weeds to reduce spread.

Tools – All tools and equipment brought on site should also be clean and free of soil. If working in an area infested with weeds it is important to wash down equipment before moving to a weed free site. A covered bathtub with a water/vinegar mix can be used to wash tools between sites or when using tools brought from use in the home garden. This will not kill all weed seeds but by removing soil can reduce weed seed in soils attached to tools and implements.

Plant material – Plant material brought onto the site should be from a known clean source. If potted seedlings are brought in it is critical any weeds are removed before entering the site and the soils are from known clean sources. Usually punnetted seedlings brought from nurseries contain high quality and weed-free soils. If bare-rooted plant materials are brought onto the site they should be washed thoroughly before use removing all soil. Any excess plant material removed from gardens should be composted in the compost bays provided. The growing of plants from non-hybrid seed in the hothouses on site would further reduce the incidence of weed infection within the garden areas.

Soils – The movement of soils around the site should be discouraged as this leads to uncontrolled spread of weeds also. If garden beds need additional soil the best option would be to purchase weed-free soils in large storage bags as commercial nurseries do. These soils have been heat treated to kill any weed seeds and pathogens, however the expense of this may not be suitable.

If extra soil is needed for garden beds it should not be brought from home gardens where the weed load is unknown. It would be more beneficial if the soil is used from the site and dug from a central area that is covered when not in use. As weed seeds are predominantly in the top 10-20cm of soil – generally soil taken below this depth is free of most weed seeds. Soils stored for later use should always be covered or mulched to reduce infestation by wind-blown weed seed.

Mulches – The sources and type of mulches for garden beds and pathways is a critical factor in reducing weed loads. Mulch sources typically consist of bales of straw, compost and wood/tree chipped mulches. Bales of straw are easy to use but typically carry weed seed and can come from unclean sources. Straw bales are best used when dry and should be spread when brought on site and not stored for periods where they can moisten, and if not covered can result in weed seed germination.

Eucalypt chipped mulch materials are excellent for pathways and around trees and should be stored in weed-free locations. These mulches usually remain dry for long periods and therefore weed germination is usually minimal. If compost is used for mulches it should be well decomposed and the covered when stored. The use of black plastic to increase breakdown and ‘cook’ weed seeds should be used to cover compost bays. Compost is best used under mulches such as straw and eucalypt chip mulches. All mulches are best stored dry to reduce weed seed germination before use.

In the longer term it would be useful to use mulch sources from the site such as using a chipper to produce mulches from trees such as She-oaks and Wattles planted for this particular purpose. The existing pine trees in the upslope gully could also in time be used in a chipper as an excellent acidic mulch cover (natural insecticide function, reduces pH where required, great as strawberry mulch cover).

Weeds removed – Any weeds removed from garden beds should not be placed in the compost bins. The first stage of treatment if they are to remain on site is that they be placed in black garbage bags and stored in a central location in the sun for solarisation. Large piles/mounds of weeds should also be covered by black plastic for solarisation and cooking of the weed seeds. After a three-month period of solarisation these weeds could either be buried on-site, removed from the site, or composted.

3. Suppressing and eliminating Couch and Kikuyu in our garden paths (policies and practices)



Figures 4 and 5 – Correctly mulched and edged garden path on the left and lacking adequate maintenance and preparation on the right.

Suppression and elimination of Couch and Kikuyu from garden paths can be achieved in a number of ways and will be an ongoing process. The following are some methods suggested to achieve this:

- **Organic sprays** – various organic sprays listed in Appendix 3 can be used to suppress and in some cases control Kikuyu and Couch especially where infestations are minor.
- **Restrict growth habit** – as Couch and Kikuyu are creeping, running weeds they need to be inhibited from moving onto garden paths – Kikuyu/Couch bordering pathways and gardens should be kept mown as low as possible at all times to reduce runners and spread onto pathways. If whippersnippers are used this should be kept to a minimum to reduce spread of weed fragments.
- **Timber garden/pathway edges** – some form of pathway edging should be used, preferably single timber edging to allow an edge to mow to.
- **Use of inhibiting organic sprays along edges** – such sprays can be used to restrict the growth of these weeds onto pathways and into garden beds.
- **Heavy mulches, carpet/hessian/jutemat** – after removing or controlling these weeds on pathways it is most important that a combination of carpet/hessian/jutemat under-laying heavy mulching is used. Pathways must be kept regularly mulched – need continuous supply – Council, local tree trimming companies (donation?)
- **Compacted crushed limestone** – using carpet/hessian/jutemat as a base and covered with compacted crushed limestone is a labour-intensive, costly, but most effective method of controlling most weeds.
- **Consider edge plantings of Lemongrass** – coupled with timber edging the use of border plantings of Lemongrass or Comfrey can be useful as a barrier to incursion by Couch and Kikuyu.

4. Suppressing and eliminating Couch and Kikuyu in our garden beds (policies and practices)



Figures 6 and 7 – Poorly maintained beds on the left and effective preparation on the right.

Preparation of newly planted garden beds should focus on correct initial procedures to reduce the weed infestations and promote long-term reductions in overall weed issues.

- **Newly prepared beds** – should utilise the use of ‘clean’ soils with hessian, jute mat or carpet underlay covered by a thick layer of mulch. This should then be rested to settle for a period of a month to monitor any potential weed growth. The thickness and quality of mulch is critical to long-term success. Timber borders should be used to allow Kikuyu and Couch to be mown to edges and whippersnipped if required. Organic inhibiting sprays can be used such to reduce the edge incursions also. In the longer term it is suggested that Lemongrass and/or Comfrey border plantings are used to reduce both key weeds from moving into the garden bed. Mowing close to the edge should occur regularly to inhibit Kikuyu and Couch growth around edges.
- **Weeds within garden beds** – organic sprays can be used to reduce the impact of all weed species present however long-term success is only achieved with adequate mulching and if possible the use of hessian/carpet underlay under this mulch and to smother weeds. New seedlings can still be planted by cutting holes in the hessian or underlay. Effective weed control is also achieved by out-planting and in effect smothering the growth of weeds. Bare soil vegetable plots are labour intensive and will need constant organic spray or manual control of emerging weeds.
- **Clean sources of soil and plant material** – as mentioned in previous sections, reductions in weed impact are assisted by using clean soil sources and plant material.
- **Use of carpet and mulch surrounding garden beds** – as suggested for pathways the use of carpet and thick mulches in the longer term in areas surrounding garden beds and pathways has the greatest impact on reducing weed impact.



Figure 8 – Well-prepared garden plot using cardboard, carpet, jute mat or hessian under-laying mulch layer.

- **Consider increased use of wick-type or traditional raised beds** – the use of raised beds are not only ergonomically more functional but also are easier to avoid the incursion of creeping weeds such as Couch and Kikuyu. Although more expensive and labour intensive to set up raised beds reduce long-term weed control issues and should be considered.



Figure 9 – Overview of wick-type raised beds (Image source: Google Images 2014).



Figures 10, 11 – Examples of wick-type raised beds (Image source: Google Images 2014).

5. Suppressing and eliminating Couch and Kikuyu in our food forest area



Figures 12 and 13 – Current state of Kikuyu infested and low nutrient status of Food Forest areas.

- **Use Roundup to remove initial Kikuyu problem** - the food forest area is so heavily infested with kikuyu and couch that it requires initial control using Roundup and a buffer of 1m sprayed around the edges. This will allow mulching (carpet/mulch) and border plantings of multiple rows of Lomandra, Lemon Grass to attempt to stop the incursion of new infestations.
- **Fertilise to reduce Nitrogen drawdown** – use sulphate of ammonia or dynamic lifter or blood and bone around each plant to reduce the drawdown of nitrogen via mulching and stimulate increased growth.
- **Mulching** – it is critical that this area after Kikuyu is sprayed is mulched as heavily as possible using hessian/carpet underlay beneath the mulch. This needs to be done on a quarterly basis for best results.
- **Companion planting** – it is suggested also that permaculture design principles are used in this area where particular nitrogen fixing plants and flowering species are used to assist in outcompeting any weeds and providing flower resources for beneficial insects and predators to control pests predated the fruit trees.
- **Areas immediately surrounding the food forest** – she-oaks are nitrogen-fixing plants that could be planted surrounding the food forest to provide wind shelter and excellent coverage of weed inhibiting mulches. These could be coppiced from time to time to reduce their height with the nitrogenous-rich leaf material chipped used as mulch. She-oaks also capture windblown weed seed in their branch and leaf structure, whilst the timber if used is hot-burning and smokeless. There are two species that could be used and that grow in shallow soils and on hostile sites.
- **Use of Agpipe** – inserted into soil around root zone for occasional deep watering.
- **Create buffer area** - Plant multiple rows of Lomandra, Lemon Grass as border to inhibit invading Kikuyu.
- **Long-term** - use steam/hot water to keep kikuyu back from border and general organic controls where it may reinvade.

6. Dealing with annual weeds such as Fleabane, Dock. (policies and practices)

Fleabane is a weed that spreads by wind as it reaches seeding stage to un-mulched and bare earth areas. Dock on the other hand is a weed that dominates poorly drained areas. This information gives direction as to how best control these species.

- **Fleabane** – try to cover bare areas of soil in garden beds using heavy mulches and areas where it dominates in bare patches within Kikuyu it should be continually mown before it sets seed and it will eventually be dominated by Kikuyu. These bare areas should be could be mulched also. The use of knockdown organic sprays and hot water treatment can also be used. Avoid whippersnipping while in flower and seed so as not to spread this weed.
- **Dock** – this weed dominates in areas of poor drainage so raising garden beds improves drainage and therefore its dominance. It is also spread via its seed which adheres to clothing and can be moved around the site. Again mulching and the use of organic sprays are useful and where it is growing outside garden beds continual mowing usually reduces its persistence.

7. Management of the garden plot area (policies and practices)

- **Windbreak around entire garden** (see Figure 19) – it is strongly suggested that an effective windbreak planting be used around the entire site or at least surrounding the garden plot areas. This will provide an improved microclimate for existing garden areas, and reduce the spread within and onto the site of wind-blown weed seed. Sheoaks (*Allocasuarina* sp.), Callistemons and *Banksia marginata* are suggested for this purpose.
- **Border plantings of bird attracting species (pest controllers) around entire site** (see Figure 19) – inside the windbreak as suggested above it would be beneficial to plant bird-attracting shrubby species which attract small birds for the purpose of natural pest control including the control of white snails which can be an issue in vegetable gardens in this area. Advice can be provided on specific species to use for this purpose.
- **The use of Roundup** (see Figure 19) – as most recent scientific studies point to the carcinogenic nature of Glyphosate, the active constituent of Roundup, it is recommended that this be used only where necessary. It is suggested that if certain community gardeners feel the need to use Roundup then their plots should be in one group possibly located at the northern end of the garden and as far away from other 'organic' plots as possible. Roundup should not be used on windy days and certainly not when a north wind is blowing which would cause drift back over the main garden plots to the south. Information on the dangers of Roundup to human health can be found in the listed websites in Appendix 1.
- **Barrier plantings around main garden plot areas** (see Figure 19) – it is suggested over the long-term that multi-row *Lomandra/Poa* sp. plantings around the main garden plots be developed to delineate the growing areas and with the eventual aim of restricting Kikuyu and Couch into these areas altogether. Areas of Kikuyu within this barrier could slowly be smothered out using carpet and thick mulch as suppressant.

- **Sheoak mulch supply** – it is suggested over the long-term to provide reductions in competing Couch and Kikuyu and to provide a long-term high nitrogenous mulch supply, that Sheoaks and possibly Blackwood be planted in as many areas as possible (see Figure 20 & 25). These species can be coppiced or pruned over time and chipped to provide a long-term mulch supply to supplement donated or other mulch sources available.
- **Pine-trees in gully area** – the Pine trees in the upslope gully area would also provide a useful acidic mulch supply when chipped as it would be planned to replace them in the gully area with native tree species over time.
- **Education** – suggested training for community garden members may include the following: weed hygiene, weed identification, composting, propagation, use of non-hybrid seeds, organic pest control sprays and companion planting, using chicken tractors for pest and weed control, soil/equipment hygiene, garden bed maintenance and development.



Figures 14 and 15 – Sheoaks planted closely produce leaf litter that inhibits most weed growth underneath, their foliage produces high-nitrogenous mulch source, and the timber if used is hot burning and smokeless.



Figures 16 and 17 – Lomandra planted closely in multiples provide an excellent barrier to Kikuyu invasion. The garden bed areas on the right are to the north of the site and are suggested to be used for gardeners using Roundup although a policy should be developed to possibly ban the use altogether.



Figure 18 – Main areas of the community garden – old quarry site, food forest and garden plot areas.



Figure 19 – Suggested barrier and windbreak plantings.

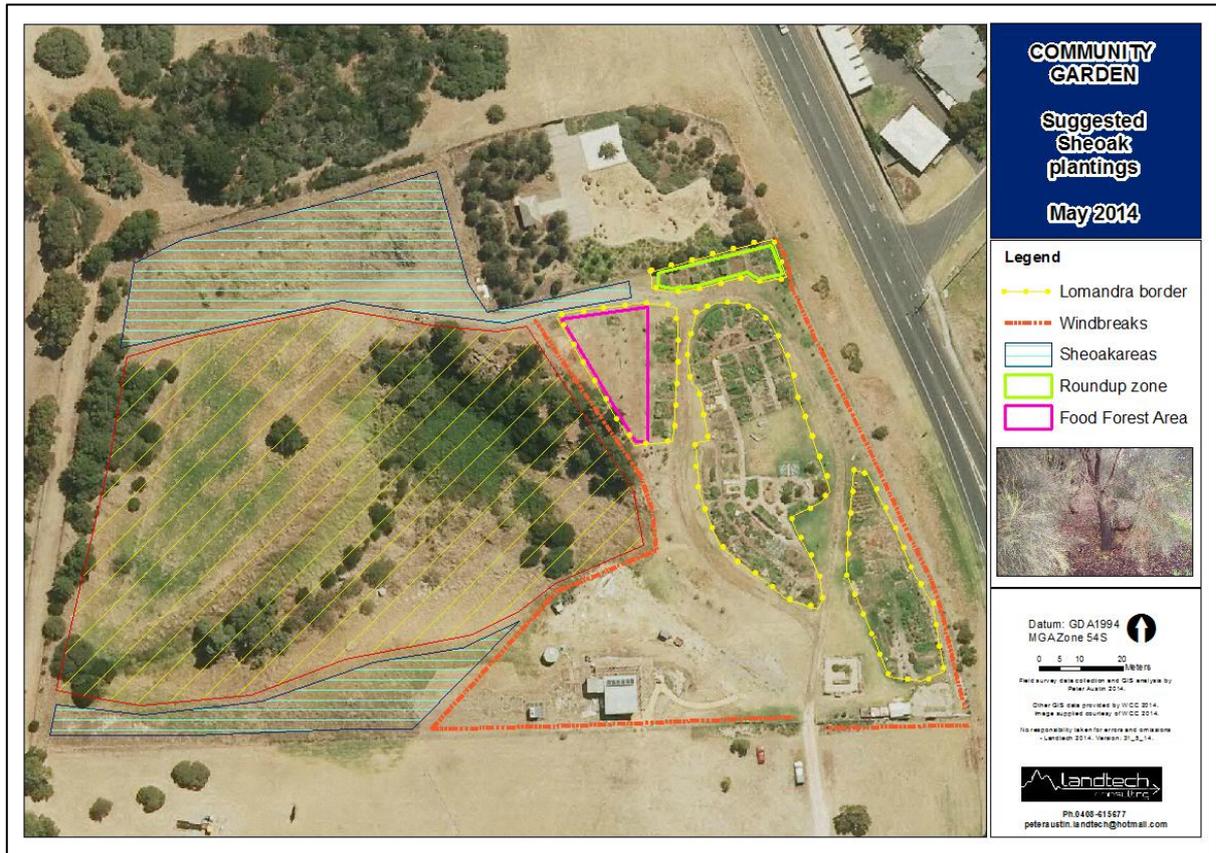


Figure 20 – Suggested areas that could be planted to Sheoak etc as future coppiced mulch supply.

WEED MANAGEMENT PLAN FOR WARRNAMBOOL COMMUNITY GARDEN

PART B - Unused part of the site/old quarry area



Figures 21 & 22 – Impact of woody and herbaceous weeds within the old quarry site area.

Warrnambool Community Garden has been experiencing increasing problems with weed management on its site, within the garden areas and the ex-quarry part of the site. Landtech Consulting has been commissioned to provide advice and develop a weed management plan on how to deal with these weed issues in a staged and systematic method.

Currently there is no agreed vision or land-use plan for the quarry and unused parts of the site. These areas do harbour an array of annual and perennial weeds that spread to the community garden area and possibly to neighbouring areas. It has been suggested Warrnambool City Council, the landlords of the entire property would provide support in enhancing the quarry site, and thus reducing overall weed impact to the garden and surrounding areas.

The quarry area and surrounding areas of the garden, specifically in the large gully area (see Figure 18), exists entrenched wind and bird dispersed weeds that continue to dominate the site and provide a potential source of new weed infestations in the garden plot areas.

The area is covered by a thick layer of Kikuyu and Lily of the Valley weed species with occasional indigenous Blackwoods (*Acacia melanoxlyn*) higher up the slope. Woody and herbaceous weeds identified in the quarry area include Kikuyu, Lily of the Valley, Mirror Bush, Blackberry, Cape Wattle, Fennel, Italian Buckthorn, Cotoneaster, and Pinus sp. Each of these weeds are controlled in varying ways which will be detailed in Appendix 4 of this report.

The aim of restoring this site is based around working methodically in stages from upslope areas to lower areas over time and replacing existing weed cover with indigenous suppressing and shading tree species (such as *Allocasuarina verticillata* and *Acacia melanoxlyn*) and in effect out-dominating any recurring weed issues. Seed could be collected of such species from adjoining sites and propagated in community garden igloos/hothouses.

This will need to be completed over short, medium and long-term time-frames and will require vigilance in controlling new weed outbreaks as replacement vegetation is planted. The multiple use of herbicides such as *Roundup* and *Wipeout* will be required in the control stages to tackle these entrenched weed species. Large amounts of mulch and jute mat will need to be used, while woody weeds will need to be removed off-site (can be chipped and the residue removed off site).

1. Overall vision for enhancing the quarry site

The aim of this weed management plan is to provide a revegetated natural amphitheatre-type area that links to the community garden below and could be used for events and possibly support some infrastructure on the flatter areas toward the lower parts of the gully area.

It would be hoped also over time that the restorative plantings become self-maintaining (self-mulching and shading), and in some instances allow for the integration of further edible tree species plantings incorporated into some areas. The lower parts of the gully on flatter areas could be transformed for various meetings, markets, or for interpretive training for school groups. There are two suggested options for weed control (see Figures 29 & 30) that would need to occur over a 1-3 year time-frame, with follow up maintenance occurring continuously.

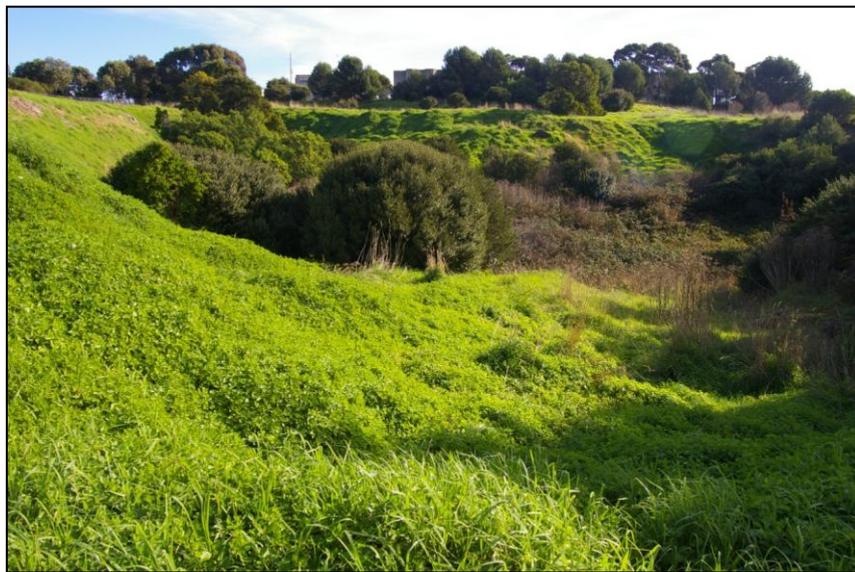


Figure 23 – Woody weeds such as Italian Buckthorn and Cape Wattle could be removed initially via cut/paint methods.

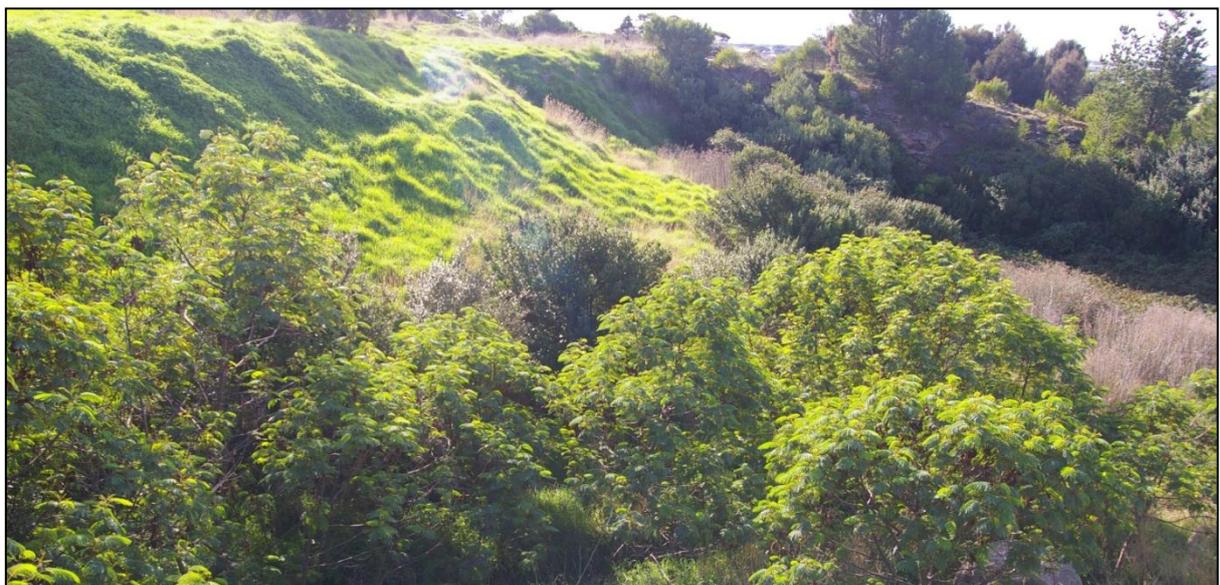


Figure 24 – Infestations of Cape Wattle.

2. Stage 1

As can be seen from the image below there are large areas around the top of the gully area that could be sprayed with herbicide to control the Kikuyu sword and provide areas where Sheoaks, Blackwoods and Silver Banksia could be planted approximately 3m apart. This should be completed in manageable sections and each tree planted must be well mulched and preferably with carpet or hessian under-laying the mulch of at least a metre square in size or in strip lines.

Follow-up weed control between these trees would be required for a period of 18 months as the trees reach a size where they out-shade new weed growth and start producing their own mulch coverage. The Sheoaks and Blackwoods could in time provide coppiced material that could be chipped and provide a self sustaining mulch source for the gardens and other newly restored areas in the gully.



Figure 25 - These works could occur around both sides at the top of the gully as seen from the image above.



Figure 26 – Kikuyu infestation on the southern bank of the old quarry site.



Figure 27 – Heavy Lily of the Valley infestations throughout the old quarry site.

3. Stage 2

It is then recommended that weed control and subsequent follow-up revegetation of the three key species mentioned previously commence from the top of the gully in bands either across the gully (Option 1) or to follow contours (Option 2) as shown in Figures 29 and 30, from one side of the gully to the other. Initial weed control may require double herbicide applications due to the volume of weeds present. As the gully is approximately 140m in length the size of these sections should be workable although can be reduced or increased as resources are available. It is suggested all woody weeds should be removed first and removed off-site to green-waste disposal sites. Existing Blackwoods in this upslope are should obviously be retained. The existing pine trees on the northern side of the lower parts of the gully could be cut and chipped and used as an onsite ready mulch supply.

Weeds should be controlled via the methods suggested in Appendix 4 where tree species such as Cape Wattle can be cut off at the ground and stumps painted with herbicide immediately. Herbaceous weeds such as Kikuyu and Lilly of the Valley would be sprayed. There is some validity in seeking permission from the council to burn the dried weed residues to most effectively clear the site for follow-up planting however this may not be admissible in such a built up urban area.

Once the weeds are controlled within the first strip across the gully the three key tree species mentioned previously should be planted at 3m intervals across the gully and with adequate mulch and the use of hessian/carpet as suggested previously. Tree-planting should coincide with winter/spring rainfall for increased success.

This first area will then need follow-up spot weed control using backpack sprayers until the planted trees start to reach a significant height and canopies start to shade out any persistently emerging weeds which will inevitably occur.

4. Stage 3

Stage 3 consists of similar treatment as with Stage 2 across the next weed control zone (see Figures 29 and 30) from one side of the gully to the other or along the contours. This section includes woody weeds as in stage 2 which should be cut at their bases close to the ground and painted with 100% Roundup or similar non-selective herbicide.

Where there are flat areas there could be some validity in attempting to access these areas with machinery to remove or drag large areas of weeds out of this area, but access to the flatter areas at the base of the gully may be problematic. The rest of the herbaceous sword of weeds may need to be sprayed twice and again there may be some potential for burning the dried biomass left over after weeds are controlled.

Again it is suggested especially on slopes within this band that the three key species are planted in 3m random intervals and well mulched with carpet or hessian squares, with ample mulch on top of this at approximately 1m square size. This is not completed until there is adequate weed control within this area and again a period of time needs to pass before the planted trees reach a size where they start to out-shade and inhibit any persistent weed growth. Follow-up spraying will be required in some of these areas also.

The flatter parts of the gully at the base could be left unplanted for future possible laying of gravel, crushed limestone or much coverage as these areas may be used for a variety of later purposes, and improve access to the remaining areas of weed control.

5. Stages 4 and 5

The final zones within the gully would also proceed as in previous stages. Again woody weeds would need to be cut and painted and the top sections dragged from the area and removed from the site so as to reduce seed drop and reinfestation (if not already removed).

Again there may be some possibility of Council providing machinery to remove excess dried weed biomass to improve the access for planting as there are sections of Blackberry in these areas which take time to remove manually.

These areas especially on the slopes should be planted with Sheoaks, Blackwoods and Banksia sp. using the same mulching methods as suggested previously. As with other areas follow-up weed control will be required for outbreaks of weed seed stored in the soil that becomes exposed, however with persistent control these can be reduced as planted trees increase in size and commence shading and self-mulching. The flatter areas in these final eastern or lower sections of the gully could be cleared and gravel or crushed limestone laid to allow areas for other infrastructure or activities as previously suggested.

6. Longer term maintenance

Over the longer term it is critical there is ongoing spot weed control across the whole gully area. If trees are planted at the top perimeter surrounding the gully there should be less chance of Kikuyu reinvading down the slope into the gully. Multiple Lomandra border planting right along the extent of the perimeter above the gully could be used to reduce any reinvasion also.

Re-mulching of areas is also recommended and may be needed in areas where weeds persist. This is a large job that will require works probably over a 5 year period as planting of trees should take place to coincide with winter rainfall as supplementary watering may not be possible. Council may be able to provide the use of their water carts that they use to water street trees.

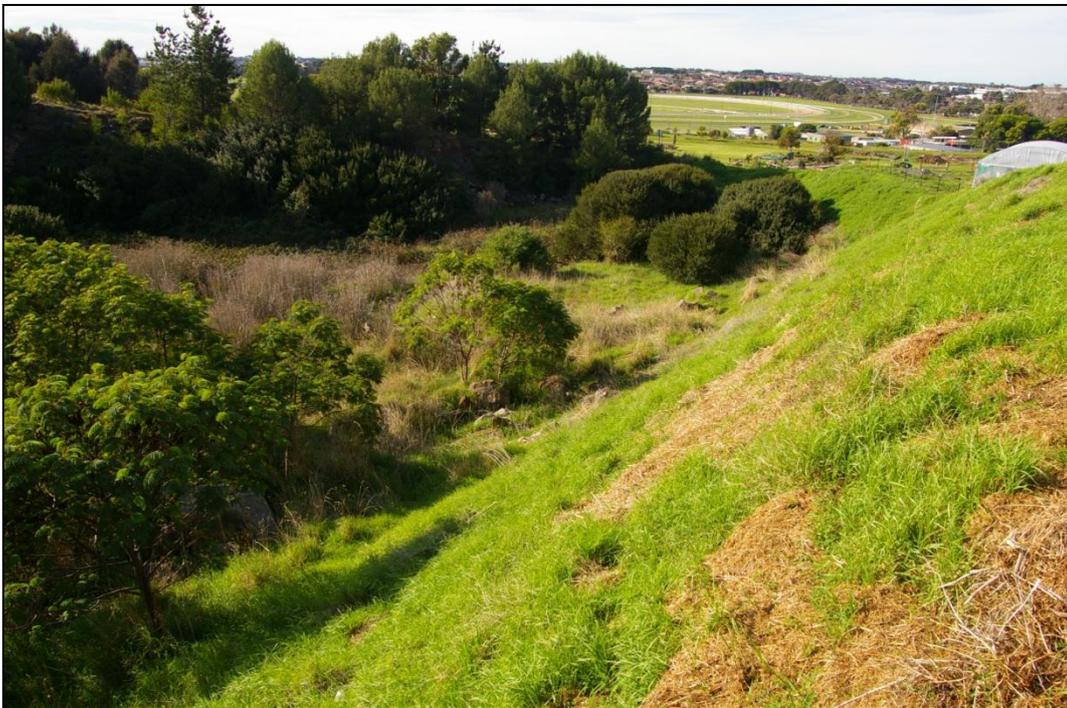


Figure 28 – Pines in the top part of this image could be cut and chipped for initial mulch supply.



Figure 29 – Option 1.



Figure 30 – Option 2.

APPENDIX

Appendix 1 - Information on the impact of Roundup (Glyphosate)

<http://www.organicgardening.com/living/roundup-unready>

Appendix 2 – Production of windbreak species

Lomandra as edging plant, Lemongrass, and Sheoaks – seed could all be collected and all species grown successfully in garden hothouses to reduce overall cost and provide seed collection and propagation skills for community gardeners.

Appendix 3 – Organic weed killers

- **PINE OIL SPRAYS** – Pine Oil sprays can be purchased commercially.
- **LAWNSAND SPRAYS** – ammonium sulphate, iron sulphate, water mixture in garden sprayer
- **VINEGAR SPRAYS AND TOOL DIPS**

One spray bottle to hold and use the solution

-1/2 cup of salt, preferably sea salt or Himalayan salt.

-Organic or non-GMO vinegar (4L)

-1/4 cup all-natural dish soap (for sale at local health food stores)

Mix ingredients and place in the spray bottle. The correct ratio is a 1/2 cup of salt for 4 litres of vinegar and 1/4 cup for this recipe.

- **VINEGAR AS AN ORGANIC WEED KILLER**

One of the best homemade recipes for killing weeds is vinegar; whether it is white vinegar or cider vinegar. The acid in vinegar kills the leaves which then deprive the roots of necessary nutrients. This is recommended for young plants such as seedlings because they are unable to re-grow new leaves from stored energy in the roots. However, enough regular applications of vinegar on an older weed will eventually destroy the plant and any stored energy.

- **BOILING WATER AS AN ORGANIC WEED KILLER**

Boiled water is a fantastic weed killer. Pouring boiled water onto a weed literally cooks the plant in place and kills it on the spot. This is a great method for destroying plants that pop up in the cracks of driveways or sidewalks, in gardens or even in the grass if done carefully. If boiling water doesn't sound strong enough, you can add vinegar to the mixture or even salt for added strength against killing weeds. Use a commercial pump sprayer .

- **6 ECO-FRIENDLY COMMERCIAL SPRAY**

Avenger® Weed Killer is a non-selective, post-emergence herbicide that quickly and effectively kills weeds, grasses and broadleaves without causing harm to the environment. The active ingredient d-limonene (citrus oil) naturally strips away the waxy plant cuticle, causing it to dehydrate and die. University and independent testing results prove that Avenger® Weed Killer is as effective, but faster acting when compared against leading synthetic herbicides. When tested against non-organic 'natural' herbicides that contain vinegar (acetic acid), citric acid, clove oil or fatty acids (soap), it is more effective with quicker results.

- **GENERAL WEED KILLER**

1 tbsp gin
1 tbsp cider vinegar
1 tsp dish detergent
1 quart water

Mix all ingredients in a large bowl and pour into a spray bottle.

Both weed killer recipes will kill any vegetation they contact. Be careful to spray only the weeds you want to kill and not your lawn or flowers.

- **8 ALTERNATIVE VINEGAR/LEMON JUICE**

Start with 2 cups (400 ml) of cider or white vinegar. Vinegar contains acetic acid, which effectively kills weeds and other plants.

Add 2 to 3 tablespoons (29 to 44 ml) lemon juice concentrate. Lemon juice contains high levels of citric acid and may also be effective either used with the vinegar or alone.

Mix in 1 ounce (30 ml) of cheap gin, or use an equal amount of rubbing alcohol.

Add 1 to 2 teaspoons (7 to 14 ml) dish soap. Either dish washing or dishwasher soap, in liquid or powder form, may be a helpful addition to weed killer. The soap attacks the outer protective layer of the plant, making it more vulnerable to attack.

Dilute the weed killer with water. You can use the full-strength solution, but many report success after diluting the mix by 50 to 90 percent. Start with a 50/50 diluted mix, and then mix up a more or less concentrated solution depending on the results you have.

Pour the solution into a plastic spray bottle. Set the nozzle to "stream" rather than "spray" if the weeds are growing close to plants that you do not want to kill. Weed killer does not discriminate: it will kill any plant it comes in contact with.

- **9 USE SALT AS A WEED KILLER**

Try this method only if you want to eradicate weeds in an area where you do not plan to grow anything for several years -- perhaps around paving stones and in pavement cracks. Salt kills the weeds and absorbs into the ground, preventing all plant growth. You can apply salt in one of two ways:

Dissolve 1/2 cup (120 ml) salt into enough warm or hot water to fill your spray bottle. Any type of salt should work. Some people recommend common table salt; others suggest using rock salt.

Apply the salt dry. Instead of dissolving the salt into water, you could apply the water and the salt to the weeds at the same time. Hose the weeds well leaving them wet, liberally sprinkle them with salt, and then soak them with water again.

Appendix 4 – Control methods of each weed – Quarry area

SPRAY - Kikuyu, Lily of the Valley, Fennel

CUT & PAINT - Mirror Bush, Blackberry, Cape Wattle, Italian Buckthorn, Cotoneaster, and Pinus sp