



the bush is a garden

chemical free weeding strategies

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Foreword

My ancestor Noombat camped at Blackadder Creek until the 1850s when he was charged with stealing from a white farmer. Under Aboriginal Law Noombat had rights there and he could take whatever tucker the land provided. He also had a duty to set fire to bush at certain times, to bring on feed for the kangaroos. The white people didn't understand anything about this but they had guns and Noombat was forced to move on to Chittering.

Those Old People kept coming back to their Homegrounds. Noombat's grandson Teddy Wilkes used to camp at West Guildford, and he married Cecilia Munderan, who was the granddaughter of Midgegooroo. Midgegooroo was accused of a murder he didn't commit and with no trial was publicly executed by the King's 63rd regiment on St Georges Terrace in 1833.

My mother Adeline was born at a bush camp at Success Hill in 1898.

I am the oldest living grandson of Teddy Wilkes and Cecilia Munderan. I still live in the land of my mother's Ancestors and have 5 children, 18 grandchildren and 6 great grandchildren all living in the area. These are my qualifications for speaking about Blackadder Creek.

Before wadjelas arrived here our home was like the Garden of Eden. There was always plenty of food because the Old People always followed the Law, which said you had to pass on to your children the same thing your parents passed down to you.

Our Ancestral Spirits in the Dreamtime provided everything for us. The Waugal, our Rainbow Snake made the freshwater springs. The Yakkarn, Turtle Spirit, and the Yanjet, the Bullrush, gave us our tucker. The Dreaming Tracks of these spirits had to be looked after by their Moort, their family, the Nyoongar people, to make sure there would be enough for future generations forever.

In the last couple of hundred years, a lot of the land was cleared for whitefella farms and later for roads and houses. The creeks and springs were polluted when they should have been looked after. Our people are still being moved on, killed and imprisoned.

Most of the Birds, Plants and Animals of our Land are also struggling to survive.

I hope our People will go back to the land and nurse it back to health.

Albert Corunna
Swan River Elder

Introduction

This story begins with a little wetland in our neighbourhood that had been almost completely covered by weeds. Only a few remaining remnant floral species such as Bullrush, Flooded Gum, Wattle, Swishbush and Paperbark had struggled to survive. They hinted at the swampy bushland that had once covered the area.

We decided not to use herbicides to control the weeds as intuitively we felt that by poisoning the earth we would poison ourselves. All kinds of chemicals that had been once been hailed as wonders of convenience are now considered dangerous and banned from use. We didn't want the responsibility of such a legacy. Our philosophy has always been "do no harm".

Our partners said it would be impossible to remove the weeds without herbicides but we still wanted to give it a try.

Volunteers have a lot of power. They do work that others don't want to do or cannot afford to do and they become the keepers of the area. They have the power to say yes or no because without them nothing will happen. So we began to learn about manual weeding. We adopted the Bradley Method of Bush Regeneration and started on a small scale. We slowly learned about the local conditions and the particular cycles and the rhythms of the land, climate and species.

As we achieved our first successess we had the confidence to gradually expand our method on to other reserves and degraded bushland in our neighbourhood.

From the outset we have always consulted with local Nyoongar Elders. As Non-Indigenous people our connection to the Life of the Land is only made properly possible through respectful relationships with Aboriginal People who are, were and always will be the First People of the Land. We feel enormously privileged and grateful to have had their ongoing permission, approval and support.



Little Wetland, Midland, 2003 (left) and 2014 (right).

Identifying Weeds

The first step is to learn to identify plant species so that you can distinguish the local remnant flora from the introduced flora. A good rule for weeders is: if you don't know what it is leave it alone.

Plant identification is not part of the scope of this booklet. There are already excellent guides to identifying plants in the Perth area such as *Western Weeds* by Hussey et al. You may be able to get positive identification of a plant from your local nursery, the Wildflower Association or the Western Australian herbarium.

Even with years of experience it can still be difficult to know for sure if a plant is a weed or a local, especially in their early stages of growth. Some local annuals look and behave like weeds and some weeds resemble locals.

Also some native species can be regarded as weeds, such as *Typha orientalis* or *Eucalyptus camaldulensis*, and when they have interbred with local species such as *Typha domingensis* or *Eucalyptus rudis* it becomes even more complicated. In these cases you will have to consider how invasive the hybrids are and weigh that up with the habitat they provide for native fauna.

Identifying plants may seem daunting at first but if you start with one species at a time and get into the habit of noticing them through their growth cycles and reproductive habits then you soon get a feel for them, from the cotyledons (seed leaves) onwards.



Left. *Baeometra uniflora*, a weed that looks like a native wildflower. Above. *Alternanthera nodiflora* looks and acts like a weedy annual but is native.

Philosophy

Our approach begins with Joan and Eileen Bradley's weeding book *Bringing Back the Bush*. We recommend their methods and techniques as a foundation for landcare works and as they are so well described and illustrated we have decided not to replicate that information in this booklet.

The Bradley sisters designed a bush care strategy that combines bushland walking with weeding practice. As they walked around enjoying the bush they removed weeds from small patches adjacent to healthy native bush plants so that native seedlings would germinate in the weeded area. When they passed by again they would remove new weeds which would assist the growth of the native seedlings. Only once the new seedlings were established would they start to weed a new patch adjacent to the seedlings.

The fundamental difference between our task and the task of the Bradley sisters is that we aim to restore far more degraded bushland. Despite this difference we believe the basic methods apply.

We may have modified their methods in our work but have always adhered to three critical principles.

1. *secure and work from the best areas of the site first*
2. *minimise disturbance to the soil and replace topsoil and leaf litter to avoid disturbing native flora and fauna and compromising the natural conditions of the site*
3. *resist the urge to overclear or overweed and let the regenerative ability of the native flora set the pace of clearance.*

1. Work from Best Areas First

Before doing anything walk around and calmly observe. Learn to focus on and identify the positive environmental values inherent in what remains of the local flora and fauna. Take time to learn to identify local flora and fauna so that they are not pulled or dug up, trodden on or disturbed. Avoid focusing on "problems" which can induce an overwhelming sense of hopelessness and encourage frantic and badly planned activity which can result in big mistakes with lasting consequences. Recognise that mistakes will be made but that small mistakes can be easily managed and rectified.



*Left. A remnant Flooded Gum on the creek bank in Midland. Understorey consists of *Bolboschoenus caldwellii*. This 'good area' was expanded by removing weeds to allow the native species to regenerate naturally.*



Left. An artificial dam on former grazing pasture at the Blackadder Creek Floodplain, Viveash. The lone Flooded Gum and dam was the starting point for tree planting to provide shade and enhance the habitat values.

The absolute priority is to secure and conserve the unique biodiversity of local remnant native flora. Look out for and encourage self-regeneration of local flora for that is the sign that the land has the ability to heal itself and is the most effective use of resources.

Weed a little at a time outwards from the good area of local flora to promote the natural germination of the seeds of local flora previously suppressed by weeds. Work with a steady, consistent and humble commitment to creating conditions that let the local flora and fauna return.

Be flexible in assessing what constitutes a "good area" with the best environmental values. It might be where the last remnant local flora species stands surrounded by nothing but weeds. Or it might be an area close to the water, rich in Aboriginal cultural values, but now littered with rusted shopping trolleys. It might be a small community of flora in a park or reserve that the council mowers have not destroyed. If you are lucky it might be a beautiful expanse of bushland with very few weeds.

2. Minimise disturbance

Minimising disturbance minimises mistakes and avoids damaging seed stock, seedlings and mature plants. Carefully work and weed around and away from remnant plants. Weed appropriate to the season. To avoid disturbance to reproducing local native flora and fauna, learn to identify their breeding seasons. To make your weeding easier, learn about the seasonal strengths, weaknesses and the reproductive life of weeds. Be flexible in your approach but always experiment with new techniques on a small scale. Your hands and low impact hand tools are your best friends as they do the least damage.

The Bradley Method avoids having to spend money on chemicals that can accumulate in the land and water. It is the safest response as it doesn't add to the chemical stressors already present in the environment.

Another mistake can be made when introducing mulch, which can inhibit the germination of seeds and smother seedlings. It can also be an unhygienic option introducing pests and pathogens.

The planting of seedlings should be sensitively and cautiously undertaken. Only plant seedlings where there is little or no potential for natural regeneration because the species is locally extinct or unable to migrate into the site or because there is no natural flood, fire or biological events necessary for germination. As some native floral species are more easily propagated from seed it is easy to overplant with them to create a monoculture that outcompetes and suppresses other local flora. Seedlings should be propagated from local provenance seed. Otherwise the seedlings may compete with local species and compromise their survival. These mistakes can be difficult and costly to rectify.

Keep a detailed record of activities undertaken and critically monitor the effects. Accept that mistakes are inevitable and that lessons should be learned from them. Once a practice has been evaluated as damaging, then cease or modify it so that the damage does not compound upon itself. Acknowledgement of mistakes inspires the best kind of creative solutions.



Self regenerating native Juncus seedlings growing among weedy annuals.

3. Do not overclear or overweed

Weeds, particularly in urban catchments, provide important habitat for native fauna. Blackberry shelters nesting wrens and Arum Lilies provide moist environments for frogs over dry months. So even in areas almost completely colonised by weed species restoration work should only be undertaken in stages so that native fauna have a chance to adjust.

Weeding in stages avoids the problem of building up too much weeded material that can pose a nuisance or a fire risk. Removing weeds offsite incurs costs, increases greenhouse gases and offloads the responsibility onto someone else. After each activity weeded material should be put into a compost heap onsite before being properly desiccated or composted and its nutrients returned to the land. Onsite disposal should be avoided where there is a significant risk of spreading Dieback.

Let the regenerative ability of the local flora set the pace of weed clearance. This strategy minimises mistakes and leaves time to develop activities that match available resources. Aiming for quality over quantity avoids exhausting the enthusiasm and energy of volunteers and workers. Resist the urge to do as much area as possible in the shortest amount of time as this ultimately depletes resources that must be reserved for critical followup weeding and for progress evaluation.

Always include follow up work in your planning. Measure the actual long term commitment of labour and resources available and start out working to that measure. Follow up work to remove weeds previously missed or weeds that have opportunistically germinated may need to be continued for a substantial period of time before local flora seedlings appear or before seedlings can be introduced. The border between weeded and non weeded areas is particularly prone to weed infestation where bare ground has not yet been filled by local flora. Follow up must be done to avoid ruining all the previous good work.

An exception to this rule is where an area has been depleted of upper storey floral species such as on former agricultural land. Tree seedlings can be planted into these areas and weeding can be postponed until the trees introduce shade and establish a microclimate. Meanwhile research understory floral plants that would best suit the area and introduce these as the trees develop.

We have successfully adapted the Bradley Method to our own urbanised creek reserves in Perth, but it can be adapted to any conditions. With proper application of these basic principles flora and fauna communities so superbly adapted to local conditions and free from disturbance and competition will over time return gains inversely proportional to the amount of labour and money required.

Never panic. Listen and observe and let the bush be your guide. At all times focus on maintaining the good areas while acknowledging that meanwhile weeds sufficiently contained will do their work in providing valuable habitat in areas not yet weeded.

Starting your project

1. Choose a site

Ideally the site should be close to where you live. Your local council will be able to tell you if the land is privately or publicly owned and who you should contact before starting your project.

2. Negotiate with the landholder

Land in private ownership may be earmarked for development. You might be able to negotiate with the owner to undertake restoration work if some of the land is required to be set aside as public open space. Developers may work with a bushland group to develop community links, which assists them in their development approvals and to offset remediation costs.

In the case of public reserves you may be able to negotiate with your local council to take over management. Councils will work with bushland groups to enhance community capacity and to offset reserve maintenance costs.

3. Form a Group

Contact your local natural resource management agency for information about integrated catchment management plans for the area, for information about other groups in your area and to get support from a dedicated resource officer.

Decide on your group's vision and objectives and devise a plan that you can present to the landholder, other groups and funding bodies.

4. Get message out into the community

Leaflet drop, post notices in public places such as the local library, have a sausage sizzle or a stall at your shopping centre to get people interested in the work you are planning to do, or are doing, and start to build a support base.

5. Funding

Local councils may provide start up funding for the group. Funding for works can be sourced from State and Federal Government agencies.

6. Legal stuff

Get public liability insurance to cover third party damage and volunteer injury. Educate your team about health and safety issues. Paid workers will need to have their own workers compensation.

7. Management plan

Draw up a table showing the 'who', 'what', 'where' and 'when' of your project. Include a risk management strategy with another table identifying risks, their likelihood and impact as well as how you plan to mitigate them. Having this sort of information ready will make it easier to deal with Government/funding agencies.

Tools and techniques



Pickaxe

Care should be taken when using the pickaxe because it has the potential to cause potholing and erosion of creekbanks. We recommend it mostly for providing leverage. When the blade is hooked under a rhizome such as False Bamboo, the handle can be pulled to lift the rhizome out of the soil. Only use the pickaxe around creek banks during the dry season when there is no water flowing.

Gloves

Leather welding gloves are essential if you going to be handling Blackberry.





Pitchfork

The pitchfork is a versatile tool. It is used to loosen the roots of mature bulbs, clump grasses and tap rooted weeds. It is also used to lever immature bulbs, rhizomes and seedlings. As with the pickaxe, the pitchfork should be used cautiously during the wet season to minimise soil disturbance.

Screwdriver

Use it for getting at bulbs in difficult places, such as among tree roots.

Bolt cutters

Bolt cutters are used for cutting the canes and branches of woody weeds. It is recommended the canes or stems be cut down to several centimetres above the surface of the soil before using a pickaxe or pitchfork to lever out the roots. Bolt cutters are also useful when reaching through prickly Blackberry brambles.

Hands and eyes

Our hands and eyes are valuable tools because they are sensitive and responsive to the spiritual and life affirming values of the environment.

The Weeds Themselves

Sometimes a weed can be used to control other weeds. For example Kikuyu grass, does not set seed and only spreads via runners so is very easy to control with solarisation.

Kikuyu will prevent other weeds from colonising a bare paddock in which tree seedlings have been planted. The Kikuyu will provide habitat and hold the ground together until it is time to weed or solarise before planting understorey species.

We are not suggesting introducing weeds into an area. But by observing and understanding existing weeds you will learn to work with them and their cycles rather than against them.

Let the sun do the Work – Solar weed control

Solarisation is the use of black plastic to control weeds through a combination of heating and light deprivation. It is particularly useful where the majority of native understorey flora has been replaced by introduced weeds, such as Kikuyu and Couch. Black plastic is also useful for killing grasses that grow among weedy bulb and tap root species and Morning Glory. By solarising the grass first it will be easier to locate and remove the bulbs and tap roots.

Black plastic can also be used as a preventative barrier between a weedy area and a weeded area. Any new growth of weeds will grow over the black plastic and can easily be gathered and rolled back and pushed under the plastic.

Use good quality black plastic so it can be re-used. Keep the plastic in good condition and avoid puncturing or tearing so as to minimise waste and maximise effectiveness. Bin any black plastic that has begun to shred.

Solarisation does not harm native bulbs and appears to enhance the self-regeneration of local flora. Solarised areas benefit from dead weed material forming a layer of mulch that retains moisture and cover.



The first sheet of black plastic is laid down along a ridge covered in Kikuyu at Spring Avenue Reserve, Midland.



The solarised area is gradually expanded and native shrubs and groundcovers are given a chance to grow without having to compete with Kikuyu.

Technique

For solarisation to be effective it is critical that all the green live parts of weedy runners, crowns and nodes are completely under the black plastic. Any green part of a plant that protrudes out from under the plastic or that is exposed to light will not die and will keep the rest of the runner or vine viable even if most of the plant is under the plastic.

Use continuous strips of black plastic weighed down along the length so that it is not blown around or torn. Any weeds that grow over the plastic from the unweeded area can be pulled back and rolled off the plastic onto the unweeded area.

Stage the solarising process by working small sections that can then be expanded out over time to ultimately meet with other sections. Be cautious with solarising and avoid the temptation to overclear. Weeds provide habitat and cleared areas are quickly colonised by new weed seedlings.

If there are trees or saplings already growing in an area pull back all grasses or weeds to ground level and wrap the plastic around the base of the trunk making sure that no green weed material protrudes. This does not harm the tree.

The length of time it takes to successfully solarise an area varies according to season, weather and site conditions such as shade.

Once an area is solarised remove the plastic or roll it over onto the adjacent weedy area. Use the plastic strips to establish a barrier around the solarised area. This prevents it from being re-colonised by runners from the weedy area.

After solarising remove any weeds that survive such as bulbs or grass crowns and continue to monitor and hand weed any new seedlings.

Check the solarised area for self-regenerating local flora before planting seedlings. We have observed the germination of rushes, Eucalypts and other species that must have lain dormant under dense mats of Kikuyu for years. Where there is no germination of dormant native seed, planting of propagated seedlings can usually take place the first winter after solarising as long as opportunistic annual weeds are controlled.

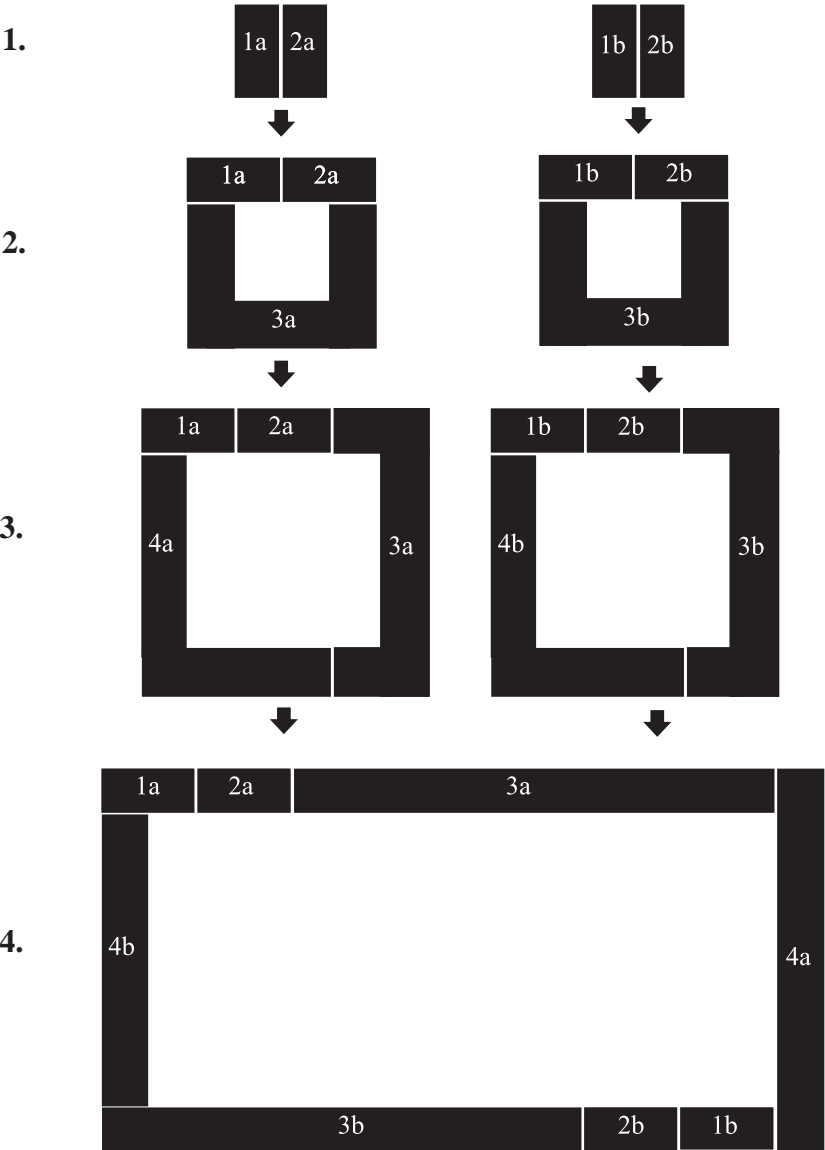
A balance has to be found between creating a solarised area that is large enough for the new native plants but small enough to manage the weedy seedlings. Only consider moving out the plastic once the native vegetation has established itself sufficiently in the cleared area.



Make sure all green parts of the plant to be solarised are pushed under the black plastic.

Mosaic strategy

The following diagram illustrates a mosaic solarisation strategy where two small solarised areas of 16 square metres are gradually expanded and combined in 4 stages over 24 weeks to form a larger solarised area of 480 square metres.

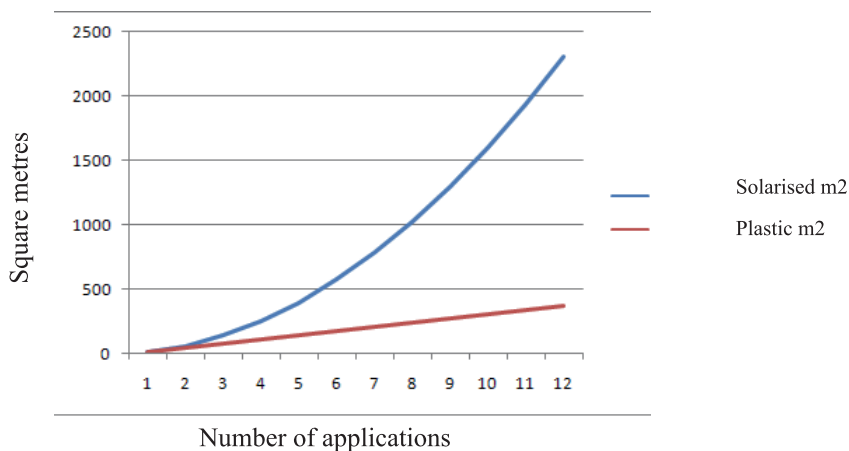


Months	Time	No. Applications
January-March	6 weeks	2
April-June	8 weeks	1.5
July-September	12 weeks	1
October-December	8 weeks	1.5

Above. Table showing maximum solarisation applications per year.

Applications	1	2	3	4	5	6	7	8	9	10	11	12
Solarised m2	16	64	144	256	400	576	784	1024	1296	1600	1936	2304
Plastic m2	16	48	80	112	144	176	208	240	272	304	336	368
Cost \$	11	34	56	78	101	123	146	168	190	213	235	258

Above. Table comparing the area solarised with the amount and cost of plastic required, assuming that black builder's plastic costs about 70 cents a square metre, over a 2 year period.



Above. Graph comparing the area solarised with the amount of plastic required.

Example. In 12 months it is possible to solarise 576 square metres using 176 square metres of plastic costing \$123. In 24 months it is possible to solarise 2304 square metres using 368 square metres of plastic costing \$257.60. While the solarised area expands exponentially with each application, the required amount of plastic (and cost) increases at a constant rate.

Note. These are examples to show the effectiveness of solarisation. Remember the solarised areas will need to be weeded until the ground is covered with native plants.

Quick Guide

Category	Weed	Technique	Time	Substitute
Annual herbs (see page 18)	Chenopodium, Fumitory, Pimpernel, Plantain, Pennyroyal, Nasturtium, Ranunculus, Vetch	Pull up plants before they flower. If seed heads have started to form the plants will have to be bagged for composting or removed from the site.	Late winter to early Spring	Alternanthera, Lobelia, Persicaria and Euphorbia
Biennials with tap roots (see page 19)	Dock, Pattersons Curse, Wild radish	Remove the tap root with a pitchfork and bag for composting. If beginning to flower cut down to ground level. If seeding, bag and compost seeding parts.	Winter to early Summer	Centella, Eryngium
Bulbs (large) (see page 20)	Arum Lily, Watsonia, Taro, Canna Lily	Dig up bulbs with a pitchfork, bag and compost on high ground on a sheet of plastic. In watercourses only dig during the dry season.	Dig Arums in Summer and follow up in Autumn. Pull up Watsonia in Spring.	Typha, Bolboschoenus, Patersonia, Triglochin, Haemodorum
Bulbs (small) (see page 25)	Guildford Grass, Oxalis, Cape Tulip	Pull up when the soil is wet. Oxalis can be exhausted by pulling up green parts and then follow up checking for regrowth. Solarising can weaken them over time.	Winter	Typha, Bolboschoenus, Patersonia, Triglochin, Haemodorum
Clump grasses (see page 26)	African Love Grass, Veldt Grass, Paspalum	Use pitchfork to lever out clumps if well established, otherwise pull out by hand. In some cases solarisation may be an option.	Winter	Austrostipa, Cyathochaeta, Neurachne, Eragrostis

Quick Guide				
Niche	Weed	Technique	Time	Substitute
Runners and vines (see page 27)	Kikuyu, Couch, Morning glory	Solarisation will suppress or kill shallow rooted runners. This method will reveal the location of deeply rooted nodes and these can be dug out.	Summer	Alternanthera, Centella, Kennedia, Hardenbergia
Sedges (see page 29)	Cyperus	Hand pick young seedlings as they appear. Mature plants can be dug out or the seed heads removed.	Spring to Summer	Carex, Juncus, Baumea
Trees (see page 30)	Brazilian Pepper, Fig, Castor Bush, Olive, Cape Lilac	Handpick new seedlings. Cut tree down to the base and remove new growth on a regular basis until dead.	Spring to Summer	Viminaria, Acacia, Melaleuca, Eucalyptus
Woody weeds (see page 31)	Blackberry, Arundo	Cut to the base with bolt cutters then prize out roots with a pitchfork. Regular follow up is required for Blackberry.	Spring to Summer, follow up after rain.	Viminaria, Acacia, Hakea

Note. This table is only meant to be a general guide. Please see the page numbers referred to for more detailed information.

Annual Herbs



Hand picking Pennyroyal growing among Alternanthera nodiflora.

Annual herbs are mostly a problem in newly solarised or weeded areas. While they are small short lived plants they grow quickly and seed prolifically and can inhibit the growth of self-regenerating native plants.

The most effective strategy for working with annual herbs is to hand pick them when they are large enough to identify and the soil is still moist.

The difficulty is that often native annual herbs can be found germinating among the introduced species.

Success depends on learning to distinguish weedy annuals from natives in their early stages of growth. This may seem daunting at first but with experience you can learn to distinguish weedy annuals from native annuals before they flower.

A few hours hand picking weedy annuals each September will bring long term rewards as the native annuals will have more opportunities to spread their seed than their weedy competitors.

The aim over time is to use basic gardening techniques to achieve a critical mass where annual weeds no longer out-compete native annuals.

Biennial weeds with tap roots



Make sure you remove the whole root when handweeding Dock.

Dock is a common biennial taprooted plant which can be very invasive particularly when its seeds have been blown or washed into a solarised or previously weeded area. The optimal time for weeding Dock and other biennials is when the soil is moist. Before removing large mature plants cut off and bag any seed heads. Then use a pitchfork to lever around the base of the plant, loosening the taproot from the soil. Finally, grip the central stalk as close to the ground as possible and lift the plant, taking care not to break the stalk or leave behind any roots. Where the ground is drier and harder you may need to do more work with the pitchfork. Shake off soil and use it to fill the hole.

Small taprooted seedlings can be removed by using a prong of the pitchfork to loosen the root from the soil. If you can catch biennial seedlings before the taproots develop then they are easy to handpick as annual herbs.

It is an effective strategy to target small seedlings in late winter and early spring.

All taprooted weeds will continue to grow if left on moist ground, so the roots must be immediately bagged and composted.

Bulbs (Large)

Large bulbs such as Arum Lily and Watsonia are easy to weed when you have an understanding of the growth and reproductive cycle of the plant according to seasons.

Arum Lily is at the peak of its cycle around September when the tubers will be sitting in waterlogged mud and the plants will be flowering. Do not dig up mature Arum Lily tubers at this time, it will lead to soil erosion and water turbidity.

Cut the stems back close to the ground using garden shears. This will not kill the plant but will reduce its ability to produce fruit and new tubers.

When the water in the creek has mostly subsided and it seems unlikely that there will be any more heavy rain the plant will go into decline. Collect any fruiting cones before they ripen. When the leaves start to wilt, that is the signal to start digging.

Between December and January is the optimal time for digging Arum Lily tubers. The vitality of the plant is low, the soil is dry but not hard and the new underground tubers have not started forming.

Lever with a pitchfork around the base of the stalks to gently lift the tubers from the soil. By the time you completely encircle the plant you should be able to detach the rootmass from the surrounding soil.

Then sit down next to the raised rootmas and gently pull away the larger tubers with your hands. Great care must be taken to ensure that all tubers are bagged and taken immediately to a compost heap on high ground.

When you have all the main tubers it is worth stiring through the soil looking for broken pieces. A white surface indicates that a tuber has broken. You will often find broken pieces or corms in the soil next to the larger tubers. Be as thorough as time allows, but don't worry, you probably won't get them all the first time.

The fleshy white roots that grow downwards from the tubers cannot regenerate if separated from the tuber. The only underground parts that can reproduce are the tubers that snap when you bend them and contain a white surface.



Above left. Cutting back the stems. Above right. Collecting seed cones.



Above. technique for levering out the root mass of a clump of Arum Lilies.



Above: A whole Arum Lily tuber with no broken parts.



Above. A broken Arum Lily tuber with white surface showing.

The follow up work is essential but is not difficult. After rains in April or May you will start to see small Arum sprouts emerging from the places that you previously dug up the main tubers.

Use a pitchfork to go around the outside of the sprouts and gently lift the bulbs. If the soil is moist you should be able to lift each sprout including the small tuber at the bottom. Take care to bag all of the small sprouting tubers for composting.

Follow up work requires several visits to the site between April and June, gently plucking up the last sprouts and seedlings.

When there are no new shoots by August then it is time to start planting.

To start an Arum Lily compost, lay down a sheet of black plastic on high ground above the floodway of the creek. Place the tubers in a pile. Over summer most will be completely dessicated. It may take more than a year to process each pile. You may need to go through the pile, discarding dessicated pieces and keeping any pieces that are still moist inside and put them on a new heap. When you are familiar with them you can tell from looking at them if they are viable. If you are not sure, break the tuber in half. If it snaps and there is a white surface then it is viable. If it crumbles and is yellow or brown then it is dead.



Above left. New sprouts hand weeded when soil is damp. Above right. All tubers should be placed on a sheet of plastic on high ground where they will be dessicated by the summer sun.

Watsonia is one of the easiest weeds to control with but timing is critical. Weeding can only be done when the ground is soft after winter rains and when the plant has sent up its green leaves and the early flower stalk. This is usually between August and September in Perth. The new year's corm or bulb is the small white fleshy part in the middle. By grabbing the flower stalk close to the ground the whole of the plant complete with corm can be pulled up. It is not necessary to pull up or dig out the outer husk of previous years' growth as this no longer alive or viable and will help to minimise erosion along creeklines.

In a heavy old infestation corms may have grown in layers. It is important to identify the most recent corms which are usually at the top or around the edge of the clump. Be guided by the ease with which the plants are pulled as usually the more recent plants come out the easiest. Once the more recent watsonia are removed the older bottom layer or corm can be just as easily pulled out.

A large clump of watsonia or a single watsonia can be loosened by levering under the plant with a pitch fork. If the stalk comes away without the corm don't waste too much time trying to dig it out. Rather leave it and come back again the next year to remove it. Don't waste too much time or energy in levering out and fossicking for bits of a missed watsonia. This disturbs the soil unnecessarily which should be avoided. Just move on happy in the knowledge that many or most of the watsonia corms have been successfully pulled up. Without their flowering stalk the few stubborn corms will be unable to successfully produce seed that year and can be targeted in subsequent years.

To successfully turn the watsonia plant material into mulch it is important to shake off excess earth from the corm as you weed. Remove the weeded watsonia material onto a large sheet of black plastic and leave in a dry open space over the summer. Turn the pile a couple of times over the summer. By the next winter almost all of the corms will be sufficiently dried out to be returned to site as mulch. If the corms do not appear to have fully dried out then continue to turn them occasionally. With this method valuable biomass in the weeded material can be retained on site, saving on transport and waste disposal costs.

If the *Watsonia* does not come out easily it may be because you started work too late. The best course of action is to remove flower stalks and be ready to remove the plant at the right time next year.

Using this method a few people can clear large areas of watsonia over a couple of years. Always ensure on each return that follow up work to remove watsonia that was missed in cleared areas on previous visits takes priority before moving onto weeding new areas. Then marvel at how it easy it was to clear knowing that not a drop of chemical needed to be used.



When the soil is moist in spring Watsonia bulbs are easily pulled up.



A pile of composting Watsonia at Spring Avenue, Midland.

Bulbs (Small)



Take care to remove all the tiny cormels that surround the mature bulb. Each of these cormels will become a new plant if left behind.

Small bulbs usually grow in profusion but don't let that deter you. Each year from August to October when the ground is soft set yourself a small targeted area for clearing of small bulbs. Aim for clearing one bulb at a time. If the soil is very soft the bulb will come out with a firm and steady pull of the stalk. Where the soil is less soft and where bulbs do not come out so easily use a pitchfork prong, trowel or screwdriver to gently loosen the bulb under the stalk from the soil before pulling on the stalk.

Take special care with bulbs that reproduce via many tiny cormels (little bulbs attached to the main bulb). Take your time to try to collect all the cormels and immediately bag for composting. Use a trowel to scoop a ball of soil around the bulb to catch all the cormels. Place the ball of soil containing bulbs and cormels onto a sheet of black plastic in the sun for dessication over summer. If you are not prepared to collect all the cormels it is better not to disturb the bulb in the first place, although in that case you will need to cut off flowers and seedheads.

Do not to overdig as this will make it more difficult to find the small bulbs and may also disturb small delicate native plants such as mosses and groundcovers.

Ensure that all bulbs are bagged as you go and then put on a plastic lined compost heap specifically for bulbs.

Clump Grasses



Use pitchfork to lever a section from the outside of the clump.



Make sure the whole of the root comes out.

Clump grasses, such as Paspalum, Pampas Grass, African Love Grass and Veldt Grass, grow in large clumps with shallow but sturdy roots. Before weeding clump grasses remove any seed heads and bag them for removal to a compost pile.

A large paspalum plant cannot be dug out all at once as each section of the clump supports the other. Start by levering with a pitchfork a small section of the paspalum from the plant's edge where it will come more easily. Pull out the small section. Move around the plant levering and pulling out more small sections of the clump. Each small section will increasingly come out more easily than the others before it. Make sure all the root is taken out when removing each section. Shake off the earth clinging to the roots. Keep working around the clump until finally without the support of its external sections the central clump can be levered out, bagged and composted. Both the seeds and the roots should be bagged and composted in their own compost heap where they will easily compost within a year. Put back earth into the hole from which the paspalum has been removed and smooth over before moving onto the next plant.

It will be necessary to weed small paspalum seedlings for the next year or so otherwise they will soon grow into new clumps. During a walk through the area small seedlings can easily be pulled up by hand but make sure that all the root is included before being bagged and put on the compost heap.

Runners and Vines



Above. Before treatment. Above right. Sheets of plastic are laid down around native trees.

Right. The same area after solarised area has been extended. Right (inset). After solarisation new Morning glory shoots are easy to spot.



Runners and vines can provide good habitat. The aim is to manage their spread and push them back in stages away from good areas of bushland or waterways and to stop them from smothering remnant flora and preventing natural regeneration.

To control vines there must be a strategy for managing both vertical and horizontal growth. Cut off the water supply of vines growing in tree canopies by severing all vertical vines at ground level. Once the vertical vines are cut then any vines growing along the ground can be suppressed or weakened by solarisation. To prevent new vines climbing up the trunks of trees wrap black plastic around the base of the trunks at ground level. If black plastic is not used you will have to come back the following year and cut back new vertical vines.

Try to avoid pulling on vines that have climbed into the canopy of native trees because this can damage live tree branches. Once vertical vines are cut parts of the vine left in the tree will eventually dry. This method retains habitat, doesn't cause damage the tree and stops the vine from totally smothering the tree.

When managing horizontal growth, for example when Morning Glory has grown along the ground and into a wetland, start from the recent growth and work back towards the older growth. The aim is to identify the end of the vine and roll it up as you walk back to the root from which it has grown. From each root there are generally several branches. Once you have found and removed the root and its branches you can then start rolling the vine back to the next root.



Above. Solarising Morning glory vines on a steep bank.

Weeding progress begins to slow as you work your way back towards the centre of the plant because the roots will become deeper and harder to remove because they will have had more time to grow. Also the vine cover will be more dense. In these dense growth areas you may consider using black plastic to kill or weaken the shallow or horizontal parts and expose the location of deep roots.

Start tracing back new growth to the first shallow roots at the end of winter. Dig out shallow roots from October to December while the ground is soft. At this stage you will probably haven worked your way into an area of thicker or denser vine cover. Also the vine may be growing amongst runner grasses or other weeds. Solarisation will often kill the other weeds so the vines and their roots can be more easily located.

Use black plastic to cover the weedy area for about six weeks. After that roll the plastic onto an adjacent weedy area and leave it there. This plastic will remain in place as a barrier between the weeded area and the unweeded area.

Within the solarised area it will be necessary to pull up any viable vines and dig up any roots. These can be dug up using a penknife or a pitchfork depending on their size.

As part of the staged approach to removing vines it is necessary to go back and do follow up work. Begin in the area where you previously dug out the vine roots, removing any roots that were missed. When you are ready to expand the weeded area, pull back any new vines growing on top of the plastic barrier and roll into balls. Move the plastic onto the adjacent area of growth to be weeded and place the balls on top of the plastic. This stops the vines from re-sprouting. Then start weeding the area that had just been under black plastic for any vine roots and viable vines which are easy to identify from new shoots that will appear.

In this way the black plastic acts as movable barrier from the edge of the infestation to its centre.

Using this method we have been able over a 2 year period to completely remove infestation from within the edge of our wetland for a distance of almost 20 metres including over the top of a 5 metre bank. However we always continue to monitor the cleared 20 metre area for any regrowth of vine that we may have previously missed .

Sedges



Above. Pulling up Cyperaceae seedlings growing among Juncus amabilis.

Bare ground on creek banks following solarisation is quickly colonised by both native and introduced sedge species.

At Blackadder Creek our biggest problem has been *Cyperus polystachyos*, a prolific seeder, growing among native *Juncus sp* seedlings. When the main flooding events of the wet season have finished and the ground is still moist, usually around September or October, a few hours of careful work handpicking the weeds in their early stages of growth will save a lot of work in the future. It will also save you money if you consider that each native sedge you rescue in this way is \$1 that you no longer have to spend on propagation. Even if the ratio of native sedges to weedy sedges is 1:10 that may represent a potential saving of hundreds of dollars per square metre.

Remove mature plants by leveraging the roots with a pitchfork. As with annual weeds it is critical to remove the plants before they seed.

Trees



Wild Fig at Plunkett Park, Midland

At Blackadder Creek there are several weedy tree species including Coral Trees, Willows and Poplars, which do not appear to reproduce. Figs (*Ficus sp*), Olives (*Olea europaea*), Castor Oil Plant (*Ricinus communis*) and Brazilian Pepper Trees (*Schinus terebinthifolius*) are the ones we have to watch because occasionally new seedlings are found.

The best strategy is to regularly walk through your local reserves and pull the seedlings out while they are still small.

For dealing with mature trees cut the trunk down to the base using a handsaw or boltcutters. Regularly cut off any new growth so that over time the tree will die.

If you cut the trunk of a Brazillian Pepper Tree this will result in multiple basal shoots forming new trees. If there is no commitment to follow up work then one tree will rapidly become many. In that case you would be better off leaving it alone.

Woody weeds

Blackberry provides better habitat than most other riparian weeds. Its network of horizontally spreading suckers are good for maintaining creek bank stability. The leaves are eaten by native moths and the ripe berries are popular with small birds such as wrens, silvereyes and pardalotes. Blackberry thickets are avoided by cats and often used as nesting sites for small native birds. Use a staged approach.

Blackberry is one of the most challenging weeds. It is prickly and the roots break easily and require regular monitoring for regrowth. The main problem with Blackberry is that it provides good habitat and protection for native fauna and careful thought and planning should go into timing, pace, extent, and what you will plant in its place.

The best time in the growth cycle to begin working with Blackberry is in January or February. At about this time the leaves begin to wilt, and this is when the vitality of the plant is at its lowest.

The first step is to cut the canes. Boltcutters are used to cut the canes close to the ground. Then, wearing a thick pair of leather welding gloves, pull the cane, folding it every foot or so and then using the soft ends to wrap it together into a bundle.



Cutting Blackberry canes at Spring Avenue, Midland.

It is very important not to try this during spring and early summer when a lot of bird nesting is occurring.

Depending on the fire risk at your site, it may be better not to stack Blackberry bundles in a pile. An alternative is to disperse the bundles around the site away from water.

Next, use a pitchfork to dig up the main root node or crown underneath each cane. After loosening the soil around the canes, pull the crown out with your hands. Some shallow horizontal roots, like subsurface runners, can also be pulled up at this time. This work should be done during January and February, especially as Blackberry usually grows on creek banks and you will want to minimise soil disturbance. The soil is hard at this time of year, so don't worry if the horizontal roots break and you can't get them all. At this stage just pull up as many of the larger roots as you can.

Pick up any root pieces and place them on a sheet of black plastic in the sun. When they are thoroughly dried the root pieces can be dispersed on higher ground.

After the main crowns and larger runners have been pulled up there is nothing to do except wait for rain. The first heavy shower in April will soften the soil and some viable pieces of Blackberry root in the soil will sprout leaves. At this time you can use a pitchfork to gently lever the new crowns and pull up more horizontal roots.

When the creek is in flow it is time to wait again. Around October or November, after the heavy showers have finished, it is time to look for Blackberry sprouts and to pull them up.

Follow-up is the most important part of working with Blackberry. If you are just going to pull up the main roots without a follow up plan then it is better to leave them alone considering the habitat value.



Left. After cutting the canes use a pitchfork to lever out the roots. The roots are shallow but easily break, leaving viable parts that will sprout again after rain. Regular follow up work is required for several years.

False Bamboo is very easy to remove with the right technique and strategy. It is important to consider the habitat value of the weed when planning work.

While dense thickets of False Bamboo offer hiding places and shelter for native fauna, they do not provide much food and are low in insect activity. The networks of rhizomes are useful however in providing shade and creek bank stability.

Timing is everything. Never dig up False Bamboo from a riparian area during the wet season. This will erode the creekbanks and increase water turbidity. Also, broken fragments of the plant will wash downstream starting new colonies.

The best time to weed False Bamboo in Perth is January or February when there is no water in the creek and little chance of rain.

The first step is to cut the canes close to the ground using a pair of bolt cutters. Take the canes and stack them on higher ground. At this time of year they will not be able to strike new roots and after a few months they will be dead. If it rains during this time it might be necessary to watch the canes for any sprouting and to shuffle the canes around so that the sprouting ones are on top and not touching the ground.

The second step is to clear away leaf litter or other materials from around the base of the cut canes. This will help you to see where to dig.

The third step requires a tool for leverage. Don't use a pitchfork, you will only break it. The best tool for the job is a sturdy pickaxe. Start with one of the cut canes at the edge of the colony. Use the blade to scrape the dirt away from base of the cane until you find the outline of the rhizome, which resembles a large piece of ginger. Ease the blade of the pickaxe under the rhizome, it will be not be very deep. Once you get the blade wedged under the rhizome then pull the handle of the pickaxe back as a lever to prise it loose.

The best technique allows gravity and leverage to do the work rather than physical exertion.

Try to keep the rhizome pieces as whole as possible and avoid smashing them or creating small fragments unless you are prepared to pick them all up. When you are finished, stack the rhizomes on a piece of black plastic in the sun. Left for a few months they will dry out and be incapable of new growth.

Keep your stack of rhizomes well away from the floodway in case there is a sudden storm.

A big stand of False Bamboo can look very intimidating but it is actually one of the easiest weeds to work with because it usually requires little follow up and the site will be ready for planting in the following wet season.



Cut the bottom of the canes with bolt cutters.



Use the handle of the pickaxe as a lever.

Case Study: Plunkett Park

We started studying this site in 2007. Our first step was just to observe and learn from the species and conditions on the site and their seasonal changes.

At the time there were some large mature Flooded Gums (*Eucalyptus rudis*) and some small to medium sized Paperbarks (*Melaleuca raphiophylla*). There were a few remnant sedges (*Juncus pallidus* and *Juncus amabilis*) struggling to survive among the weeds. We collected seeds from these remnants.

The creek in this area is very winding and branched, forming small islands. The soil is fine alluvial clay which is soft mud in winter and hard as rock in summer. During winter rains the creek often breaks its banks and the whole area resembles a lake for several days at a time.

On first rains the Arum Lilies (*Zantedeschia Ethiopica*) sprouted, using their stored energy to quickly shade out any germinating seedlings. When the creekbed started to dry up around November or December the Arums died back and the Kikuyu (*Pennisetum clandestinum*) took over, climbing over everything and creating a dense mat. By working together these two weeds had prevented any natural regeneration at the site for decades.

Our first step was to look for reference sites nearby to try to piece together the original structure of plant communities at the site. In nearby Eveline Reserve we found more species of sedge (*Carex tereticaulis* and *Eragrostis sp.*). In the surrounding wetlands were shrub species such as *Melaleuca viminea*, *Melaleuca lateritea*, *Viminaria juncea*, *Acacia saligna*, *Taxandria linearifolia* and *Astartea leptophylla*.

As we developed our seedbank we thought about the Arum-Kikuyu team. It worked very well and a kind of status quo had been established. The stability made for good habitat, judging by the presence of Dugites and Owls. The dense undergrowth was a hiding place for insects, lizards, spiders, frogs and rats. To simply go in and spray the area would be disastrous for the native fauna, and the area would just be taken over by new weeds next season. It would be better to do nothing.

We looked for native species that would fill the same niches that were then occupied by the Arum Lilies and Kikuyu. These species were all close by, but their populations were small.

We knew that given a chance rhizomatous groundcovers *Centella asiatica* and *Alternanthera nodiflora* could perform the same seasonal job as Kikuyu. Native bulbs such as *Typha domingensis*, *Bolboschoenus caldwellii* and *Triglochin sp* could fill the role of the Arum Lily.

In 2009 we successfully applied to the Federal Government for funding through the Envirofund program. This project just focussed on digging Arum Lilies. What we



Digging the first Arum Lilies at Plunkett Park in 2009. As reference points note the footbridge in the foreground and the distinctively shaped Flooded Gum in the background.

learned though this was the importance of timing and strategy. It is hard work digging out Arum Lilies that are covered in Kikuyu. It is a better strategy to target the Kikuyu first by solarising it. The Arums will not be affected but once the Kikuyu is gone the Arums will be easier to dig. Also, when the Arum bulbs that you missed (you always miss some on the first round) start sprouting, you will be able to spot them and deal with them quickly.

After solarising about 50 square metres of Kikuyu over January, we dug out the Arum Lilies in February. A small area of creekbank was included. Digging Arums on creekbanks should never be tried when the creek is flowing, due to turbidity and bank stability issues.

After the Autumn rains we dug up the sprouts from little bulbs that we missed the first time. Over the winter we watched the area and by the Spring of 2009 we were satisfied the Arums were all gone. With no Arums or Kikuyu to compete with, it was time to plant our sedges, which we had propagated from the local remnant *Juncus* species.

In the Summer of 2010 the sedges we planted in the solarised area were thriving. It was necessary to hand weed a few weedy annuals such as *Paspalum sp* and *Cyperus sp*, but it looked as if the solarisation had killed most annual seeds in the soil.



Above. solarisation in 2009. Below. Native sedge regrowth in 2010.



What we didn't expect was that after solarising there would be such an appearance of a native bulbs (*Bolboschoenus caldwellii*), native rhizomes (*Alternanthera nodiflora*) and the germination of some Flooded Gums. This was probably the first natural regeneration of native species on the site in 50 years or more. These were signs we were on the right track.

Our next concern was to establish boundaries around our solarised areas to prevent Kikuyu runners from recolonising. We used a long 2m wide strip of builder's plastic, weighed down with whatever was handy. Every month or two, we'd check underneath and when the Kikuyu was dead we'd flip the plastic over and start cooking the next bit of grass.

Now that we knew our methods worked we applied for funding under the State NRM to expand the project in 2010 and 2011.

As the Arum bulbs were dug up they were bagged. When the bags were full they were carried to an on-site composting area. This was a sheet of black plastic on higher ground, away from flooding, where the bulbs were piled. Over the summer most were completely dessicated. The compost heap had to be sorted every year and the viable bulbs left out for another year.

By the Spring of 2011 the site had taken off. Once you get to this stage there is not much work to do apart from maintaining the boundaries and doing occasional handweeding. Every year the area was expanded by a few hundred square metres, more sedges were planted, and more and more native species were coming up by themselves.

In 2014 the solarised area has expanded to half a hectare. It requires a little hand weeding and maintenance apart from adjusting the boundaries twice a year. There is a thick undestorey consisting of native bulbs and rhizomes (*Bolboschoenus caldwellii*, *Centella asiatica* and *Alternanthera nodiflora*).

Sedges from this site and nearby reference sites are producing millions of seeds every season and spreading into newly solarised areas.

Fauna habitat is now more varied and just as dense. Insect pupae are more commonly seen, especially moths, dragonflies, beetles and cicadas. The whole place has a vibrancy and spirit that it lacked when it was a weedy paddock in 2008.



Before and after photos: spring 2010 to spring 2013.

Case Study: Arum Lily as habitat



Christmas beetle in Arum Lily tunnel.

Before we started work on our Arum Lily project at Plunkett Park we looked at all the options before us.

A local environmental contractor recommended spot spraying of Chlorsulfuron and Garlon with surfactants such as Pulse and diesel, and blanket spraying with Chlorsulfuron and 2,4-D amine. *Bushland Weeds* (Brown and Brooks 2002) recommended spraying between June and September, our wet season.

When we researched Chlorsulfuron we found that it is potentially hazardous to aquatic organisms even at low environmental concentrations. According to studies it persists in the soil for more than a year and significantly alters the mass and composition of soil microorganisms. Soil adsorption is dependent on soil type, with a demonstrated low affinity for fine clay soils.

Garlon (Triclopyr) residues have been found to persist in the soil for more than a year. The average half life has been estimated at 138 days. There is an established body of research detailing the effects of Triclopyr toxicity on fish, amphibians, zooplankton and invertebrates. Negative impacts from lower than expected environmental concentrations have been recorded on the survival and reproduction of freshwater crustaceans and amphibians. Research suggests that zooplankton and tadpole populations could be at risk in already stressed wetland sprayed directly or indirectly with Triclopyr.

2,4-D is potentially carcinogenic and has been linked to an increased risk of amyotrophic lateral sclerosis, a motor neuron disease. Other studies have suggested that 2,4-D causes abnormal morphology and decreased motility and death in human sperm. It is a suspected endocrine disrupter.

From our previous work at the site we knew that hand weeding would potentially disturb the soil and any soil dwelling fauna that might be associated with Arum lilies.

We knew Arum lilies provided great habitat for introduced slugs and snails.

We also learned that some of the large tubers decayed over summer, giving off a characteristic fecal stench, attracting flies, slaters and cockroaches.

Tufts of paspalum in the middle of Arum lily colonies are favoured by rats for nest building. The nests are usually full of Arum lily berries. Native fauna such as Dugites and Bobtails patrol the Arum lily understorey in search of rats and insects.

We have noted Tawny frogmouths and Mopokes in areas where the understorey is dominated by Arum lily. While they are probably interested in eating introduced fauna such as rats, their needs still have to be considered.

In summer, when the succulent stems wither and rot they leave behind tunnels which are used by native fauna, in particular summer burrowing animals.

One of the most commonly found species we found digging Arums at Plunkett Park were Christmas beetles. The pupae were often found in the soil around Arum lilies. Whether the larvae had fed on Eucalyptus leaves in the canopy above and then dropped down and burrowed into the soil, or whether they fed on underground roots, we don't know. What we noticed was that they used the tunnels created from rotting Arum lilies as pupation sites.

Another species that we discovered was the Impatiens Hawk Moth (*Theretra oldenlandiae*), a species with a natural distribution from China and India through South East Asia to Australia, which has adapted to eating Arum lily leaves.

Impatiens Hawk moth larvae can grow up to 7 cm in length and the pupae and adults provide substantial meals for native birds and reptiles.

Reptiles such as Marbled Geckos (*Christinus marmoratus*) have been known to seek shelter under Arum lilies. Presumably they are also interested in the various insects using Arum lily as habitat.

Frogs such as the Sandplains Froglet (*Crinia insignifera*) and the Moaning Frog (*Heleioporus eyrei*) both crawl into the tunnels left by decaying Arum Lily stems where they find good places to burrow in Summer.

Care can be taken to minimise injury to the animals that use Arum Lily as habitat, but there is no way to avoid disturbing them altogether. That is why it is important to not clear too much Arum Lily in one season.



Some of the native fauna using Arum Lily as habitat: Hawk moth pupa, Gecko and Moaning Frog.

There are many factors to consider when you decide on your strategy and methodology, including the size of your project area, the time of year and site conditions, the native fauna utilising weeds as habitat, native flora growing in the midst of the weeds, water quality and also the health and safety of the humans who will be doing the work.

Case Study: The Flooded Gum



Flooded Gum (Eucalyptus rudis) at Blackadder Creek, Midland.

The Flooded Gum is the tallest tree in the Blackadder Catchment. There are remnants that are many hundreds of years old. Every mature Flooded Gum is precious, not just for heritage value but because they provide the essentials of life for countless lifeforms, from microscopic organisms to humans.

The work of restoring Blackadder Creek not just about having more trees around. What we are really interested in is the web of life that each tree supports, so it is worthwhile to look at trees in a holistic way.

Some trees attract birds by producing sweet fruits or nuts rich in fat and protein. The birds then provide the tree with nitrogen rich waste products. Eucalyptus trees use a different strategy. They use insects to provide sugar, fat and protein to attract birds.

Have a close look at the leaves of Eucalyptus trees planted by the Council on street verges. They are invariably species from the other side of the continent. In Midland we have Queensland bloodwoods. You will notice that the big glossy leaves are all perfect, with hardly a blemish on them. Compare that with a Flooded Gum growing in the bush. It is rare to find a Flooded Gum leaf that is without signs of insect activity.



Lerps on a partly eaten Flooded Gum leaf.

The reason for this is that a Flooded Gum in its natural home is far more than just a tree, it is the sum of many mutually beneficial relationships.

The most important inhabitant of the Flooded Gum canopy is the psyllid, a tiny sap sucking jumping louse. Psyllid larvae secrete crystallised honeydew, which they use to construct intricately patterned shelters called lerps.

Psyllids take sap from the tree, but in return the psyllid attracts a whole chain of life into its branches that the tree ultimately benefits from.

Shield bugs, ladybirds, lacewings, hoverflies, dragonflies, spiders and lizards prey on psyllids. Birds love the sweet lerps, especially honeyeaters, pardalotes, willy wagtails, silvereyes and parrots.

Even humans are partial to the sweet taste of lerps, they are delicious!

Psyllids also seem to have a relationship with the red warty galls that are often seen on Flooded Gum leaves. One theory is the sucking tube of the psyllid larvae is somehow able to inject its DNA, via a symbiotic bacteria, into the nucleus of plant cells. In other words, galls are weird and wonderful structures, designed by insects and built by plants.

Unfortunately there is very little interest in the special relationships insects have with Eucalyptus trees. It is really only with the recent investment in Eucalyptus plantations that there has been some research into Eucalyptus insects. Sadly the forestry approach is to treat a tree as so many dollars per tonne of wood. Insects are merely seen as pests that need to be destroyed for fear they will eat into the bottom line.

If you ever walk through a Eucalyptus plantation one thing you notice is the silence. There are no birds. The plantations are sprayed with pesticides to kill the insects.

After sap sucking psyllids, the next most important group of insects are the moths. Flooded Gums host more moth species than any other tree in our Catchment. Small moths like leaf miners, leaf rollers, concealer moths, gum-leaf skeletonizers and autumn gum moths are snapped up by willy wagtails, skinks and frogs. Larger moths like cup moths, snub moths, hawk moths, snout moths, emperor moths, ghost moths and hairy marys provide meals for magpies, owls and marsupials.

Moth caterpillars feed at night and hide during the day. If you look carefully you will see the signs of their activities, scribbly patterns on leaves, leaves with chunks taken out of them, folded leaf shelters. Sometimes the best way to get an idea of moth populations is to watch for cocoons and chrysalis skins in the bark or around the base of trees.

Our largest moth at Blackadder Creek is the Ghost moth, which live in tunnels feeding on Flooded Gum roots. After autumn rain you will see hundreds of the empty chrysalis shells poking out of their tunnels.

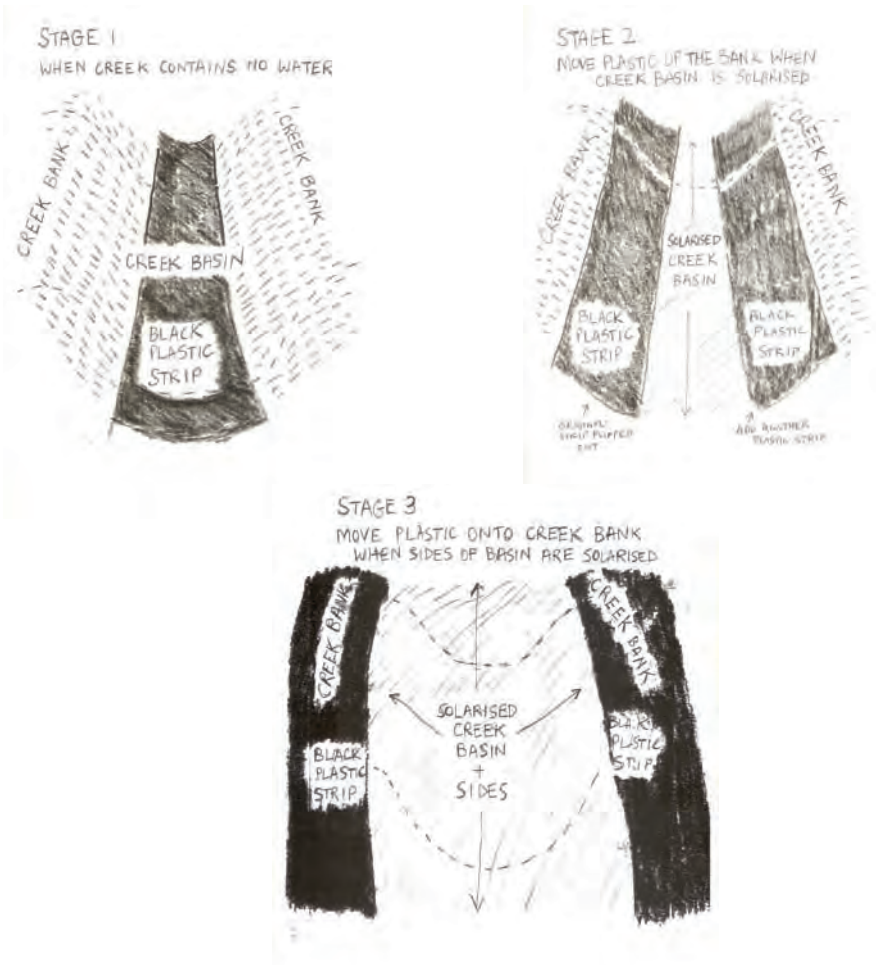
Dozens of animal species are drawn to Flooded Gums because of the sugars, fats and proteins developed by sap suckers and leaf eaters. The waste products and dead bodies of these animals, and their predators, provide nitrogen to the tree.



Ghost moth pupa shell in Flooded Gum understory. Native birds require healthy moth populations.

Case Study: Solarising a waterway

To solarise a waterway that has been completely invaded by grass, start in summer when there is no water and lay two long strips of black plastic to cover the centre and edges of the channel. Within a month or so the plastic can usually be flipped over up the edges of the waterway basin and onto the banks. Continue to monitor that the plastic stays in place during summer wind and rain events and re-secure if it has moved. At the end of summer the plastic can be flipped over onto the bank before the first winter rains. The dead rhizomes and crowns will continue to stabilise the banks until dormant sedge seeds germinate or until the area is planted out with sedge seedlings. Continue with follow up weeding in the solarised area digging up and removing any grass crowns and weeds that may have been missed or that have germinated in the area.



Weeds as food and medicine



Forager's Salad including Soursob, Nasturtium, Watercress, Wild turnip flowers, Marshmallow, Nightshade berries, Brazillian peppers, Patersons Curse flowers.

Many of the weeds now naturalised in the South West were deliberately imported because they were regarded as useful plants. Some were introduced as food for livestock and some for their traditional medical uses.

There are many edible weeds growing in public reserves around Perth, but there are also some that are very toxic. Don't try to eat any plant unless you have correctly identified it and done your research. If you aren't 100 per cent sure then don't eat it.

The other issue to consider when eating wild plants is contamination. Don't eat plants that are growing downstream from waste disposal sites, sewerage pumping stations, industrial areas or places where herbicides have been used. When looking for weeds to eat it is worth studying maps and local history and most of all talking to locals who know the area well.

Forager's Salad is a balance of sweet, bitter, sour, spicy and bland. It is fresher than anything you will get in a restaurant or supermarket and costs nothing.

Imagine if urban waterways were not so polluted and people were aware of the value of these plants. There would be no need for weed control because people would be harvesting them for food and medicine. This is how the waterways were in the past, they were gardens supplying all of the needs of the people.

A garden, not a wilderness

To the distant eye the country has the appearance of being well wooded, but I should not say it was thickly timbered. In some places there are open plains that resemble well ordered parks.

George Fletcher Moore, Swan Valley, 8 December 1830.

The word “bush” is derived from the Afrikaan “bosch”, meaning land that had not been occupied by Europeans. In Australian colonial mythology “the bush” is a pristine wilderness that is exotic, romantic, disorienting and terrifying. It is simultaneously “untouched” by humans and inhabited by savages. According to this view “the bush” is contrasted with orderly urban and rural landscapes.

It is as important to weed out these myths as it is to weed on the ground.

Two centuries ago Woombanung had the appearance of a well maintained parkland abounding in kangaroos, birds, turtles and fish. It was known for its many springs of delicious water that flowed all year round. Today Woombanung is called Midland, a jungle of concrete and weeds best known for its poor urban planning, regular sewage spills and sites contaminated by heavy metals and pesticides.

Once it was a Garden: today it is a Wilderness.

Aboriginal people have been prevented from looking after their land and their Garden has fallen into neglect. The prisons are overflowing, the Swan River is almost dead, the once abundant fresh water springs have dried up, the tributaries are polluted and choked and every year more native flora and fauna species become endangered or extinct.

These problems may appear desperate and insurmountable. The usual response is to panic and do something stupid or deny there is a problem at all.

Of course there is no quick fix but by following the methods and philosophies outlined in this booklet, any problem can be solved slowly and steadily.

Stay calm, take the time to observe before acting, learn to identify what is local so that it can be protected and cultivated. Start small, be realistic about maintaining a long term commitment and don't be afraid to reflect critically and honestly on what you have done. Learn from your mistakes.

Then the Wilderness becomes a Garden.



Restoring understorey species at Spring Reserve, Midland, 2011-2014

