**BEGA RIVER AND WETLANDS LANDCARE GROUP (BRAWL) MANAGEMENT STRATEGY**

**PURPOSE OF THIS STRATEGY**

To assist decision making by BRAWL, and ensure that volunteer effort is effective, including by clarifying the things to consider when planning and carrying out activities on sites.

**GOALS OF THIS STRATEGY**

To clarify things to consider before planting, and approaches to site preparation, planting and maintaining plantings.

To identify appropriate species for planting at sites.

To identify and/or clarify weed management objectives and priorities for sites: i.e. which weeds, where and how; including on a seasonal basis.

To mitigate the threats posed by weeds on values of sites managed by BRAWL, including quality and survival of plantings.

To establish ways to monitor success.

To communicate BRAWL intentions and successes (including to partners and funders).

To encourage and retain volunteers.

To ensure volunteer safety.

**BACKGROUND**

BRAWL is a small community Landcare group which focuses its activities on ten sites[[1]](#footnote-1) along the Bega River in Bega NSW – see page 3. The group began in 2005, and members meet monthly to do mainly planting of tubestock, planting maintenance and weeding. Other activities have included: community events, such as River Days (2015 and 2018), and seasonal River Sundays (2019–20); and cooperative planting activities with schools and, in previous years, employment and volunteer schemes. BRAWL has an executive committee and a part-time Coordinator. BRAWL considers the Coordinator to be critical to its ongoing success.

BRAWL’s main support person is Shannon Brennan, Senior Land Services Officer, South East Local Land Services (SE LLS). Other supporters, collaborators and participants include:

* South East Coast Landcare Coordinator
* Bega Valley Shire Council (BVSC)
* contractors (via LLS and BVSC)
* neighbours, e.g. at Bega Eco-Neighbourhood Development (BEND).

BRAWL resources include: access to contractors and machinery for site preparation; tools and equipment; a range of experience and training; relationships (e.g. to source seedlings); promotional and display materials.

BRAWL members have been planting seedlings on its sites since before it was formally a Landcare group. Grant funds from both State government (e.g. NSW Environmental Trust) and Council have assisted with planting and maintenance of plantings over the years.

This document combines a Weed Management Strategy and Planting Plan developed in recent years. The current intention is to use this as a basis to plan and support site activities, and to monitor success over time.

**LEGAL/POLICY/PLANNING/SURVEY CONTEXT**

The previous Southern Rivers CMA (Shannon Brennan) prepared the ***Bega River Catchment Rehabilitation Plan*** in 2011. The document covers the entire catchment, and notes the following.

* The reach in which BRAWL works is: ‘under significant geomorphic or biodiversity threat as a result of riparian weeds’ (p. 18).
* ‘Riparian vegetation is generally in a degraded condition and is dominated by exotics or cleared river banks. Old stands of Casuarina trees occur in some sections, but limited regeneration of these trees is a long-term issue’ (p. 37).
* ‘If the quality of the riparian vegetation understorey is not improved the long-term viability or vegetative succession will be broken and stream banks will eventually be denuded of riparian vegetation’ (p. 192).

Further relevant information is included at Attachment A1.

Alison Rodway (then BRAWL Project Officer) prepared a **‘Draft Management plan [for] Spenco Lagoon’** in 2008. The draft plan covers a range of matters, such as weed management and revegetation[[2]](#footnote-2), and includes lists of appropriate species to plant and priority weed species. Relevant information is included at Attachment A2.

The NSW ***Biosecurity Act 2015*** replaced the *Noxious Weeds Act 1993* as the primary legislation dealing with weed management in NSW, to provide a framework for the prevention, elimination and minimisation of a wide range of biosecurity risks, including weeds. Consistent with this, BVSC has a *Local weed management plan* on its website, with various related pages. Of specific relevance to BRAWL is ***Weed control and identification*** which identifies priority weeds for the South East.[[3]](#footnote-3)

The ***South East Regional Strategic Weed Management Plan 2017–22***(SE LLS June 2017), developed in partnership with the South East Regional Weed Committee. BRAWL provided input to the consultative process. The Plan identifies state and regional priority weeds. Relevant information is included at Attachment A3.

As a landholder, BVSC is required to manage **priority weeds** on its own land, and informs and encourages other landholders to do so on their land. LLS and BVSC cooperate on weed management in the Shire. Both fund weed works within their own budgets, and also attract state level funding. BRAWL has successfully gained significant grants from such funding (e.g. NSW Environmental Trust). Some priority weeds occur on BRAWL sites, but most are **environmental weeds**: ‘plants that invade native vegetation and may replace native plants and cause loss of habitat for native animals’[[4]](#footnote-4). There is no obligation to control environmental weeds which are not listed as of state/regional risk. However, such weeds ‘may cause as much or more harm to the environment as priority weeds’[[5]](#footnote-5). For example, they may: dominate an environment; prevent regeneration of native vegetation; affect areas set aside for conservation; reduce native animal and bird habitat; increase fuel loads, making areas more fire-prone; or change the soil so that native plants can no longer survive.[[6]](#footnote-6) This Strategy is consistent with relevant legislation and related Plans, and BRAWL target weeds reflect their priorities.

A **fauna survey** in February 2016[[7]](#footnote-7) found that the fauna diversity of BRAWL areas is ‘relatively high’, and provided ‘Recommendations for future management’, including ‘Habitat restoration’, such as:

‘6. Continue planting native grass and tree species to attract fauna and therefore offering shelter, corridors between stages and food resources.

7. Gradually remove exotic shrubs and replace with native species.

8. Clean up tree guards.

10. Aquatic habitat would be enhanced by native aquatic grass plantings along sections of the waterline.’

Specific relevant **management recommendations** included:

* ‘softening the matrix’, providing ‘stepping stone’ (e.g. piles of timber) in cleared areas
* gradually replacing exotics with native species, taking a ‘patch work mosaic’ approach to minimise disturbance on small terrestrial fauna
* cleaning up plant guards
* dealing with bamboo regrowth.

The survey also recommended ‘enhanc[ing] microhabitat features at ground level in combination with the weed control’. An extract of the survey report is at Attachment A4.

Various **vegetation surveys** (species presence and condition) have been undertaken on behalf of BRAWL, most recently ‘Assessment of vegetation on Bega River core restoration area and Spenco Lagoon’ (Jackie Miles, June 2018). This was a rapid survey (one day, winter), and included both planted and naturally occurring vegetation. Site and timing constraints meant that some species and details may have been missed. However, a species list was provided, and management issues and possible responses considered, of particular relevance to this Strategy (see Attachment A5):

1. lack of natural regeneration
2. lack of planting on the toe of the [River] bank
3. lack of a planting plan.

Each site is intended to have[[8]](#footnote-8) a one-page ‘Site management strategy’ which outlines: condition/values; constraints/threats; condition sought; and next efforts [follow-up required]. The content covers weed management, planting intentions and related maintenance. This Strategy and site-based detail – including mapping/zoning[[9]](#footnote-9) – are intended to inform an overall schedule (database) of BRAWL activities – especially regular working bees – and support future bids for activity funding.

**THE SITES**

The ten BRAWL sites are as follows – see map at Attachment B:

1. **Bega River Reserve**: from bottom of Auckland Street, east
2. **Old bamboo area**: between sites 1 and 3
3. **Anabranch egress and causeway**: between sites 2 and 4
4. Old paddock: between sites 3 and 5
5. **Boxthorn site**: between site 4 and yellow bollards on path to east
6. Racecourse path: from yellow bollards, between path and River edge, along northern edge of racecourse
7. **Spenco Lagoon East**: eastern edge of Lagoon
8. **Spenco Lagoon South**: southern edge of Lagoon to developer site boundary
9. **Gipps Street**: road reserve from Bega Street to Spenco Lagoon, and drain to developer site boundary
10. Bega/Brogo Rivers’ Junction: across the Bega River from Main Reserve – upper bank bounded by Brogo River and road.

**SITE QUALITY AND DIVERSITY**

The quality of the sites is compromised by their setting: the upper reaches of the Bega and Brogo Rivers are degraded, and it is a dynamic system: regular flood events mean that new weedy material is delivered to the site; disturbance (scouring) and deposition damage plantings and landscaping, and provide seedbeds for colonising weeds. The surrounding farmland (‘improved’ pastures) and townscape are also weedy, providing an extensive nursery of new weeds, and a significant buffer from native vegetation as a source of natural revegetation.

Although the remaining vegetation is highly degraded – with only the *Casuarina cunninghamiana* (river oak) overstorey relatively intact in patches – there is some regeneration of native species (e.g. the common reed *Phragmites australis* in wet areas), and plantings over the past decade have improved the biodiversity of the mid- and ground-layers, which also has an aesthetic benefit (especially for recreational users).

As noted in Miles 2018, the **original vegetation** on the sites would have included, most likely:

* ‘riverine forest ‘dominated by river she-oak (river bank)
* ‘river-flat eucalypt forest on coastal floodplains’ (an Endangered Ecological Community) abutting the riverine forest (missing) – including species such as forest red gum *Eucalyptus tereticornis*, ribbon gum *E. viminalis* and rough-barked apple *Angophora floribunda*, and possibly also blue box *E. baueriana* and river peppermint *E. elata*
* understorey of the riverine forest and river-flat forest (missing) – including shrubs, vines, ferns, grasses and herbs, such as tree violet *Melicytus dentatus*, veined cassinia *trinerva*, black wattle *Acacia mearnsii* and white sallee wattle *A. floribunda*, with a belt of water gum *Tristaniopsis laurina* along the edge of the river bed
* around Spenco Lagoon, most likely, dense thickets of swamp paperbark *Melaleuca ericifolia* in ‘ephemerally wet areas surrounding a core water body with submerged, floating and emergent aquatic species’, and beyond the paperbark the river-flat eucalypt forest
* possibly riparian scrub with small trees and shrubs such as water gum, white sallee wattle, slender wattle *A. elongata*, various teatrees *Leptospermum* species, river bottlebrush *Callistemon subulatus* and river lomatia *Lomatia myricoides*, with some more shade tolerant species extending as understorey in the riverine forest.

Given the condition of the sites, it will not be possible to restore their original riparian vegetation. Unlike revegetation approaches on less degraded (more natural) sites – which might include a focus on protecting, maintaining and enhancing existing native vegetation – the approach for BRAWL is largely planting, with locally appropriate species[[10]](#footnote-10). BRAWL revegetation and related management are intended to minimise further erosion, and enhance amenity and habitat values (e.g. by enhancing the matrix through removing and stacking weedy woody vegetation on the edge of Spenco Lagoon).

Specific information about, and objectives for, each site are detailed in brief **site-level summaries**[[11]](#footnote-11), which address: condition and values (e.g. weediness, habitat, amenity, erosion, debris, plantings and infrastructure); constraints and threats (e.g. potential for weed spread); condition sought (recognising resources and feasibility of actions); and next efforts required. Basic assessment and mapping of condition at each site, and ongoing monitoring, will inform BRAWL activities.

**ACTIVE MANAGEMENT CONTEXT**

Further to requirements under legislation and related plans, BRAWL activitiesare undertaken in the context of the ongoing Council planting program, reserve establishment/maintenance and other site/weed management issues along the Bega River and adjacent areas.

BRAWL recognises the need for planting – e.g. to stabilise banks and enhance habitat, and for amenity – and that volunteer and community plantings are uplifting and often popular events. BRAWL also recognises that planting comes with a legacy of management, especially long-term weeding. BRAWL can only share responsibility for weeding related to the extensive planting near the River in recent years.

As noted earlier, because of agency responsibilities, neighbours, and employment and educational programs, BRAWL’s role complements that of others (e.g. LLS, BVSC, contractors, BEND, local schools). BRAWL considers the opportunities (and potential risks) this poses, such as regarding:

* timing of activities – e.g. leaving tasks for others with capacity/energy, not hand-weeding areas before spraying is planned
* enhancing and supporting effort by others – e.g. planting
* requesting support required – e.g. use of machines, to remove bagged seed heads or piled weeds from site (to avoid stockpiling), to remove rubbish
* identified risks – e.g. myrtle rust and need for hygiene protocols.

Of particular note, the following contractor assistance will be sought, and related activities (e.g. LLS/BVSC initiated) need to be worked around:

* spot spraying along paths, other infrastructure (e.g. bollards) and edges
* spot spraying of weeds around seedlings and on weed matting
* slashing and/or spot spraying of large weeds (e.g. privet) and infestations (e.g. bamboo, cape ivy, African lovegrass) beyond the capacity of hand-weeders
* assistance with planting
* brush cutting access paths through sites and around infrastructure (e.g. bench seats)
* chainsawing/removal of flood debris and other remediation after flood damage (e.g. soil works).

**PLANTING STRATEGY**

The **benefits** of planting on BRAWL sites include to:

* rehabilitate site structure, e.g. stabilise banks
* enhance habitat structure, for a range of species
* compete with weeds for space/resources, including by shading out with trees
* improve amenity, including for recreational users
* provide opportunities for community to join in a positive activity.

Potential **disadvantages** of planting include:

* it leads to the need for extensive weeding until the plants become established; in very weedy areas, over many sites, with limited volunteer resources – such as BRAWL – plantings can be grown over by weeds before weeders return
* a growing fire hazard on the edge of town.

BRAWL’s general approachto planting is as follows.

***Planning***

* Prioritise all efforts – zone and map areas within sites to identify existing and proposed plantings. Zones to reflect: situation/siting, features/infrastructure, opportunities/constraints, planting progress/success.
* Choose the right plant for each position
	+ appropriate to the site, local species only and local provenance preferred – from list at Attachment C.
	+ consider each species relevant to its purpose (e.g. stabilisation, weed exclusion, amenity) and needs (e.g. soil moisture, space)
	+ avoid plants not local to the site/region
	+ avoid siting clashes, e.g. concerns re flammability to neighbours, too close to infrastructure (e.g. over picnic tables, near powerlines)
* Source healthy seedlings from reliable growers, e.g. don’t take overgrown or pot-bound specimens. Where appropriate, move recruits (e.g. water-edge plants at Spenco) around sites.
* Focus on closing the canopy to reduce weed competition.

***Site preparation***

* Use recognised good practice, for example:
* prepare sites well prior to planting
	+ slash and mulch and/or spray existing (weedy) vegetation, if required
	+ drill planting holes appropriate to the site/species and at an appropriate placement/density
* avoid problem locations (e.g. very sandy/unconsolidated on banks, rubbishy).

***Planting***

* Consider seasonal circumstances, and choose appropriate planting times. Avoid planting in prolonged dry periods.
* Use recognised good practice, for example:
* check and correct root problems (e.g. overgrown, tangled) at planting
* place appropriate plant carefully and well within hole, and tamp down soil
* water in seedlings well – have a plan for the day (e.g. leave the pot on the stake to identify new plants, pump/hose/buckets and efficient group effort)
* use staked plant guards, ideally considering their own risks and limitations (e.g. plastic waste, reuse), and the likely direction of flood water
* mulch with ‘clean’ weeded material from site, or off-site if available, placed carefully to protect stems
* avoid using weed matting that does not break down (can cause stem damage later).
* Provide pre-planting briefing to support volunteer understanding/awareness/effort at all events
	+ consider volunteer safety at planting events, e.g. when carting water.
* Where possible, and as resources permit, use a contractor to support effective volunteer effort at each working bee and community event.

***Maintenance***

* Use recognised good practice maintenance and follow-up techniques:
* re-water if required
* weed inside guards carefully as plants grow (to avoid pulling out seedling, to check for wasp houses) and around them to assist establishment (ideally to 1 m2 )
* reduce smothering of seedlings by climbers
* re-plant when seedlings fail (tag cages with dead plants to identify them)
* repair/replace guards around planted seedlings when necessary, including to protect from grazing and herbicide spray drift
* remove old guards from established plants, and from site (EnviroKey noted the need to ‘prevent littering and danger to fauna species such as turtles and aquatic species’).

A recent local report on ‘fire retardant shelterbelt design’ (Dean Turner 2020)[[12]](#footnote-12) noted the protective effect of shelterbelts, and suggested consideration of factors such as height, density, species choice, placement, spacing and management (e.g. site preparation, maintenance, pruning, thinning). While BRAWL sites are not intended as shelterbelts, and previous BRAWL plantings have not been carried out with the listed factors in mind (BRAWL has broader objectives), BRAWL undertakes to put the report’s recommendations into practice as appropriate (e.g. species selection and maintenance, patch treatments to break up fuel density and continuity).

**WEED MANAGEMENT STRATEGY**

**Target weeds** relevant to each site are listed generally (Attachment D), and site-specific approaches (e.g. context of adjacent areas, density of infestation, level of threat posed, best effect for effort, potential for management/eradication) and limitations (e.g. historic planting, insufficient resources, too well established) are included in the site-level summaries.

Relevant information from previous ‘BRAWL Maintenance Plans’ has been considered. Site information is connected directly to an overall **BRAWL sites management plan** (database and schedule[[13]](#footnote-13)) which informs regular volunteer working bees, contractor assistance and other activities/events.

BRAWL’s ***general approach*** is integrated weed managementat all sites as follows.

Clarify the greatest weed threats (including to respond to new weeds) and prioritise all efforts, including after considering weed life cycle – i.e. dormancy/flowering/seeding and seasonal response.

Identify and understand the weeds and use recognised good practice in managing each.

Work from ‘good’ areas (e.g. less infested where they exist, or around plantings) to more infested areas. Hold the advantage gained by each weeding activity, i.e. avoid wasting effort (e.g. by mulching to reduce reinvasion).

Focus on stability and closing the canopy.

Respond to early detection of new infestations.

Assist planted seedlings by removing weeds.

Avoid accidentally pulling out planted seedlings (e.g. tangled with weeds or in felt, mistaken identity) or local recruits.

Minimise disturbance (e.g. avoid leaving bare areas to be [re]colonised by weeds).

Deal with large areas gradually, ensuring a ‘patchwork mosaic’ of cleared/uncleared areas, to provide small fauna habitat.

Mulch with ‘clean’ weeded material, placed carefully.

Avoid regrowth by removing seedy/root material from site, to avoid it reproducing/reshooting.

Leave woody material on site where it can provide habitat structure (‘soften the matrix’).

Seek resilience of planted areas: reduce competition (including smothering by vines), avoid disturbance (through weed removal and herbicide spray drift) and assist natural revegetation.

Protect and enhance community assets on BRAWL sites (i.e. plantings, landscape and infrastructure).

Cooperate with others, to enhance BRAWL resources, to sequence actions and avoid duplicated/wasted effort.

Identify any potential hazards from fire prone species, and involve RFS as appropriate (e.g. control/practice burning).

Emphasise volunteer safety, e.g. hot/cold/wet conditions and site risks.

Reassess priorities after flood events – and respond promptly – to protect sites and previous efforts.

***Weed priority***

**Target weeds** have beenidentifiedacross BRAWL sites, and **management priority** identified. Relative priorities are intended to be assessed further through mapping.

***Technique(s) and equipment***

Up-to-date field guides and good practice weed specific information are readily available. However, **Weed species management information sheets**have been prepared for most target weeds, to support volunteer activity, including good practice information/techniques suggested and any relevant risks to weeders. A **summary of suggested approaches** for target weeds has also been prepared (see Attachment E).

Weed **photo flip-books** have been compiled for target weeds and are available at weeding events to assist volunteer identification.

***Usual BRAWL weeding activities*** adopt generally suggested good practice, and include:

* carefully hand-pulling weeds from around planted seedlings, including from within guards
* repairing/replacing guards around planted seedlings, including to protect from herbicide spray drift; removing old guards from site
* chipping out weeds around plantings and adjacent to infrastructure
* digging out and removing weed tubers
* cutting and poisoning stems
* spot spraying
* reducing smothering of seedlings by climbers (including some native species)
* piling/bagging weedy material (e.g. inflorescences/seeds) for removal from site (e.g. by Council), or removing it.

Where possible, and as resources permit, a **contractor** is funded to support volunteer activity at each working bee and community event.

BRAWL has a range of **tools** available for use by volunteer work parties, including: hand tools (e.g. trowels, mattocks, spray equipment) and power tools; and safety equipment (e.g. gloves). Power tools are for use by experienced volunteers only, and may need prior training; ideally used by contractors. Slashers and chainsaws are not to be used near volunteers (appropriate buffer distances will be identified), and should be handled carefully to protect plantings and regrowth.

An appropriate form of **herbicide** (e.g. glyphosate) will be applied when required, using an agreed method and type, to protect volunteers and plantings/regrowth, and avoid impacts on the River.

**WORKING WITH VOLUNTEERS – skills, training, resources and risk management**

As noted above, **information** to support volunteer understanding/awareness/effort should be available at work parties to assist volunteers, including pre-activity briefings.

The need for specific **training** required by volunteers, including in weed identification, techniques, and use of equipment and herbicides, should be identified and provided as soon as possible, including with the support of agencies.

There is also a need – generally and on a site-by-site and activity-by-activity basis – to identify and seek to avoid any **potential hazards**, for example:

**negative animal encounters**, with invertebrates (e.g. ticks) and vertebrates (e.g. snakes)

**injury to volunteers**, such as through

* falls – over things and uneven ground, into water, down holes
* wounds – from tools (e.g. cuts), from plants (e.g. puncturing), from rubbish (including glass, sharp objects and exposed metal)
* chemical spillage onto clothing or skin.

**Individual participant limitations** should also be considered at events (e.g. health or mobility issues) and weather complications (e.g. heat exhaustion).

A **first-aid** kit is available at all BRAWL activities; the Coordinator has current first-aid certification. Water and soap for handwashing (before eating) is also available. BRAWL sites have good phone reception, and the local ambulance service/hospital is close by.

**RISKS AND THREATS TO AND BY SITES**

**Flooding** is a risk at all BRAWL sites, and an unavoidable threat to plantings while they are establishing, e.g.

* physical damage by flood water, debris and soil movement
* washing away of guards/stakes.

Previous flooding, and historic use of sites for **waste** dumping, has meant that soil has been disturbed and there are ‘floating’ inclusions (e.g. metal, glass, concrete).

The **weediness** of BRAWL sites is a risk to plantings. The intention is that all plantings will be managed for weed effects while they become established.

BRAWL sites are relatively remote from the town, and there is a history of **vandalism** and **anti-social behaviour** at some sites (e.g. theft of signs, littering). Plantings are generally away from paths and are not usually tampered with.

There is some evidence of native (wombat, wallaby) **species causing problems with plantings** – e.g. breaking stems, digging out plants – and potential for damage by feral species (e.g. rabbits). This is unavoidable on these sites.

**Climate change** effects are largely unknowable. However, there are likely to be long dry periods, as in recent years, and storm events (leading to flooding). All activities should consider weather forecasting. Site assessment after flooding should be used to inform priority for follow up at previously planted sites.

**Fire fuel** levels at BRAWL sites change over time, resulting from removal or slashing of weed species (e.g. bamboo, paspalum), growth of planted species, and debris deposited by floods.

**FUTURE OPPORTUNITIES**

BRAWL is a mature volunteer group with an excellent history of funding and participation. Ongoing site-based management will be possible only to the extent that resources are available (e.g. coordination, materials, contractor support), and enhanced by new approaches. A planning meeting, involving members and key others, in mid-2019 identified four ‘5 Year Goals’:

1. secure and increase Coordinator’s role
2. prioritise sites and complete effective management documentation/monitoring
3. increase engagement and education
4. develop the Bega River and Wetlands Reserve proposal.

Of relevance to this Strategy, related strategies identified included:

1b investigate alternative income streams …

1c explore other funding opportunities that complement core program

2a finalise and implement management plan with integrated weed management strategy

2b devise and document planting strategy

2c maintain regular drone monitoring of key sites

3a research and prepare strategies to engage with all schools in catchment

3b refine and ramp up River Sundays for volunteer recruitment

3c look after existing volunteers

3d develop more partners (e.g. Bioblitz)

3f explore cultural burning as land management strategy.

Issues identified in the planning and subsequent discussions include:

*Reduce the number of active sites and clarify priorities.* As already mentioned, BRAWL does not have capacity to manage ten sites, and needs some resilient sites to ‘showcase’.

*Potential for sponsorship*. From local businesses or neighbours (e.g. Bega Cheese, Spotlight).

*Sourcing plants*. If BRAWL ever had sufficient resources or interest there is potential for volunteers to be involved in seedling propagation.

*Adopt-a-site*. There is potential to increase the commitment of volunteers by linking sites/activities with groups over a longer period. For example, a school/year could be involved in a planting and continue to revisit that planting to weed/water/replant/maintain until establishment. This would be a clear lesson in the effort involved for success.

*Community education*. About BRAWL’s revegetation success/intentions, for example interpretation along the adjoining pathways.

*Working differently with key others.* For example, various parts of BVSC, Aboriginal community, schools, Panboola Wetlands, BV Regional Gallery, Landcare NSW.

**MEASURING SUCCESS**

BRAWL needs to monitor its activities to know whether it’s been effective and when to ‘mop up’ (revisit) an activity/site. Monitoring and recordingeffectiveness also enables celebration of success.

Monitoring has been relatively ad hoc to date, with the Coordinator building in personal observations/records and intelligence from others (e.g. contractors, keen BRAWL members) into the working bee program (e.g. site selection, most urgent tasks). There is obvious potential to formalise this approach.

Monitoring should include both brief written assessment (addressing things such as level of participation, area, technique[s] and outcome[s]) and use of photos. However, this critical step depends on resources, for example the availability of Coordinator time; it could be allocated within the group for each activity. To date, there has been no detailed and systematic approach to recording exactly what has been planted, how many, where, and what has survived. Miles (2018) noted the ‘impression of … [an] ad hoc’ approach, ‘using whatever semi-suitable local species … available’. In recommending a ‘planting plan’, she suggested ‘that records of dates, species, location and numbers should be kept for future plantings’. Also that experience of success/loss of plant species should inform future plantings, to avoid wasted effort.

It is difficult to make an estimate of the number of plants planted so far, over the decades, but conservatively it would be in the thousands.

The BRAWL Coordinator now keeps a list of plant species planted at sites/events. Mapping of this information over time is proposed, and follow up monitoring to consider success/failure of plantings/species is required. Ground- (e.g. pegged/taped) or GPS- (coordinate) based definition of planting areas should be noted in mapped zones.

A regime for monitoring should be prepared to list: sites, planting date(s) and period for revisiting; method to be used (e.g. stem/species survival, plants (to be)/replaced, cages removed). Monitoring could be offered as a less-active option for older volunteers. All details, including urgency of need for weeding, should feed into working bees.

The use of remote sensing technology – especially drones – and photography (photo monitoring points, over time), and possible enthusiasm/participation of more/younger BRAWL volunteers may assist.

**ATTACHMENTS**

A1. *Bega River Catchment Rehabilitation Plan* (S Brennan 2011, extract)

A2. ‘Draft Management plan [for] Spenco Lagoon’ (A Rodway 2008, extract)

A3. *South East Regional Strategic Weed Management Plan 2017–22* (extract)

A4. *Baseline fauna study: Bega River and Spenco Lagoon, Bega NSW* (Envirokey 2016, extract)

A5. ‘Assessment of vegetation on Bega River core restoration area and Spenco Lagoon’ (J Miles 2018, extract)

B. Map of BRAWL sites

C. Appropriate plant species

D. Target weeds

E. Suggested approaches for target weeds

**ATTACHMENT A1**: EXTRACTS FROM *BEGA RIVER CATCHMENT REHABILITATION PLAN* (Shannon Brennan for Southern Rivers CMA 2011)

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*Biophysical condition summary:*

* Riparian vegetation is generally in a degraded condition and is dominated by exotics or cleared river banks. Old stands of Casuarina trees occur in some sections but limited regeneration of these trees is a long-term issue.
* There are no ‘Conservation’ recovery potential reaches in the Bega River sub-catchment. …The section of the Bega River from Wolumla Creek junction to Brogo River junction has been given a ‘strategic’ rating despite its poor condition because of considerable potential for sediment release downstream.

*Social-economic values summary:*

* Significant investment has been made into riparian rehabilitation and vegetation recovery programs along the Bega River over the last 10 years … [including] riparian revegetation … Three active Landcare groups also occur … [including] Bega River and Wetlands …
* … The river is also valued for … walking and a number of public reserves border its banks in Bega …

*Summary of recommended management actions:*

* Priority management actions for this sub-catchment are centred around:
	+ reducing rates of channel expansion ... through extensive revegetation/regeneration programs

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**5 RIPARIAN WEED THREAT (THRESHOLD LEVELS):** ‘High = 1’\*

Noxious and environmental weed species are present along most riparian areas across the Bega Catchment …

Dominant riparian weed species present include willow, blackberry, honey suckle, cape ivy, privet and St  John’s Wort.

\* = weed infestations are spreading quickly [the] reach is on a threshold that will cause severe degradation if they continue to expand within the next 5 – 10 years. Alternatively a reach is on a recovery threshold and with weed control works will significantly improve condition in this period

**6 SOCIAL VALUES – COMMUNITY INTEREST:** 1

Broad community support is required for any rehabilitation strategy to be successful, so that ownership of outcomes is attained. Efforts must be realistically achievable or there is the risk of losing the good will of the community who are committed to these initiatives.

… [identified to have] significant community interest or social values that are aligned with river health outcomes.

In particular, reaches that have Landcare … groups that undertake stream rehabilitation works are prioritised under this category…

**7 NRM INVESTMENT:** Major investment = 2

… conservation and rehabilitation outcomes can be increased by aligning actions in areas where NRM resources have already been invested to achieve river health outcomes.

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**8. SUMMARY OF KEY RECOMMENDATIONS FOR PLAN IMPLEMENTATION**

*Management strategies to target key biophysical issues*

* … 3. Improve riparian vegetation cover.

*Implement appropriate management actions*

* … Reach based management strategies must be appropriate for each river style and its position in the catchment for implementation of on-ground works to be effective.

*Focus efforts on high recovery potential reaches first*

* Protection of reaches with ‘conservation’ recovery potential should always precede rehabilitation efforts as it is more effective to protect what is already intact than what is already degraded. …
* ’Strategic’ recovery potential reaches are likely to be costly and difficult to rehabilitate but will result in significant positive off-site impacts and enhance recovery of other reaches in the catchment thus they are high priority for investment.
* Reducing riparian weed threats may mean that investment may need to be directed outside high recovery potential reaches if effective top-down control is required.

*Incorporate socio-economic values*

* … for any rehabilitation strategy to be successful broad-community support is required, so that ownership of outcomes is attained. Efforts must be realistically achievable or there is the risk of losing the good will of the community who are committed to these initiatives.
* Social values that may influence investment into river rehabilitation activities include the presence of active community groups, landholder interest, aesthetics and vicinity to urban areas.

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***9.2.2 Improving riparian vegetation cover***

Action: Reduce threatening weeds that are impacting on geomorphic processes or biodiversity

Type of works: Develop sustained or strategic weed control programs in reaches under significant geomorphic/biodiversity threats as a result of weed invasion.

Major streams: … Control works may need to consider working in lower recovery potential reaches to achieve long-term goals with regards to weed management.

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***9.2.3 Minimise erosion and sedimentation problems***

Action: Stabilising sediment stores of the Bega River

Type of works: … include revegetation … and strategic weed control programs … works in these reaches provide an opportunity to link with socio-economic, community outcomes (e.g. urban centre, Landcare groups … recreational values, aesthetic values) and tie in with past investment.

Priority reaches: Targeting the ‘strategic’ reaches of the Bega River (from Wolumla Creek junction to Tarraganda …

EXTRACTS FROM THE ***BEGA RIVER REHABILITATION PLAN – PART 2: SUB-CATCHMENT REPORT CARDS***

[biophysical (geomorphology and vegetation) condition summary, socio-economic values and recommended management actions]

pages 187–190: Grevillia to Brogo River junction

pages 191–4: Brogo River junction to Jellat Jellat

Considerable effort will be required keeping environmental weed infestations under control.

Specific attention should be given to revegetating and stabilising banks of the Bega River at entry and exit points to the Bega River anabranch.

**ATTACHMENT A2: RELEVANT INFORMATION FROM THE ‘DRAFT MANAGEMENT PLAN [FOR] SPENCO LAGOON’ (RODWAY 2008)**

The document:

* proposed ‘weed and pest animal control’ and planting of local species
* noted
	+ that the lagoon was ‘currently degraded with significant weed infestations … and contains almost no remnant native vegetation’
	+ the potential for eutrophication to stimulate weed growth and hinder aquatic life
	+ that global warming might affect weed species that threaten the area
	+ how the areas is ‘highly prone to weeds’ because of its moist fertile soil, proximity to urban areas, and receipt of stormwater and irrigation runoff
	+ the need to replant, and to choose plants that cope with inundation and help to stabilise banks, and to provide suitable habitat for native fauna
	+ the impact of weeds on decline of native mammal populations in the valley since European settlement
	+ the cooperative activity with BEND, and supportive attitude of some other neighbours (Curtis family, Mumbulla School, BVSC)
	+ that the ‘main threats to regeneration of native flora are competition from weeds, lack of viable native seed in the soil and trampling by humans’
* identified an action to implement a weed management strategy (weeds are listed in an appendix, including strategies and priorities for each species).

Some other specific detail

**‘2.2.3 Potential Recreation and Tourism Values**

A walking track [to/through Spenco sites], as well as providing this link [with Bega town], will give access to the lagoon itself where several possibilities exist for both active and passive recreation. The lagoon is an interesting site for bird watching as the number of species recorded there (47 species in 2006-7) shows the ability of native bird species to adapt to a highly modified environment. Ongoing plantings of appropriate local species should increase the number and diversity of birds as will the addition of nesting boxes. The construction of a birdhide would facilitate the viewing of birds.’

‘Revegetation strategy’ at Appendix 6 (including appropriate species and location for planting).

**ATTACHMENT A3: Relevant information from SE Regional Strategic Management Plan 2017–22**

The plan relates to all lands and waters in the South East Local Land Services region. [p.10]

**Vision and relevant goals** [p.9]

**Vision:** *Government, industry and communities of the South East Region working together to protect the environment, economy and community from the negative impacts of weeds for the benefit of the region.*

**Goal 1: *Responsibility for weed biosecurity is shared by the whole South East community***

Actions focus on a whole of community approach to weed management, with an emphasis on:

* building community capacity
* building stronger partnerships
* fostering a shared responsibility
* promoting behavioural change

**Goal 3: *Weed biosecurity supports healthy, diverse and connected natural environments***

Actions focus on weed biosecurity to protect the environment and foster sustainable economic growth. The emphasis is on:

* preventing new weeds from entering the region
* eradicating or containing the spread of new weeds that do establish in the region
* managing widespread weeds on priority sites.

**Goal 4: *Weed biosecurity is supported by coordinated, collaborative and innovative leadership***

Actions focus on a consistent approach to implementing this plan, with emphasis on:

* providing good governance and leadership to support a collaborative approach
* supporting and delivering the weed biosecurity reforms for NSW
* implementing risk based systems across all tenures in a co-ordinated manner
* using information and mapping systems, current research and adaptive management to improve effectiveness of weed control.

[Introduction, p.11] The plan will guide resource allocation and investment for weed management in the region and provide a consistent basis for regional weed planning and delivery. In line with recent weed reforms in NSW, it has a wide scope, covering weed risks that impact:

* biodiversity of natural environments (terrestrial and aquatic)
* animal and plant industries (agriculture, horticulture, forestry, aquaculture, recreational and commercial fishing)
* human health, livelihood, lifestyle, recreation and landscape amenity
* infrastructure and service industries, including energy, transport and water supply .

This plan sets the vision, goals, outcomes, objectives and strategies for weed management in the South East for the next five years, and outlines the strategies and actions to achieve these goals. The plan specifies and defines state and regional regulation of weed species. The plan recognises Landcare groups as significant community partners in weed management [pp.26 and 37].

After weed risk assessment, the Plan identifies four weed management categories [p.29]:

* prevention – to prevent the weed species arriving and establishing in the Region
* eradication – to permanently remove the species and its propagules from the Region, OR to destroy infestations to reduce the extent of the weed in the region with the aim of local eradication
* containment – to prevent the ongoing spread of the species in all or part of the Region
* asset protection – to prevent the spread of weeds to key sites/assets of high economic, environmental and social value, or to reduce their impact on these sites if spread has already occurred.

State and regional level priority lists are established, and included in Appendices.

**‘Guiding principles for implementation’** are identified [p.33]

The following principles will be used to guide weed management planning and implementation and are consistent with the weed reforms and leading practice: [those of relevance to BRAWL shown, with italics for emphasis]

* *Effective stakeholder collaboration* and shared responsibility are essential for effective regional weed management.
* *Increasing community capacity* and fostering responsibility for weed management (behavioural change) is important to achieve effective weed outcomes.
* Causes of weed invasion and spread are managed wherever possible, not just the symptoms.
* The biology and ecology of weeds, including dispersal mechanisms, vectors and pathways for spread are considered in weed management.
* *Regular monitoring*, evaluation and improvement are incorporated in weed management programs.
* Weed management is an integral part of land management. Land *management practices and their timing are critical* to the prevention and reduction in the spread and impact of weeds. Innovation which results in more effective and efficient weed management is encouraged.
* *Weeds are managed in a strategic and coordinated manner across the landscape*. Assessing and managing weed risk at a landscape and multi species scale (where appropriate) can lead to significant efficiencies in use of resources and achievement of strategic outcomes.
* The *best available science, expertise and tools* are utilised in weed management decision making and practice.

The need for community engagement, including through a communication strategy, is identified [p.38]. In order not to ‘reinvent the wheel’ where activity is underway: ‘The approach proposed is to *identify successful and enduring community groups involved in weed management and build additional capacity around these groups* to deliver more widespread weed management through existing programs. In addition, a range of communication activities (as outlined in the communication strategy) will be directed to these groups. Once implemented, this approach will be evaluated to determine its effectiveness and the strategy refined as appropriate.’

**Plan appendices include**

Appendix 1: Priority weeds for SE Local Land Services Region

 A1.1: State priority weeds

 A1.2: Regional priority weeds

Appendix 2: Other weeds of concern

 A2.1: Potential regional priority weeds

 A2.2: Species subject to local management program

**ATTACHMENT A4: RELEVANT INFORMATION FROM *BASELINE FAUNA STUDY: BEGA RIVER AND SPENCO LAGOON, BEGA NSW* (ENVIROKEY 2016)**

**3 Existing environment**

3.2 Fauna and their habitats

* ‘[fauna] diversity is considered relatively high given the landscape position of the study area directly adjacent to the Bega town centre’
* ‘bird diversity … is considered relatively high’
* ‘Frog diversity is considered very low’
* ‘All of the species [of mammals] recorded are generally widespread across the Bega Valley … However, the study area is considered to provide ample roosting, foraging and potential maternity opportunities for a number of bat species and these species could become flagship fauna for the BRAWL area particularly in the context of monitoring and community participation …’
* ‘Reptile diversity is considered moderately high given the quality of habitats present. This is most likely influenced by the presence of the aquatic and riparian habitats which tend to be resource rich in terms of productivity for food such as insects.’
* fauna habitats present are
	+ riparian and aquatic, along the River
	+ lagoon
	+ hollow-bearing trees.

**4 Recommendations for future management**

Habitat Restoration

2. ‘Softening of the matrix, particularly in existing clearings’ (e.g. providing ‘stepping stones’ using piles of fallen timber.

7. ‘Gradually remove exotic shrubs and replace with native species.’

8. ‘Clean up tree guards’ to ‘prevent littering and danger to fauna species’ (including aquatic).

9. ‘Bamboo regrowth around Stage 4 should be sprayed to avoid further invasion and smothering of … plantings’.

**5 Conclusion**

‘Overall, the general fauna diversity of the study area is considered relatively high. Restoration effects have focussed on the removal of exotic flora and this should be extended to enhance microhabitat features at ground level in combination with the weed control. It is important that the removal of any ground cover consider a patch work mosaic in any program of works to minimise the effects of heavy ground disturbance on small terrestrial fauna such as frogs, reptiles and small mammals.’

**ATTACHMENT A5: RELEVANT INFORMATION FROM ‘ASSESSMENT OF VEGETATION ON BEGA RIVER CORE RESTORATION AREA AND SPENCO LAGOON’ (J MILES 2018)**

**‘Management issues and possible responses**

A few general issues were recorded on the sites.

**1. Lack of natural regeneration**

It was not clear whether some of the White Sallee Wattle along the river banks is naturally occurring, or whether it has all been planted. There may have been some natural regeneration of this species following woody weed removal. If so, it appears to be almost the only natural regeneration on the south bank of the river. A little natural regeneration of Black Wattle and River Oak was observed at the Brogo River junction east of the north bank planting area, but I did not investigate it closely enough to form an idea of what might have promoted this.

In general many Australian natives have small seed and consequently their seedlings do not have a large store of built-in nutrients to draw on while they are becoming established. They are adapted to germinating on bare ground with little competition from other plants and they therefore do most of their recruitment of new plants following disturbance such as fires and floods. The riparian species tend to recruit mostly in damp sand in the river bed rather than on well vegetated upper banks. Because of this it is very unlikely that most of the planted species will ever become self-perpetuating on these sites. A possible exception is on bare mud around the edges of Spenco lagoon, which will provide a good seed bed for small-seeded species such as teatree and bottlebrush. Many natives also do not do well in full shade, another factor mitigating against them self-seeding on the river banks. The seedlings tend to be prone to fungal attack (“damping off”) when grown in moist shady conditions.

Wattles are a slight exception to this, having larger seed with a hard seed coat. Seed is likely to wash down from the upper catchment and be deposited by floods. The scouring by sand during this process would help to break dormancy, and there is thus a good chance that wattles will recruit naturally on the site, at least to some extent.

However, the River Oak and eucalypts fall into the small-seeded category which needs disturbance and lack of competition for seedlings to establish, so it is likely that it will be necessary to continue planting these species to replace the older generation of River Oak and the eucalypts that were probably removed by early clearing. Apart from near the junction, only one instance of River Oak natural recruitment was seen, a single sapling in sand at the toe of the bank in the eastern section of the south bank.

Unfortunately many of the weeds in the Bega area have the other type of recruitment strategy, with large seeds which can sustain a seedling in its early growth phase while it is struggling up through dense groundcover. These are the species which tend to appear in the absence of disturbance. Many of them are bird-dispersed, since their seed it too heavy to be moved any distance by wind. Local native examples are Sweet Pittosporum (*Pittosporum undulatum*), Tree Violet (*Melicytus dentatus*) and rainforest species such as Lilly Pilly (*Acmena smithii*) and Muttonwood (*Myrsine howittiana*). Weedy examples are the privets, Cotoneaster, Pyracantha and Camphor Laurel. These species find it all too easy to become established in shady conditions with a dense groundcover, and the weedy species will continue to appear on these sites, due to the proximity of a seed source on the site, along the river up and downstream and in town nearby. The natives are less likely to spontaneously appear on the sites, because of a shortage of local seed sources in the immediate vicinity. Lilly Pilly has been included in the plantings to a small extent, and has some potential to self-perpetuate on the site when it eventually begins to produce fruit.

**2. Lack of planting on the toe of the bank**

Although very little of the river bed was traversed, it did appear that almost all the planting has been concentrated on the more visible upper parts of the bank, and that little or no effort has gone into stabilising the toe of the bank. Some parts of this consist of a vertical bank of sand, which is vulnerable to being undermined by floods. I would suggest that a planting of riparian shrubs, Water Gums, divots of Common Reed or other locally sourced native sedges should be done into the sand at the foot of the bank, to help protect the banks, at least in the more vulnerable looking areas. The survival of such plantings is in the lap of the gods, since a flood soon after planting has the potential to wipe them out, but the chances of their survival can be improved by planting “long-stem” tubestock. These are overgrown plants in small pots which are planted deeply, with about half of their stem being buried. This gets the root ball down to where the sand remains moist even if the river ceases to flow and anchors the plant more securely against floods. Most riparian shrubs are adapted to being buried in sand, so are not killed by this treatment as Dryland species might be. Various Landcare groups have experimented with long-stem plantings in the region and might be able to offer advice (e.g. Cobargo and Candelo).

One advantage of a planting in this location is that it would be unlikely to need much follow-up weeding, since it would be planted in the sand of the bed, which generally remains more or less free of weeds. Whether the plants needed guards or not would depend on the extent to which rabbits are a problem on the site.

**3. Lack of a planting plan**

Planting to date gives the impression of having been ad hoc, using whatever semi-suitable local species are available. So far the results of this approach appear to have been reasonable, although without a list of species planted and in what numbers and locations, I have no way of telling whether some species have performed better than others. A more detailed review of what has succeeded on the site might be worthwhile to inform future plantings, but was outside the scope of this review. If no planting records exist, then it might not be possible to undertake this. I suggest that records of dates, species, location and numbers should be kept for future plantings. Whichever person provides or lays out the plants would be the best person to be responsible for doing this and the records could be kept by BRAWL or the Local Land Services, or preferably both.

It might also be possible to micro-site particular plant species in a way that gives them a better chance of survival. For example, Blue Box were found at Spenco lagoon to be intolerant of prolonged inundation during the big 2011 flood, with some dying, while Forest Red Gum survived (Chris Allen, pers. comm.). Such information needs to be recorded so that species are put in the best part of the site for their survival in future plantings. Without this, a lot of strenuous activity may be wasted.

**4. Recreational vehicle use on the river**

Local 4 wheel drive enthusiasts are in the habit of using the sandy bed of the Bega River when it is dry or nearly so, and have also made numerous tracks up and down sections of steep bank around the Auckland Street to Parabel Street ford. This activity might compromise plantings. For example, an apparently little-used track runs through the north bank planting, presumably providing vehicle access to the swimming hole at the junction. It is hard to see what can be done about this activity, since any sort of blockage of existing tracks is just likely to lead to the creation of new ones, further destabilising the banks.’

1. in recent years activities have occurred on five main sites [↑](#footnote-ref-1)
2. some strategies for these sites are relevant to other BRAWL sites [↑](#footnote-ref-2)
3. accessed 6/19 [↑](#footnote-ref-3)
4. BVSC website [↑](#footnote-ref-4)
5. see above [↑](#footnote-ref-5)
6. previous BVSC Weeds Strategy 2002 [↑](#footnote-ref-6)
7. EnviroKey, *Baseline Fauna Study: Bega River and Spenco Lagoon, Bega NSW* [↑](#footnote-ref-7)
8. main sites (where BRAWL is currently active) have summaries (bolded in the following listing) [↑](#footnote-ref-8)
9. as resources permit (project funding to be sought) [↑](#footnote-ref-9)
10. Miles (2018) indicated that some past plant choices were not appropriate [↑](#footnote-ref-10)
11. these are intended to be updated regularly, so not attached to this Strategy [↑](#footnote-ref-11)
12. ‘Fire retardant shelterbelt design notes for SE Australia developed from 2018 to 2020 with particular reference to the Far South Coast of NSW’ [↑](#footnote-ref-12)
13. still to be developed [↑](#footnote-ref-13)