



**Final report for the
St Helena Nature Conservation Group project on**

**Protection of the critically endangered
Gumwood (*Commidendrum robustum*) habitat
at Peak Dale, St Helena**

20 April 2016

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Adapting the Bradley Method to Peak Dale gumwoods (*Commidendrum robustum*)

St Helena Nature Conservation Group

Final project report

Background

The overall aim of the project was to develop an effective working method for the conservation of endemic St Helena gumwoods at Peak Dale and their associated ecosystem. The Bradley Method has been shown to be effective at many locations and follows three guiding principles:

1. Work outwards from good areas of native plants towards areas of weed.
2. Make minimal disturbance to the environment.
3. Do not over-clear: let native plant regeneration dictate rate of weed removal.

Three treatments were proposed, to determine the most effective application of the Bradley method:

1. The Bradley Method and herbicide treatment without under-planting
2. The Bradley Method and herbicide treatment with under-planting of ferns
3. Invasive removal and supplementary planting of gumwoods utilising nursery propagated stock

The ultimate output was to develop the most appropriate working method for managing this vulnerable site containing some of the world's rarest plant and invertebrate species, and to extend the best identified method to the whole of Peak Dale. In addition to this, a committed and active volunteer conservation group, that will employ the methods established as the most appropriate over a long term programme of management, would be created.

Results

All gumwoods in the western remnant have been mapped and, where necessary, cleared with a 'halo' of about 2m free from invasive trees. This amounts to about 300 trees. This has resulted in no further loss of mature gumwoods noted from invasive tree 'over-topping'. Previously there have been grievous losses.

Under-planting

Between April and June 2014 two zones were under-planted with endemic ferns, comb fern (*Pteris dentata*) and plume fern (*Christella parasitica*). Survival was very low, with only nine comb ferns still alive in December 2015. This is considered to be partly due to a combination of factors including the generally low survival rates for endemic plants, but mainly due to the destructive impact of feral cattle on the site, and drought. The site is very steep and signs of cattle are prevalent throughout, causing erosion, trampling and grazing damage. It became clear early on that attention needs to be focused on either controlling or excluding cattle in order to ensure successful regeneration of the gumwoods and ferns in the western compartments, and further under-planting was suspended.

Attempts to persuade land owners to control feral cattle by culling did not prove successful, and consequently funding has been leveraged to erect a stock fence around the entire site. The fence-line has been agreed by all partners with accurate GPS mapping, and an agreement is under negotiation between the partners.

Rat baiting

Rat damage patterns were noted to show a distinct ring-barking pattern around October when the sap is rising, with rats focusing on the most vigorous trees. A new regime of rat

baiting was started, using wax blocks on wires tied in the trees, this uses less bait as it targets rats in the trees. Baiting is carried out every six months, timed to knock back the rat population just before the vulnerable period for the trees.

No sign of any new rat damage in the Western remnant since October 2014. A protocol for rat baiting has been developed see Annex A.

Volunteer group

The St Helena Nature Conservation Group (SNCG) organised a one-off volunteer work day at Peak Dale gumwoods in April 2014. From this, a monthly volunteer day, the GGs (Gumwood Guardians), was formed and they have met every third Sunday of the month since then (except for when heavy rain prevented work). Between April 2014 and November 2015 a total of 352 volunteer man hours have been committed to the GGs, and an average of 6 people turn up to the monthly tasks, made up of over 20 different volunteers and a core group of 5.

All volunteers have been trained in the Bradley method, and invasive trees and shrubs have been successfully cleared from the western compartments of the gumwood forest. New trees are continually being found, mapped and added to the protected area.

Invasive plants are carefully cut down, and stumps are treated with herbicide to kill them and prevent regrowth. Pesticide use is minimal and a targeted chemical approach is employed. The herbicide Garlon (active ingredient triclopyr) at 125g/l engine oil was applied but this proved ineffective at killing the Brazilian pepper tree *Schinus terebinthifolius* (locally known as wild mango) which is the main invasive tree at Peak Dale. Currently trials are being done with Garlon at 125g/l diesel for killing stumps as well as regrowth and adult uncut trees, and initial results look promising.

New equipment has been ordered from UK so that GGs has its own tools and supplies; see Annex B for the complete list of tools and equipment. A partnership has also been formed with the private owners of Peak Dale Farm to restore their gumwood grove, ensuring the owners work with SNCG to pass on knowledge and experience.

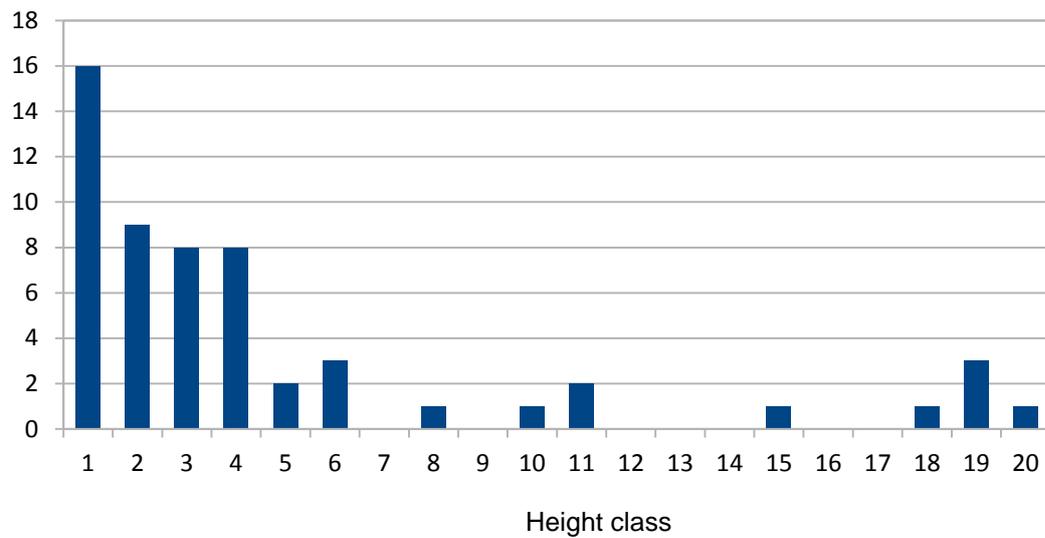
As a result of the work done, a Manual of Good Practice has been developed, see Annex C, and see Annex D for the site risk assessment.

Survey and Monitoring Work

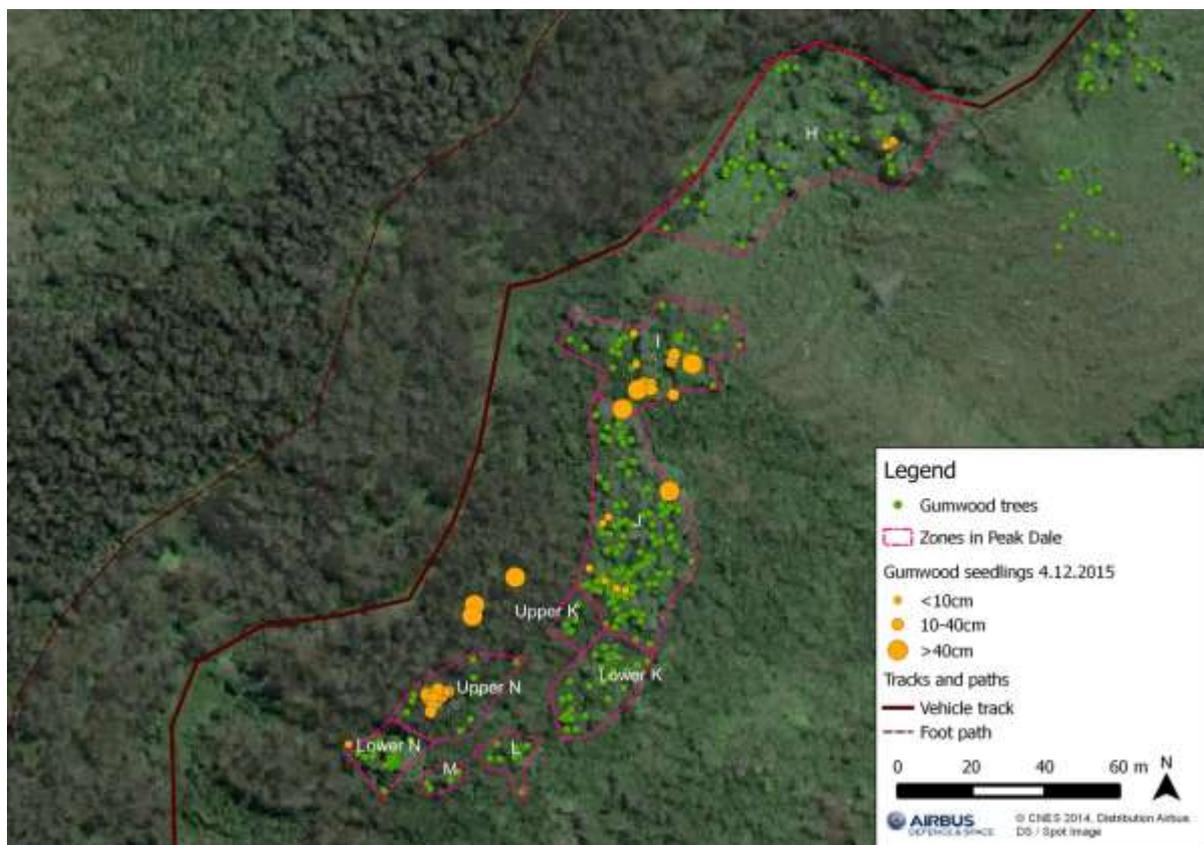
The western remnant has been divided into monitoring zones, and mapped with GPS. All zones received initial photographic records and DOMIN vegetation surveys, and regeneration of gumwoods is being monitored and recorded, with all seedlings clearly marked.

Natural regeneration was also low. A total of 67 young gumwoods have been mapped and measured to date at the site. The graph below shows the number of seedlings in each of the 20 height classes, where height class 1 consists of all seedlings from 1 to 10cm in height, height class 2 of all seedlings from 11 to 20cm in height, and so on, Three cohorts can be identified: 1 year old seedlings from the 2013/14 season (16 seedlings), 2 year old saplings from the 2012/13 season (25 saplings), and saplings at least 4 to 5 years old from previous seasons (15 saplings); raw data is given in Annex E.

Graph 1. Number of gumwood saplings of in each of the 20 height classes.



Factors favouring survival include protection from cattle, for example by fallen trees, and good canopy cover. The map below shows the location of all gumwood trees and naturally regenerated seedlings across the main zones in the 3 cohorts, excluding Peak Dale Farm seedlings, identified as at 4/12/15.



Conclusions

SNCG identified three key threats to the survival and regeneration of Peak Dale gumwoods:

1. Invasive trees over-topping the gumwoods, which rapidly die in the shade. The dense shade also prevents regeneration.
2. Rat ring-barking which can destroy up to about 90% of a tree's crown.
3. Feral cattle which are trampling the entire site, causing enormous erosion damage and destruction of regeneration.

Through the creation of an active monthly volunteer group, the gumwood guardians, trained in the use of the Bradley method, dramatic recovery has been seen within a year of nearly all mature gumwoods, cleared of invasive trees and protected from rat damage. This has demonstrated the clear success of careful, minimal clearing in avoiding shock to the surviving gumwoods, or much wind damage. Opening up areas on a small scale has avoided a large amount of invasive plant germination, and been on a scale that the volunteers can manage. No further rat damage has been seen since the whole site was brought under a new baiting regime in October 2014.

Unfortunately the research trial of under-planting failed due to the very poor survival of the under-planted gumwoods and fern seedlings, mainly due to feral cattle damage. A small amount of natural gumwood regeneration is occurring in more protected spots, and the majority are surviving to young sapling stage. A major new partnership is being negotiated and funding has been secured for the construction of a stock-proof fence which it is hoped will ensure higher levels of regeneration and a sustainable future for the western compartment of gumwoods at Peak Dale.

Annex A. Peak Dale rat baiting protocol

- The gumwoods are most vulnerable to ring barking by rats in October. Therefore start baiting in early September.
- SNCG is responsible for baiting the western zones, H to N.
- Coordinate with EMD so that baiting takes place at the same time all along the forest. EMD baits zone G and the eastern fenced area as far as Peak Dale Farm.
- There are 5 bait points in each zone, each one consists of a twist of wire around the tree at about head height, marked with red tape. All bait points are off the ground, in the trees.
 - Zone M is very small and only has 1 bait point.
- The recommended bait to use is a wax block formulation of a single-feed anticoagulant rodenticide, active ingredient brodifacoum, bromodiolone, difenacoum or similar.
- In early September place 5 baits at each point, threading the wax blocks along the wire: there are 9 zones x 5 bait points x 5 bait blocks per point + 5 bait blocks in zone M = 230 baits required.
- One to two weeks later revisit each point and re-bait. At any 1 point:
 - Where all bait has been taken, double the amount, so place 10 baits
 - Where some bait remains, replace it with 5 baits
 - Where all bait remains untouched, leave it.
- Repeat this until baits are still present at 90% of the bait points: this will probably take 4 to 5 visits.
- Keep records of the dates of each visit and the number of baits placed in each block.
- Throughout the year keep an eye out for other potential food sources for rats (such as guava or peach trees) and remove them.

Annex B. Gumwood Guardians equipment

Item	Number
Tools	
Planting spade	1
Machete and sheath	3
Silky curved saw and sheath	2
Silky pruning saw, and sheath	4
Extendable pruning saw	1
Silky pocket saw	4
Billhook	1
Sharpening files	3
Stanley knife	1
Adjustable spanner	2
Secateurs	3
Wire cutter	1
Hammer	1
Screw driver	2
Loppers	2
Hand forks	2
Hand trowels	4
Garden forks	2
Lockable pesticide cabinet	1
Waterproof lockable tool box	1
Extending ladder plus chain and padlock	1
Fluorescent tape, 4 colours	1 roll each
Personal protective equipment	
First aid kit	1
Gardening gloves, L	10 pairs
Gardening gloves, S	10 pairs
Nitrile gloves, L	7 pairs
Nitrile gloves, S	10 pairs
Monitoring and research equipment	
Soil pH – moister meter	1
Diameter steel tape	1
Light meter	1
Soil thermometer	1

Annex C. Manual of Good Practice

Gumwoods are very vulnerable to damage and death from being over-topped by invasive trees that rapidly grow faster and taller, casting deep shade that quickly kills the endemic canopy. This dense shade also seems to prevent any natural regeneration of gumwood seedlings. The Gumwoods of Peak Dale will only survive if there is targeted and consistent clearance of invasive trees from the site. The initial removal requires a lot of work, but once the important areas have been cleared, maintaining them as 'weed free' should require less time and energy, as long as it is detailed and regular.

The protocol for the work has been based on a technique and set of three principles developed by two sisters, Eileen and Joan Bradley, carrying out habitat restoration in Australia, and explained in their book 'Bringing Back the Bush'. This is now known as the 'Bradley Technique':

- 1) **Start with the best areas** - i.e. directly around the surviving endemic plants
- 2) **Minimal disturbance** – disturbance nearly always favours invasive plants
- 3) **Don't over-clear** – move only as fast as the native ecology can recover

Some disturbance is unavoidable when working at Peak Dale, but all disturbance tends to favour invasive plants which are evolved to take advantage of this ecological niche.

General

- Prioritise tasks from the most urgent (priority 1) to least urgent (priority 5), tackling the most urgent tasks first. Periodically revise the priority list, eliminating completed tasks and adjusting priorities accordingly.
- Follow the three guiding principles of the Bradley Method:
 - Work outwards from good areas of native plants towards areas of weed.
 - Make minimal disturbance to the environment.
 - Don't over-clear: let native plant regeneration dictate rate of weed removal.
- For health and safety reasons, ideally there should be at least 2 people present on the site when clearing or pesticide treatment is being done.
- Avoid working in very wet weather as the whole site is steep and sliding around causes extensive damage.
- Do your best to replace layers of leaf-litter that have been disturbed by your work. Exposed soil is the perfect place for the germination of invasive trees.
- There is no point clearing areas away from mature gumwoods unless there is a plan to kill the invasive trees and replant with nursery grown gumwoods. Cut invasive trees often regrow to 2m and produce seed within one season.
- Only open up areas that your team has the capacity to weed well for the coming years. Heavily overgrown areas with no gumwoods are more stable and less problematic than recently cut-over areas with a massive burst of new light-loving weeds. These will quickly seed into your sensitive gumwood areas and make matters worse.

Working with volunteers

- Plan the work in advance of the day, with suitable tasks arranged for both low turnout and high turnout. The turnout for Gumwood Guardians varies from 3 to 10, with a typical turnout of 6 people.
- Make it clear in advance if the task is suitable for children, identifying the lowest age for which the work is suitable.
- On arrival at the work site, give a safety talk to all the volunteers, covering:
 - How to carry tools safely
 - Working with sharp tools
 - Where the first aid kit is located for the day
 - Any relevant issues of the site
 - How to apply the Bradley method
- Assign volunteers into work groups of 2 to 3 people, spreading the groups a safe distance apart (depending on the nature of the work) for health and safety reasons.
- Never assign volunteers a task applying pesticides, unless they have the certificate of competence in the safe use of pesticides and have agreed in advance to do this work.
- The task leader for the day should check up on the groups periodically over the work session to make sure they are all working correctly and safely, and enjoying themselves.

Clearing invasive trees

The priority of the work for GGs has been to clear a small halo of about 1-2m around all of the surviving gumwoods, both surrounding the crown above, and below the canopy to prevent quick future regrowth up into the canopy.

Key points:

- Clear 1-2m of invasive trees away from the gumwood crowns.
- Clear all invasive trees from underneath gumwoods, up to 2m away from their crowns. This helps prevent future invasion into the canopy and opens the ground to enough light to stimulate natural regeneration.
- About once a year aim to visit each site and continue the process of cutting back a 1-2m halo around the Gumwoods. They recover quickly once freed up. Vigilance is needed as it is surprising how quickly invasive trees grow back into the cleared halo.
- Be very careful when invasive branches are intertwined with the Gumwoods as the Gumwood branches are extremely brittle, and even the slightest pressure when pulling down will snap them off. It is better to leave small amounts of very entwined invasive branches in the Gumwood canopy rather than almost inevitable Gumwood breakage.
- If you do leave invasive branches, cut off as much of the bottom as possible to leave as little weight hanging in the Gumwood canopy as possible.
- That said, tease out as much of the invasive branches as you can. When they are left entwined they become very hard, get blown about and break off the adjacent Gumwood shoots. Use the pole saw where possible to cut the invasive branches into small bits, which allows bigger branches to be dismantled slowly.
- For the first clear, cut the invasive trees down to waist height.

- Stack the brush as neatly as possible, to allow for essential access in subsequent years. Ensure that brush piles are not placed over wild-mango shoots that have not been cut and sprayed as they will grow back up through the piles and be very difficult to remove later.
- Wild-mango initially invades from seeds dropped in bird droppings, but later develops an extensive root network that has the capacity to sucker at all points. Cutting wild-mango without applying herbicide to the stumps can make the long-term situation worse as one tree will be replaced by twenty.
- Once the whole wild-mango root network has been killed in an area, keeping it wild-mango free should be a relatively easy process of weeding out new seedlings, and spraying off any sprouts creeping into conservation areas from adjacent infestations.
- Other invasive trees such as olive, ink and spoor are generally killed from a single herbicide application to a hacked stump.

Applying herbicides

- A targeted pesticide approach should be adopted: using pesticides as little as possible, as precisely as possible, and only if other methods are not acceptable or feasible. Acceptable areas for use currently includes:
 - Basal bark treatment for wild mango
 - Stump treatment for other woody weeds
 - Foliar sprays are not recommended due to the high risk of poisoning non-target species
- Anyone applying pesticides should have a certificate of competence for the safe use of pesticides.
- Foliar or basal bark treatments should be applied in zones where no other work is being done. Work should progress along a zone in one direction from the furthest point so that at no time are people exposed to freshly treated trees.
- Stump treatment has to be done immediately after cutting the stump. Work should therefore progress along a zone in one direction, so that those applying the pesticide follow behind those cutting the stumps, and at no time should people be moving among freshly treated stumps.
- Any pesticide treatments done within 10m of the public footpath require a sign to be displayed: up clearly visible signs, at least 8” x 12” in size, “CAUTION – SPRAYED GRASS /WOODY WEEDS” at all vehicular and pedestrian access points into the area sprayed, and leave them for at least 4 weeks after treatment.
- Where-ever possible use spot treatments such as cut & paint, basal bark treatment of cut stumps or ‘cut, drill, and ecoplug’. Spraying poses a high risk to non-target species.
- At all times follow the Code of Best Practice No. 6 Using Herbicides in National Conservation Areas <http://www.sainthelena.gov.sh/wp-content/uploads/2013/11/Code-of-Practice-for-Spraying-Conservation-Areas.pdf>

Rat baiting

The damage seems to occur on an annual basis, focused during the late winter/early spring months of September, and especially October. The rats are clearly de-barking selectively, choosing only the lushest, most vigorous trees. There is little sign of historic damage to the

sparse gumwoods growing in the dry bluff areas, and huge damage in to the bigger, lush trees growing in the guts. This may be because the rats are de-barking to drink the resulting sap, which will be at its strongest flow in the most vigorous trees and during the spring when the sap is rising along with the temperatures. The damage is very obvious when first carried out, the de-barked areas standing out as bright pale yellow areas, fading to greyish brown over the following months.

Rat damage is so destructive and extensive, that without successful and continuous rat control it is unlikely that there will be any success in restoring gumwood forest:

- Follow the Protocol for Rat Control in Peak Dale.

Replanting

Gumwood seedlings seem to appear only very close to mature adults. This is puzzling as the seeds are light and presumably easily blown. There are odd saplings to be found many meters from adults, but in the main, mass regeneration is almost exclusively almost directly under mature trees. Active replanting is required to fill gaps in the forest:

- An annual replanting should be agreed each year.
- Plants must be of the correct provenance, and sourced through Vanessa Thomas at EMD.
- Replanting should be done early in the winter season, to take advantage of the seasonal rains.

Never stop keeping an eye out for 'lost' Gumwoods, deeply obscured by heavy invasive growth. GGs has found trees directly above the track that everyone has walked directly under for 2 years without ever spotting.

Annex D. Risk assessment for Gumwood Guardians volunteer groups

What are the hazards?	Who might be harmed and how?	What are you already doing?	Do you need to do anything else to control this risk?	Action by who?	Action by when?
Slips and trips	Volunteers may be injured if they slip on mud, down a slope or trip over tree roots	The volunteer days are cancelled when the weather's wet, volunteers are asked to wear boots with good grip, when activities involve a steep slope volunteers are informed beforehand, objects protruding above the soil surface are pointed out to volunteers by the activity leader	To ask new volunteers what their levels of physical ability are Informally assess any accessibility issues related to the site of each activity i.e. site assessments.	Activity leader Activity leader	Previous to beginning each activity
Cuts and gashes from equipment or foliage	Volunteers, activity leaders and bypassers through accidental or purposeful mishandling of equipment or foliage removal process	A health and safety discussion at the beginning of each activity involving everyone present. The activity leader will ask volunteers appearing to mishandle equipment or foliage to be aware of others around them and potential ricks from mishandling equipment	First aid training for activity leaders To inform volunteers where the first aid kit is on activity days	Project manager Activity leader	When new activity leaders begin During each activities health and safety briefing
Head bangs	Volunteers or activity leaders may hit their head from a fall, on foliage, within transport to the work site or on equipment	Health and safety discussion at the beginning of each activity involving communication of the necessity to be aware of the activities surroundings, how equipment can be used safely and that felled foliage must be supported before being placed on the ground	To inform volunteers where the first aid kit is on activity days A walkie-talkie, mobile or other device is to be carried by the activity leader to enable contact with the emergency services if necessary	Activity leader Activity leader	During each activities health and safety briefing On activity days
Being hit by felled foliage or equipment	Volunteers or activity leaders may be injured by falling foliage or equipment when a volunteer has become fatigued and so lost awareness of potential risks of the activity	Health and safety briefings at the beginning of each activity involving communication of safe use of equipment, felling methods and the necessity to take regular breaks and rest when tired of physical works	The activity leader is to check in with and be aware of volunteers who may need regular breaks according to their level of physical ability A demonstration of how to use equipment and fell foliage safely	Activity leader Activity leader	Throughout the activity day Previous to beginning each activity
Sunburn, dehydration, exhaustion and hyperthermia	Volunteers and activity leaders may be at risk from hot weather, exposure to sun, rain and lack of drinking fluid	Taking regular breaks for water, food and rest in the shade Reminding volunteers to use suncream and to change clothing according to any changes in the weather	Email volunteers beforehand giving guidance of how to prevent sunburn, dehydration, exhaustion and hyperthermia during activities i.e. appropriate clothing	Activity leader	At least three days previous to each activity day
Lost volunteer	Volunteers may become separated from the group and lost	Health and safety briefing containing an orientation of the activity site and a group count of activity day participants before and after the day's activities	An SNCG member not present at the day's activity to be informed of activity location, time of departure and return	Activity leader	Previous to departure for each activity
Pesticide poisoning	Pesticide sprayer; volunteers brushing sprayed vegetation	Pesticides applied only by a holder of a certificate of competence; spraying only done once volunteers have moved on from a site.	CAUTION signs to be posted in sites where pesticides have been applied	Activity leader	Throughout the activity day

Annex E. Natural regeneration of gumwoods as at 4/12/15.

GPS point	Zone	Height (cm)	Height class (10cm intervals)	Cohort
623	Peak Dale Farm	25	3	2
624	Peak Dale Farm	198	20	3
625	Peak Dale Farm	40	5	3
626	Peak Dale Farm	180	19	3
627	Peak Dale Farm	72	8	3
628	Peak Dale Farm	34	4	2
629	Peak Dale Farm	90	10	3
630	Peak Dale Farm	106	11	3
no point taken	Peak Dale Farm	24	3	2
631	Peak Dale Farm	105	11	3
632	H	6	1	1
633	H	6.5	1	1
634	H	6	1	1
635	H	7	1	1
636	I	5.5	1	1
637	I	5.5	1	1
638	I	20	3	2
639	I	15	2	2
640	I	53	6	3
641	I	25	3	2
642	I	18	2	2
643(?)	I	30	4	2
643	I	38	4	2
644	I	31	4	2
645	I	38	4	2
646	I	34	4	2
647	I	39	4	2
648	I	57	6	3
649	J east	52	6	3
650	J east	140	15	3
651	J west	0	0	0
652	J west	0	0	0
653	J west	0	0	0
654	J west	0	0	0
655	J west	0	0	0
656	J west	0	0	0
657	J west	3	1	1
658	J west	6.5	1	1
659	J west	0	0	0
660	J west	0	0	0
661	J west	0	0	0
662	J west	0	0	0
663	J west	5	1	1
664	J west	4.5	1	1
665	J west	7.5	1	1
666	J west	0	0	0
667	J west	1.5	1	1
668	K upper, above	188	19	3
669	K upper, above	180	19	3

670	K upper, above	171	18	3
671	N upper	43	5	3
672	N upper	17	2	2
673	N upper	30	4	2
674	N upper	24	3	2
675	N upper	19	2	2
676	N upper	22	3	2
677	N upper	11	2	2
678	N upper	14	2	2
679	N upper	9	1	1
680	N upper	25	3	2
681	N upper	21	3	2
682	N upper	5	1	1
683	N upper	4	1	1
684	N upper	11	2	2
685	N upper	13	2	2
686	N upper	10	2	2
687	N lower	8	1	1