Damp-wood termite *Heterotermes spp.* distribution assessment and control feasibility in the Peaks National Park and its fringes, St Helena

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Introduction:

Heterotermes spp. (Silvestri, 1936) or the Damp-wood termite (as will be referenced in this report), also known locally on St Helena as the 'White Ants', have been recorded on island since 1840 and are believed to have come originally from the timber of old wooden ships. They are highly destructive and eat anything containing cellulose, e.g. paper, wood etc.

Through DNA sequencing, this species was identified at the genus level. However, species-level classification was not possible due to the absence of relevant references in the genomic database. There is one other termite species present on St Helena a Drywood termite *Cryptotermes brevis* present, but this report deals specifically with the Damp-wood termite, due to its risks to the Cloud Forest habitat.

Melliss first recorded the destruction caused by these Damp-wood termites on the buildings in 1846 and there was such concern about their impact that the Governor in 1800/1900's ordered experiments to deter and remove them. They were controlled by removing the infested wood and replacing it with either treated or hardwood. The government tried to limit their spread by enforcing a termite ordinance in 1957, which stopped the transportation of wood and soil across the island. Despite these efforts the Damp-wood termites can now be found island-wide, from high altitudes including Diana's Peaks to low altitudes such as Rupert's (Phillip and Myrtle Ashmole. 2000).

Why are they a cause of concern:

Damp-wood termites are a cause of concern in the Cloud Forest because they are found in high abundance just below the National Park (fringes), especially in areas of forestry. At the moment they are only found in one area in the Cloud Forest, which is the timber of the hut next to the canon. They are also present outside the Cloud Forest at Heart-shaped waterfall, as well as Wrangham Forest, Warren Gut Forest, Pleasant Valley Forest and Stitch's Ridge. An example record from outside the Cloud Forest is Dr Noel Tawatao, FERA witnessed Big-headed ants *Pheidole megacephala* attacking Damp-wood termites at Heart-shaped Waterfall, January 2023. However, a full survey of this species has not been carried out and so they may be more widespread across the island, especially within residential areas.

Heterotermes spp. thrives in damp/wet conditions, which means that the Cloud Forest is likely to be a good habitat for them. From existing records, it is known that the Damp-wood termites are present in the Norfolk Island Pine *Araucaria heterophylla*, causing significant problems for these non-native forestry trees that are present on the Peaks. It is currently believed that the present food supply for the termites is stable and does not include endemic trees, as they are generally found within the Norfolk Island Pines and in construction timber on the Peaks. They have also not been recorded during any invertebrate surveys in the Peaks. However, this situation could change if the termite population increased in relation to climate changes, other food sources could become suitable. This could result in Damp-wood termites moving onto endemic plant species and deadwood, which would affect the endemic invertebrates that survive on the deadwood, as well as endemic plants; however, surveys and assessments are needed to better understand the potential of this risk.

Location:

Damp-wood termites are found island-wide in residential as well as forestry areas, like the Wrangham Forest, Warren Gut Forest, Pleasant Valley Forest, Stitch's Ridge and at Heart-shaped Waterfall. From past records Damp-wood termites are also known from other residential areas, such as Jamestown, Lemon Tree Gut, Bates Branch, Scotland, Levelwood, Longwood to Blue Hill. They are also found in the Cloud Forest in the hut next to the canon (Mt Acteon side of the Peaks), see Diagram 1 for a visual representation of their currently distribution on island.

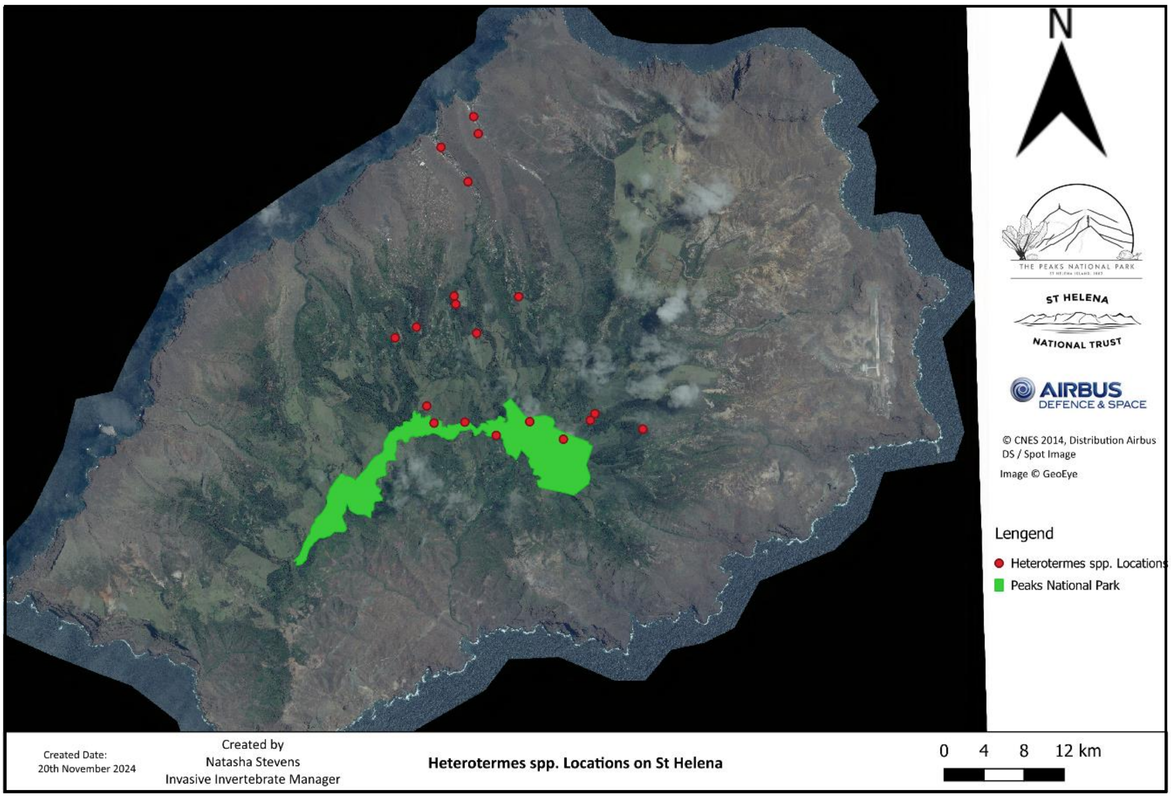


Diagram 1: This map shows the distribution of the Damp-wood termite on St Helena. However, its actual range is likely much broader than depicted, as records of this species are limited.

Scoping phase:

Understanding Damp-wood termites in the fringes of the cloud forests of St Helena

There is limited knowledge about *Heterotermes spp.* and whether their behaviour is similar to other termites nor how far they have spread in the Cloud Forest. Special permission has been granted to access the prohibited areas of the Peaks National Park (PNP) to conduct monitoring, however Pleasant Valley in the fringes of the Cloud Forest was chosen for this first phase of work, for its easy access and its lower environmental risks.

Pleasant Valley Forest is located below the PNP in Levelwood (South East of the Island) it is a woodland area, with mixed vegetation from Wattle *Acacia mearnsii,* grass such as Granadilla *Passiflora spp.* to Spoor *Pittosporum viridiflorum* with grass and deadwood, which makes it an ideal site for termites to survive in, and so termites are well established in this area. This survey has helped to highlight the termite ecology by observing factors, such as diet and abundance and also assess whether the termites exhibited a preference for different wood types. The site encompassed 10 termite stations, each housing a single piece of wood from six different tree species and these were monitored on a monthly basis. There was originally meant to be 12 monitoring station however a tree unfortunately fell on one. The selected tree species were Cypress *Cupressus macrocarpa*, Thin leaf pine *Pinus maximinoi*, Pine *Pinus pinaster*, Wattle *Acacia mearnsii*, Blackwood *Acacia melanoxylon*, and *Eucalyptus maidenii.* Three being hardwood (Blackwood, Eucalyptus and Wattle) and the other 3 being softwood (*Cypress and 2 pine species*). There were two stations for each species, apart from Eucalyptus and Blackwood as station Eucalyptus 8 was lost when a tree fell on it.

The termite monitoring stations were blocks of wood each measured roughly 48-39 cm long, 24-23 cm wide, and 1-3 cm thick. Recording standard measurements from each of the stations allows deterioration to be monitored over time due to termite predation and then comparisons made between the different wood types. The termite survey was conducted within a relatively small site only 170m^2. The site was also very overgrown with vegetation, had a lot of deadwood present, as well as an uneven terrain in certain areas. Therefore, it was impossible to place the wood into evenly separated and standardised monitoring sites, for example 20 meters a part in similar micro habitat. As a result, some monitoring stations were closer and others further apart, and they were also installed in slightly varied environments, for example some stations were place next to deadwood or beneath open canopy cover.

Measuring termite activity:

Before any monitoring could take place, the method for assessing termite activity had to be defined, as defining activity is challenging with multiple factors needing to be taken into consideration during the measurement process. This can be achieved either by counting individual termites or assessing the infestation rate. For example, one challenge is that the termites being measured disburse very quickly to avoid the light, which makes counting them difficult. Potential methods are described below and refer to Table 1 for a comparison of the advantages and disadvantages of each measurement method.

Table 1. Pro and cons of different monitoring assessments			
Measuring	**Method**	**Cons**	**Pros**
Number of individual termites	Counting or estimating number of termites on the wood and on the ground. The scale was adopted from the Big-headed ant report (DPLUS104).	• The exact number of termites inside the wood is unknown, and so the infestation may be more severe than it appears. • Human error is easily introduced during the counting process. Different surveyors measure it differently. • Difficult to count when the wood is severely infested and counting harder at different stages • Termites disburse quickly when exposed to light	• The handling of wood is kept to a minimum
Weighing the wood	Putting the wood on the scale and weighing it at each monitoring interval	• A lot of wood handling can disturb the termites or damage the wood further • Missing the termites on the ground	• More accurate
Infestation scale – direct assessment	Place a plastic sheet marked with 10 cm x 10cm over (but not on) the wood, or alternatively, mark the grid directly onto the surface, then use it to measure the infestation rate	• The infestation rate may progress slowly and does not reflect the activity occurring within the wood • Directly marking could disturb the termites on the wood • Missing termites on the ground	• More accurate • Document the different stages of infestation. • Taking images will get an accurate assessment of the infestation.
Infestation scale - image-based assessment	Capturing images of the wood at each monitoring interval and analysing the images to assess the termite infestation rate.	• The photograph must be captured from the same location and angle each time. • The image may be distorted, making accurate assessment difficult	• Easy to use in the field • Able to identify changes on the wood and record the infestation rate

During the survey, the infestation scale using direct assessment with a grid marked on the wood had deteriorated too much, preventing further use of this method. Instead, the image-based assessment was used as an alternative means of monitoring the infestation levels. However, the photographs were not standardised throughout the survey, for instance, differences in camera angle and height made it difficult to obtain accurate infestation measurements. If this method was repeated the photographs would need to be standardised. A weakness in this method is that the infestation scales focuses on monitoring the tunnels left behind, which means the termites on the ground and inside the wood may go unnoticed. 'Number of individual termites' assessment is a great way to assess the termites presents and 'weighing the wood' is the best way to measure the internal damage. During our surveys at Pleasant Valley, we conducted a mixed method approach using: number of individual termites assessment to assess termite abundance and the infestation scale using image-based evaluation to measure the termite activity.

Termite monitoring methodology:

The method below will describe the steps taken to monitor termites using the three methods outlined above and also incorporating the scale system for counting, which was used in DPLUS104 on ants (See appendix 2), for the counting of termites at Pleasant Valley. The survey took place in Dec 2023 and the monitoring took place every month to March 2025.

Equipment:

- Notebook/Recording sheet and pen
- GPS and camera
- Monitoring stations
- Measuring tape
- Survey tape/plastic pegs

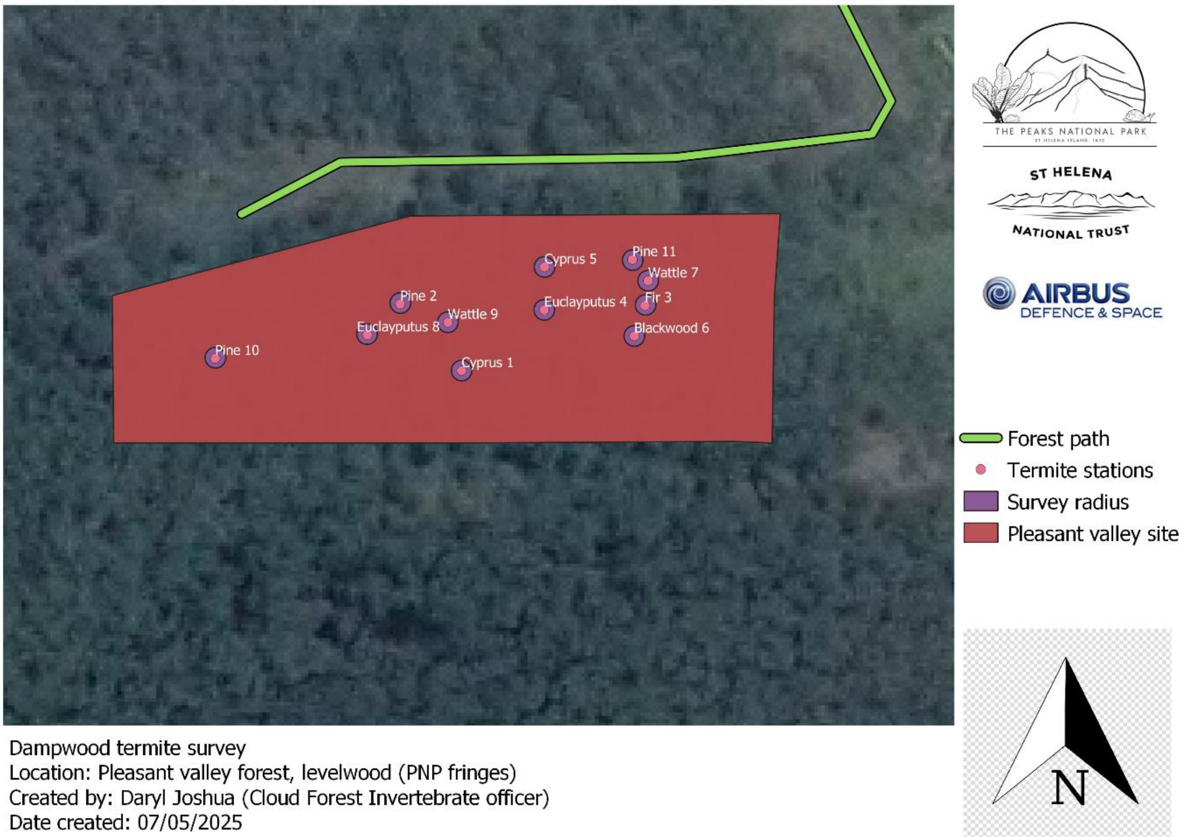
Method:

1. Initially the potential monitoring site was surveyed to determine if the termites are present or not. This is achieved by carrying out techniques including (e.g. Hand searching, inspecting fallen and standing dead wood and sieving leaf litter.
2. Once the presence of the Damp-wood termite was determined a site-specific environmental risk assessment was conducted. For more information on these methods see Ellick *et al*. 2023. The risk assessment results were low in relation to environmental risk therefore monitoring could take place. However, if the risk assessment had indicated high risks, then there would have been a need to either find an alternative site with low risks or apply mitigation measures. However, no risks were identified.
3. Subsequently vegetation survey will be conducted following the guideline from Ellick *et al*. 2023. A one-meter square quadrat round each station was used alongside a ground coverage percentile recording system to monitor selection pressures in

various micro habitats such as bare ground, grass, deadwood and leaves along with mosses and lichens. At the same time termite abundance was logged (see appendix 1) and photographic evidence documented.

4. The monitoring stations (pieces of wood at roughly similar sizes) were positioned at four different environments (e.g. bare ground, grass, near fallen and live trees).
5. The monitoring took place on a monthly basis and in dry conditions. The termite abundance monitoring occurs on a monthly basis to monitor fluctuations in environmental factors that could influence infestation of the wood.
6. Termite abundance was achieved by counting and estimating the number of termites on the wood (see appendix 2) and carrying out image-based assessment of infestation.

Diagram 2.



Picture 1. Capturing the setup process for termite monitoring and surveying for termites at Pleasant Valley

Results:

Pleasant Valley is a forest with grass and deadwood which makes it an ideal site for termites to survive in. The monitoring stations were installed on site in December 2023. For the first month, they were checked every two weeks, but no activity was detected. As a result, a decision was made to switch to monthly monitoring. It took two months for the termites to reach the monitoring stations. Then observations showed a slight preference for hardwood over softwood (see Graph 2), and they favoured certain monitoring sites, these were hardwood (blackwood 6 and wattle 9) and softwood (fir 3) (see Graph 1). They remained active year-round, see graph 2 and 3, 4 but with peak numbers of termites in July, August and December but this did vary between site and wood types, and generally related to initial infestation scale of damage at different station. The data indicates that the termite activity is initially high on the exterior of wood when it is first discovered. Then over time their numbers decline, this possibly suggests an increased activity within the wood. This behaviour was consistent across both hardwood and softwood. For example, the termites activity in the Blackwood started in Feb 2024 and approximately 20 termites were counted on the bottom of the Blackwood and they were also seen coming out from the ground. The Blackwood montioring station was located in an grassy area. In March, tunnels are formed and by July the termites were well established inside the wood. However, from September onwards the termites numbers declined outside but were still present in the wood, and numbers increased again in October. A very similar pattern was mimiced by Pine (Fir 3), approximately 50 termites were observed during July and August 2024. This number declined to around 20 in September and October, with a continued decline in November.

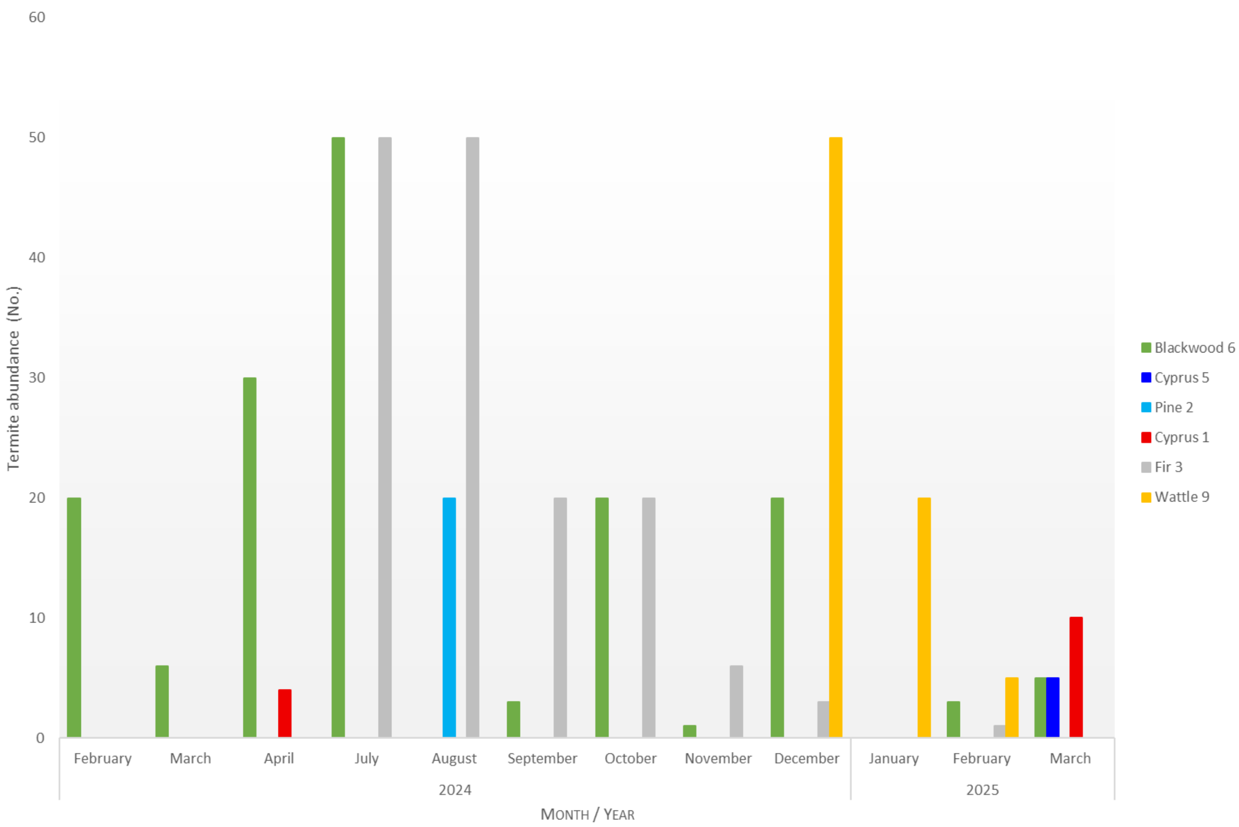
The monitoring station was located in an open grassy area. When comparing these two woods, termite-related damage was more extensive on the Pine than on the Blackwood. Refer to Appendix 4 and 5 to see the infestation scale photos for these two wood species.

Graph 2 indicates that the termite numbers peaked at 70 on the hardwood in Dec, primarily because termites infested the Wattle 9 monitoring station and then their presence gradually declining on the exterior of the wood – but this does not mean that the infestation scale decreased, as they could be in the interior of the wood. In comparison on the softwood stations in July, the termites discovered the Fir 3 monitoring station on the softwood stations and then peaked in August because the termites infested the Pine 2 monitoring station. Due to staffing constraints, data for May and June is unavailable, making it unclear when the termite infestation began at the Fir 3 station.

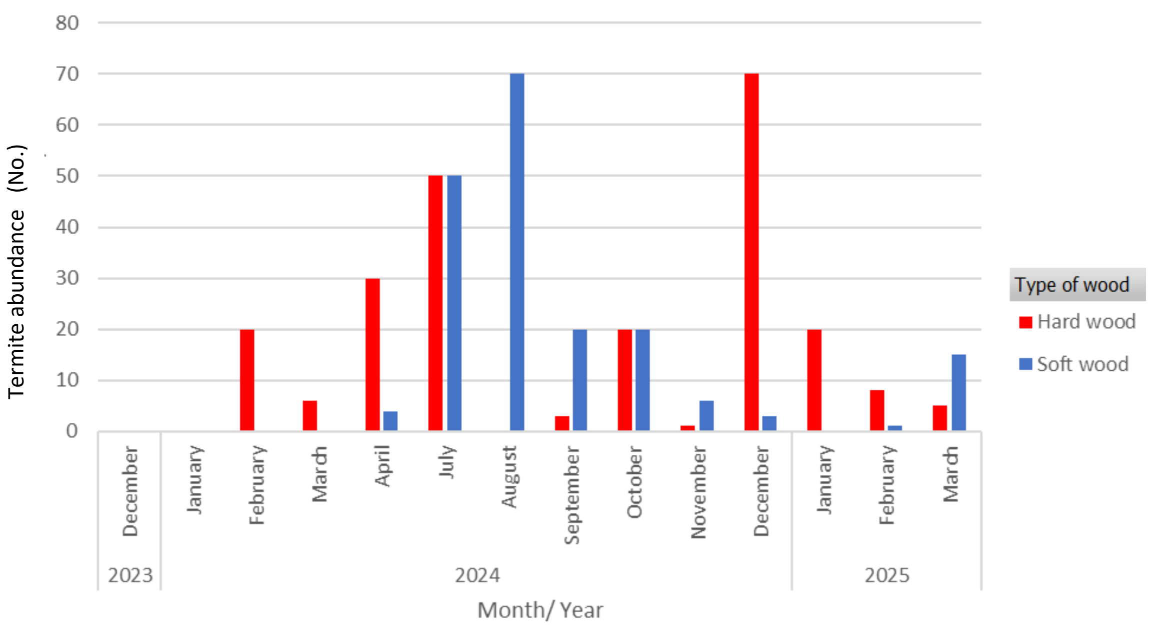
From the infestation scale – image assessment (see appendix 3.) the Blackwood 6 (hardwood) and Fir 3 monitoring station (softwood) demonstrated the most damaged by the termites. There could be many reasons why the damage is higher on these two stations, they were located close to each other and so it could be ease of infestation (see Diagram 2). It was seen that termite activity was not affected by the vegetation coverage or bare ground or leaves/deadwood levels. However, in July, numbers peaked when vegetation reached its highest average level. (see Graph 5). Also, it was clear from observations that the ground must be moist and dark for the termites to expand (ref to www.terminix.com/termites/signs/mud-tubes/). It appears that termites do not have a clear preference for either softwood nor hardwood, as one of the most infested monitoring stations is hardwood and the other is softwood. However, the surveys have shown that termites have a strong preference for the Blackwood, by consuming it first and the termites continuously have been observed on the wood throughout the survey.

Not all monitoring stations recorded high termite infestation levels (see Graph 1 and 6). The most significant damage occurred on the Blackwood 6 and Fir 3 stations, reaching infestation scale levels of 60% and 80% respectively. In contrast, the Cyprus 1, Pine 2, and Wattle 9 stations reported infestation scale levels below 40%. On the Blackwood 6, the infestation scale gradually rose from under 10% in March to 60% by November 2024, where it remained through the end of the survey. It took approximately seven months for the station to reach this level of deterioration. Termite activity steadily increased, peaking in July at 20%. Interestingly, there was no visible termite activity in August, and the infestation scale remained unchanged. From September onwards, termite numbers were low, yet the infestation scale level continued to rise, suggesting the termites were still consuming the wood internally, even though they were not visible on the surface.

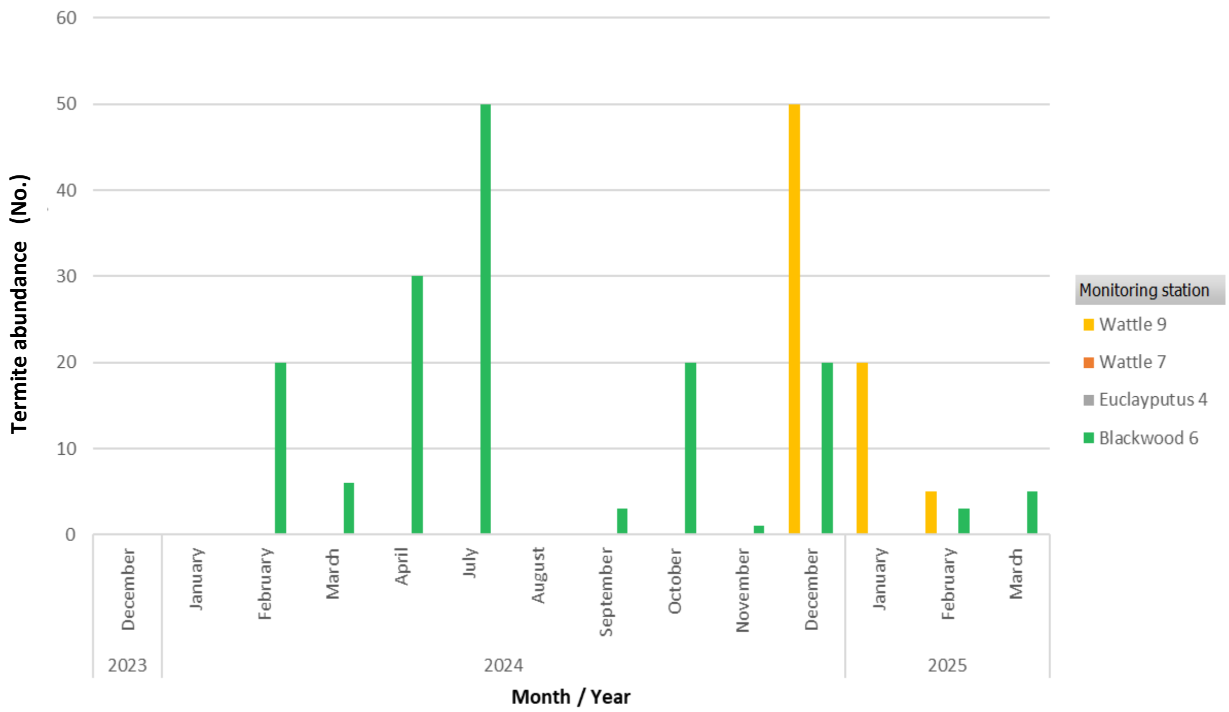
Fir 3 exhibited a high infestation scale of damage, beginning at 50% in July 2024 and rising sharply to 80% within four months. Termite abundance followed a similar trend—numbers were high in July and August, then dropped significantly to 20 in September. As with the Blackwood station, although visible termite numbers declined, substantial damage to the wood persisted. The data suggests it takes at least one month for visible damage to appear, and once the termites are established, external wood degradation slows, even if internal consumption continues.



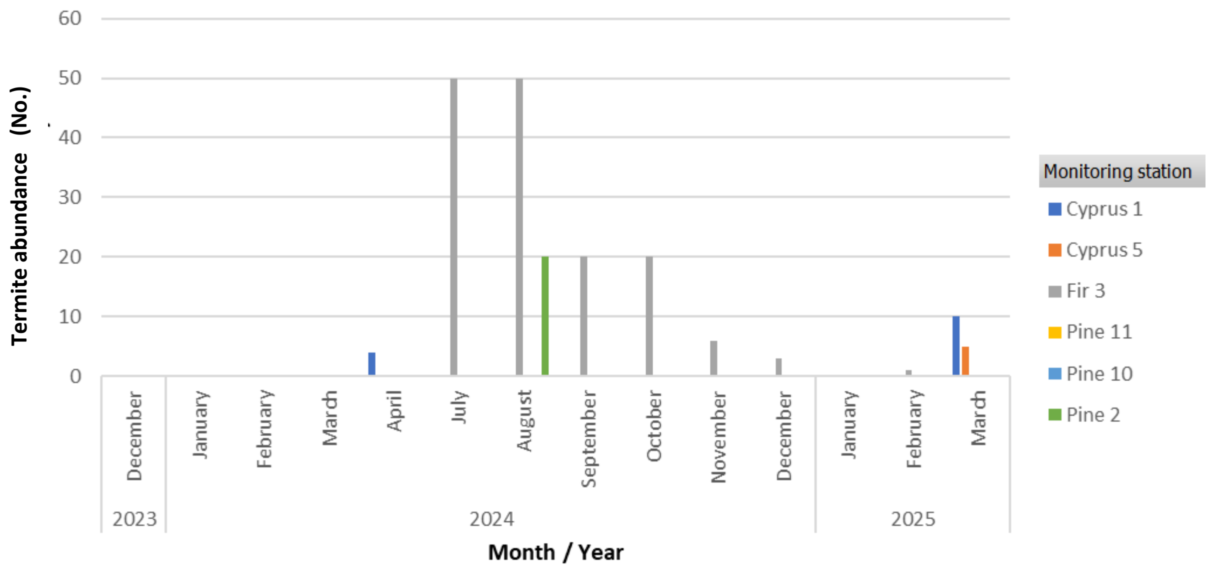
Graph 1: Monthly observations of termite abundance at each monitoring station.
Note: Monitoring stations where no termites were detected are not shown: Wattle 7, Pine 11, Pine 10, and Eucalyptus 4 and 8



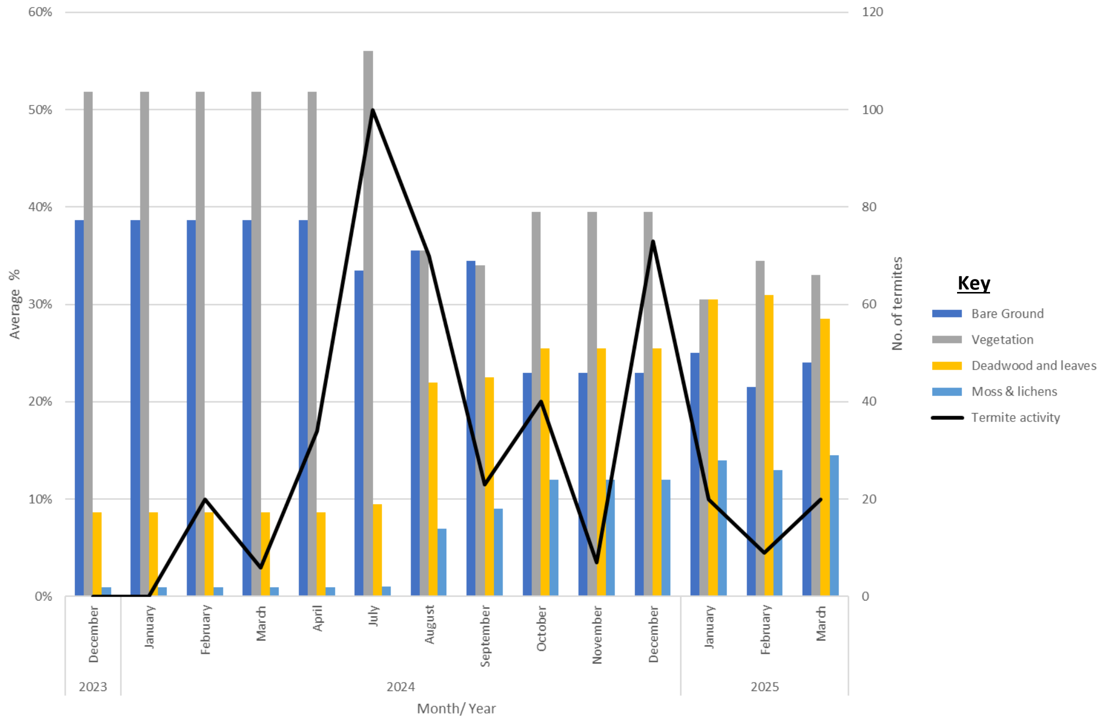
Graph 2: Monthly observations of termite abundance on soft and hard wood.



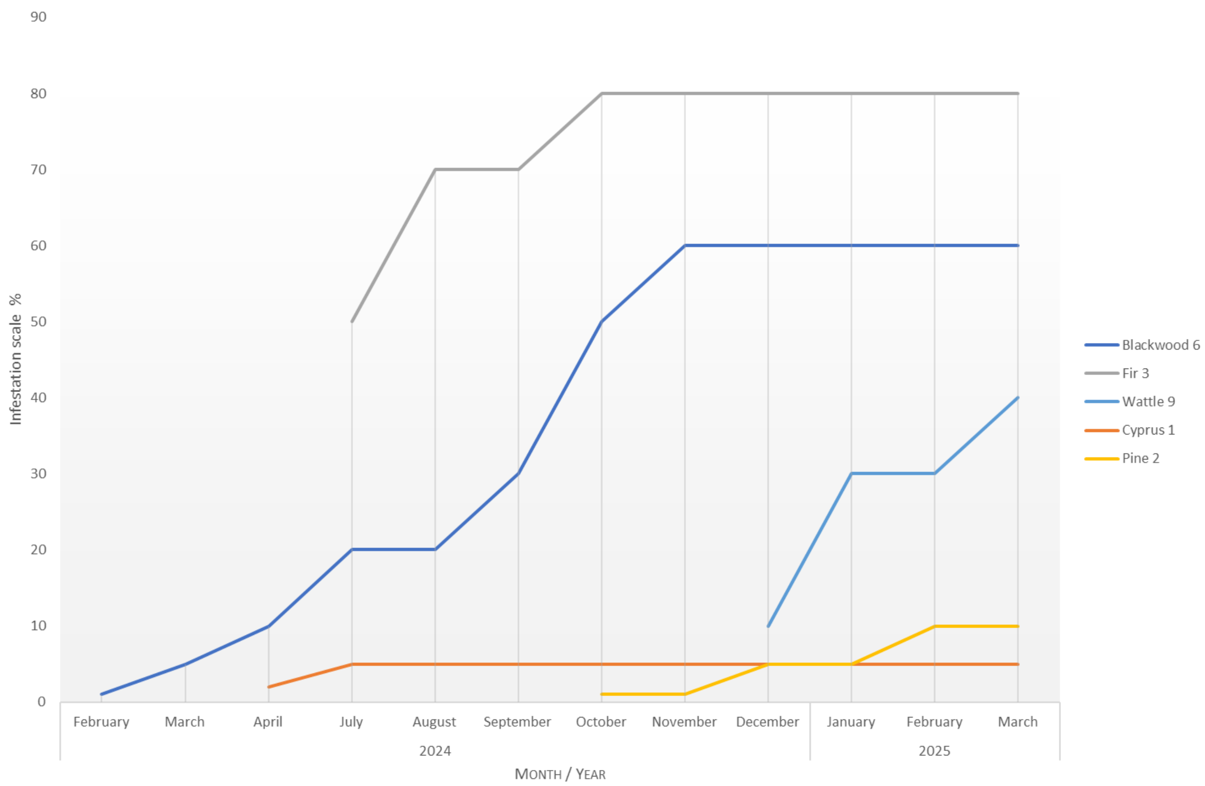
Graph 3. Shows the termite abundance on Hardwood at Pleasant Valley



Graph 4. Shows the termite abundance on Softwood at Pleasant Valley



Graph 5. Compare the total termite abundance with the average vegetation levels at the monitoring stations in Pleasant Valley



Graph 6. Shows the infestation scale by station

Note: only stations that had external damage on the station are displayed

Conclusion:

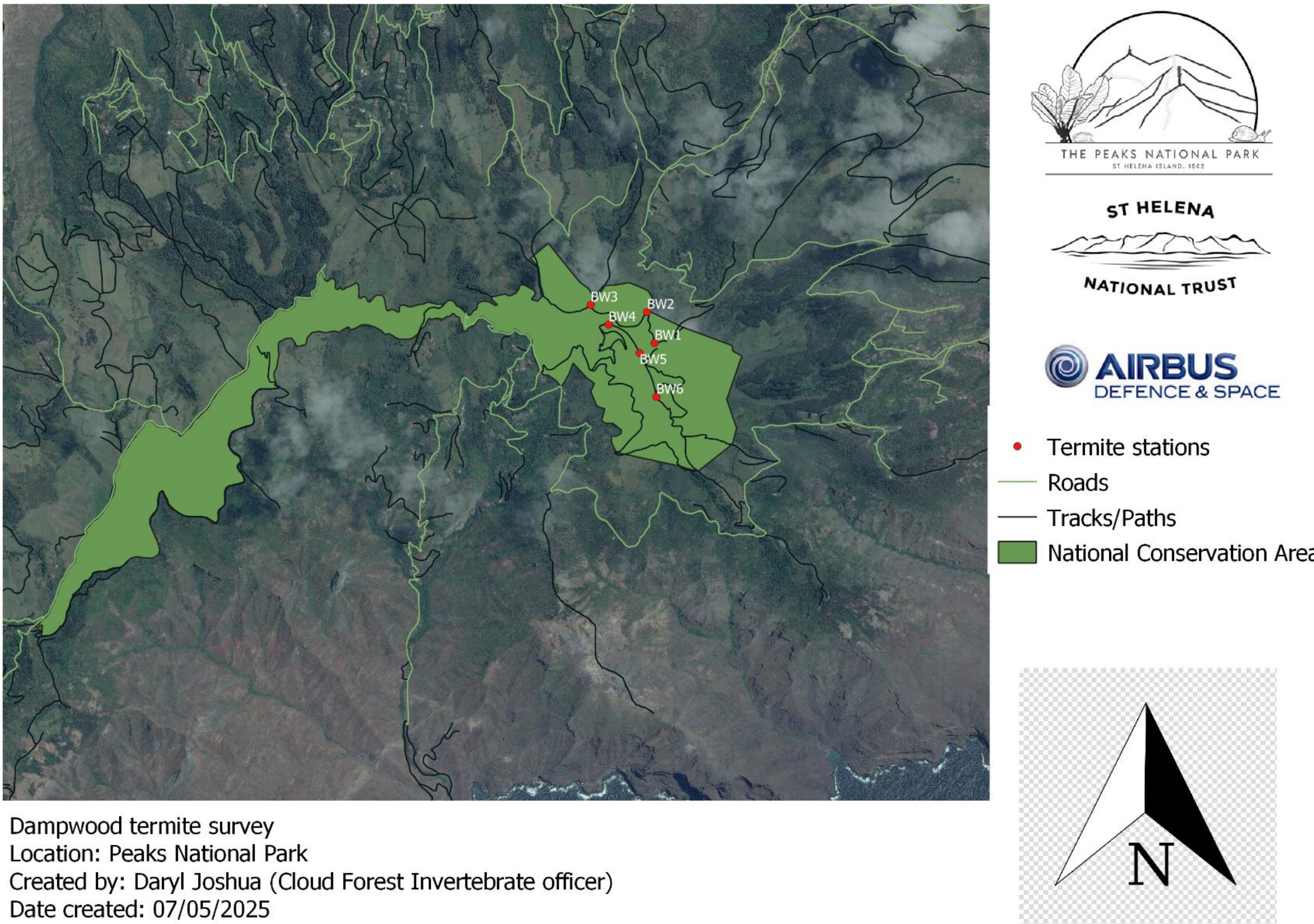
Pleasant Valley is a known hotspot for termites and it took at least 2 months for them to locate and infest the monitoring stations. Once established it took 1-2 months for the termites to create tunnels. The termites consume five different types of fresh wood Cypress, Thin leaf pine, Pine, Wattle and Blackwood, but not hardwood Eucalyptus, possibly due to its strong scent and exceptionally hard composition. Its wood is harder than the other two hardwood species Blackwood and Wattle. However, outside the survey, observations suggests that termites do eventually consume eucalyptus, once it has remained on the ground for an extended period, and environmental conditions have significantly softened its interior and reduce the aroma. Termites appear to be indifferent to whether the wood is soft or hard, with the exception of Eucalyptus. The termite appeared to have a slight preference for the Blackwood (hardwood), as they were observed on this species first and remained present throughout the survey.

In terms for the monitoring methods, there needs to be more work on refining the method for evaluating infestation, but number of individual termites and infestation scales using the images assessment both give some level of understanding. However, both these methods can be misleading, as the Fir 3 monitoring station had sustained more damage than the Blackwood monitoring station, but this wasn't picked up by the count nor the infestation scale. The Blackwood had a high count but less damage due to termites having discovered the Blackwood first and then continuing to feed on the exterior of the wood due to the wood being hard. For this work, Blackwood will be used in the monitoring stations in the Peaks as this would mean monitoring would be easier due to more external damage and although the Pine became more infested, it likely wouldn't be able to withstand the harsh weather conditions in the Cloud Forest.

Cloud Forest Monitoring of Damp-wood termites

To determine how far the termites have spread through the Cloud Forest an additional study is being established to understand the distribution of the termite and their altitudinal limit. Six monitoring stations were placed on the foot paths of Diana's Peak Cloud Forest ring road; this makes them easy to access and limits pathogen spread. They will be surveyed in 2025/26 at the same time as the fringes study at Pleasant Valley. Six stations were introduced to the Cloud Forest environment, three of which will be subjected to high altitudes 808m – 820m and the next three to a lower altitudes 728m -787m. The stations consist of the most susceptible wood species Blackwood *Acacia melanoxylon,* which was identified as the most favourable wood from the fringes survey. The stations were deployed on Dec 2024 and will continue to be monitored into 2025 and 2026. The monitoring could not be conducted at the time of this report due to the wet weather and the restrictions in the Peaks.

Diagram 3.



Cloud Forest Ad hoc Observations:

During the current survey informal observations were gathered, providing new records of the termites from the Peaks, including below Taylor's Hut, next to the Nursery, at Munchas and in the Sandy Bay Ridge Forest. Below Taylor's Hut, the Damp-wood termites and *Acanthinomerus conicollis* were found in a dead Black cabbage tree, although there weren't many termites present in the wood. They were also found in the fringes at Pleasant Valley Forest and in Alarm Hill Forest below Diana's Peak.

Damp-wood termites were also discovered in a living Whitewood tree adjacent to the Peaks' nursery, although the tree appeared to be healthy. They were also observed feeding on the wooden structure of the shade house in the Peaks, leading to the replacement of the structure to prevent further spread.

Currently, we have only observed Damp-wood termites in the lower altitudes of the Peaks National Park, and it remains unclear how far the termites have spread within the Cloud Forest, as our survey was limited to only the footpaths. However, during two surveys within Cloud Forest—the ‘Annual Invertebrate Survey on the Peaks’ and the ‘Pathogen Monitoring’ the termites were only recorded in Munchas, which is located near the Gene Bank. The Pathogen monitoring team observed them feeding on the roots of a Whitewood *Petrobium arboreum* tree. However, the extent of the damage by the termites was unclear as the tree was also affected by diseases, making it difficult to determine the primary cause of the damage.

Picture 2. Termites found on a dead endemic Black Cabbage Tree in the Peaks National Park

Picture 3. Termites found on a living endemic White Wood in Peaks the National Park

Future control and risks

There are two termiticides available on St Helena: Termite Control SC, Coopers Ultrakill, and Termidor SC BASF. These chemicals function as termiticides and insecticides, they are broad spectrum and so targeting a wide range of invertebrates from ants to crickets to spiders (see appendix 7 for detailed information on these controls). The control works by applying the toxin to the area to be treated, where it can seep into the roots and soil. The residual effects of these toxins can last up to five years.

Due to their prolonged presence and potential harmful impact on endemic invertebrates, it is not recommended to use these toxins in the Peaks or other sensitive habitats. They do not decompose easily in the soil and so pose a significant environmental risk.

Therefore, the control chosen for suppressing the Damp-wood termites on the fringes of the Peaks National Park is Pestman hexaflumuron termite bait, https://www.pestmanglobal.com/solution/we-make-a-test-killing-termites-with-hexaflumuron-bait/. The active ingredient is hexaflumuron (10%).

What happens to hexaflumuron in the environment?

- In anaerobic soil hexaflumuron has a half-life ranging from 40-64 days. See half-life box.
- Hexaflumuron has low mobility in the soil. It binds strongly to soil particles and is not highly soluble in water. It is not likely to contaminate surface or groundwater.
- Based on use the pattern, hexaflumuron is not expected to be present a ground water.

Half-life is the time required for half of the compound to degrade.

1 half-life	**=**	**50% degraded**
2 half-lives	**=**	**75% degraded**
3 half-lives	**=**	**88% degraded**
4 half-lives	**=**	**94% degraded**
5 half-lives	**=**	**97% degraded**

Remember that the amount of chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

Pestman hexaflumuron termite bait attracts the termites to the poison and then the workers carry the bait back to their colony and feed it to the other termites. This is a slow-release poison, which will lead to the colony's collapse.

Hexaflumuron is an inhibitor of chitin synthesis, which inhibits the synthesis of chitin, prevents termites from peeling normally, and eventually leads to their death; because hexaflumuron acts slowly, the worker termites do not notice it after first feeding on the bait, so they transmit hexaflumuron to other termites by feeding habits. The feeding habits of termites means that a small amount of the active ingredient will quickly poisons all individuals in the colony, leading to the elimination of the entire colony. The destruction of the colony occurs when all the worker termites began to peel after ingesting hexaflumuron *https://www.pestmanglobal.com/pestman-termites-colony-elimination-system/*.

However, this toxin has not been trialed on St Helena, for this reason it is recommended to trial the toxin and control method in a non-sensitive environment to determine any risks and how they can be managed, particularly to the environment.

Picture 4. Image of the toxin station used by Pestman

Trial control method:

This section outlines the best practices to be applied when trialing the Damp-wood termite control. Before trialing toxin application, it needs to be checked that the procedure meets the health and safety guidelines, biosecurity, fauna and flora risk assessments, as per St Helena Government protocols.

Health and safety guideline:

1. Place monitoring stations on sites that are non-sensitive with a low endemic species present and that are in the fringes of the cloud forest where a lot of the termite infestations occur, this is to determine the termites are present and the population size.
2. Once the termite distribution has been identified, an environment risk assessment should be conducted for sites to be identified for control and to assess invertebrate / plant specialists present, to determine if there is any risk to endemic fauna and flora. If there is no risk and all biosecurity procedures applied, then the control phase can be deployed.
3. Trials of the toxin can then be made and providing the toxin shows a positive result with minimum risk to the environment, the control can then take place in the sensitive habitats like the Peaks. ***Note: an environment risk assessment must be conducted with invertebrate specialist advice before deploying the toxin***.
4. Note: the termite is a problem to the residents of St Helena, for this reason you can potentially get the public involve in trialing and monitoring the control around their homes. However, this would need a lot of public engagement and risk management.

Damp-wood termite presence and abundance assessment:

Purpose: Determining if the termites are present in the area and their level of infestation. There are 2 monitoring methods that would need to be trialed to determine whether they would work on St Helena.

These monitoring methods differ from the previously described method, which focused on a preliminary look at the ecology and wood preferences of termites. The following assessment evaluates termite presence and population in the area during the control. Theoretically, termites should locate and consume wood more rapidly when it is in direct contact with the ground, therefore the preliminary method allowed for faster results, especially in moist soil.

Monitoring method 1 Termite presence assessment:

Equipment:

Plastic 500ml jar
Soft wood chunks - 1 – 2cm width and the same length of the bottle
Spade
Protective gloves
Rubbish bag to collect leftover wood

Method:

1. Build termite monitoring station by drilling at least 6 small holes (0.5cm) in 7 lines or at least 10 slots (0.5cm wide) into the plastic jar and spray the bottom of the bottle black but leave the center clear. The small holes will reduce the risk of invertebrates larger than the termite accessing the station. Slots in the jar make it easily accessible for termites to enter, however other invertebrates can access the wood as well (see Picture 5).
2. Apply a bright-coloured paint to the top of the wood chunks, and place the wood inside the plastic jar (see Picture 5).
3. Map out and record the GPS coordinates of 100m x 50m sites. Ensure it matches the size of the control site, or, if only testing the method then a 50-meter site would be suitable, (see Diagram 4).
4. Dig a hole matching the size of the bottle and insert the jar into it, ensuring that only the top remains visible. This allows the painted wood at the top to be easily seen (ref *https://www.youtube.com/watch?v=qye27aXHRsY*).
5. Place the monitoring stations on a transect line through the middle of the site, see figure 3. The line is the same as the length of the site and the stations are placed 5 meters a part. The monitoring should start 2 months before the toxin is deployed. (ref *https://youtu.be/fHwAGty2t2I*),
6. Once you can no longer see the coloured end of the wood in the jar this indicates that the termites are present in the area.
7. Check the station every 2, 4 and 8 weeks both before the toxin is applied and then also after the toxin has been removed from the site.

Note: that using the tip of the coloured wood only determines if the termites are present, however you could examine the wood if the station is dug up and put back.

Monitoring method 2 Termite infestation assessment:

Equipment:

Plastic 500ml jar.
Wood chunks 1 – 2cm width and the same length of the bottle or jar (all wood must be the same size and of the similar wood)
Spade
Protective gloves
Rubbish bag to collect leftover wood

Method – how to install the monitoring stations:

1. Build termite monitoring station by creating small 0.5 cm holes in the plastic bottle to minimize the chances of larger invertebrates entering the station. Then, drill a hole at the top, insert the piece of wood through it, and secure the wood to the top using glue (see Picture 6).

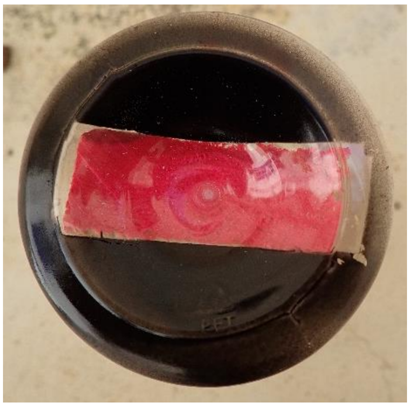
2. Secure a plastic disc at the opposite end of the wood to prevent it from moving inside the bottle.

3. GPS and plot 100m x 50m sites. Excavate a hole and install the monitoring station within it. Position the stations along a transect line spanning the entire site, maintaining a 5-meter interval between each unit. Monitoring should commence 1 month prior to the deployment of the toxin, see Diagram 4 (ref *https://youtu.be/fHwAGty2t2I).*

4. You will be able to examine the wood by removing the top of the bottle. (see Easy to Make Termite Monitoring Stations Will Save Your House From Destruction!*)*

5. Then examine and record the termite damage to the wood by removing the wood from the bottle and inspecting it. Examine the wood 2, 4 and 8 weeks after the toxin has been removed from the site.

These two monitoring methods must be tested to identify the most effective approach for St Helena. Monitoring Method 2 allows for a more thorough examination of the wood. This can be assessed by weighing or assessing the infestation of the wood by calculating the percentage of wood consumed. An ice cream container with holes drill into could possibly be used to accommodate larger wood pieces for an extended monitoring period. This trial should consider the size plot and how many monitoring stations at the site.



Picture 5. – this shows the monitoring station of monitoring method 1

Picture 6. – this shows the monitoring station of monitoring method 2

Deploying toxin and establishing a non-treatment site:

The toxin that has been identified as having the minimum risk to the environment is Pestman hexaflumuron termite bait, see more information on the link https://www.pestmanglobal.com/solution/you-will-win-if-you-start-the-soil-treatment-for-termites/ However this product needs to get assess and determine any impacts on the environment. Once the risk assessment for this product has been completed, a trial of the control can be conducted. this can be

1. Two plots 100m x 50m will be established and GPS measurements taken, one will have the toxin deployed and the other will be the non-treatment site (control). The sites should be close to one another and have similar habitat and environmental attributes to allow comparison. See diagram 5
2. Gather baseline data of the termite's population by putting softwood into the monitoring stations for both sites, following the termite infestation assessment above

3. On the treatment site install the Pestman bait stations these should be spaced 5-10 meters apart longitudinally and 20-50 meters horizontally covering 100m x 50m
4. Baseline monitoring data will be gathered in the two months prior to toxin deployment, and then introduce the toxin into the Pestman bait stations. See Picture 4.
5. Once termites have consumed the toxin, remove it one month after application of the toxin, or check the Pestman bait station every 2 weeks and once the termite abundance has ceased, or has declined by 90% and then remove the toxin bait.
6. Once the toxin has been removed, monitor the area again using the designated stations. Providing fresh wood pieces to assess whether the termites have returned.

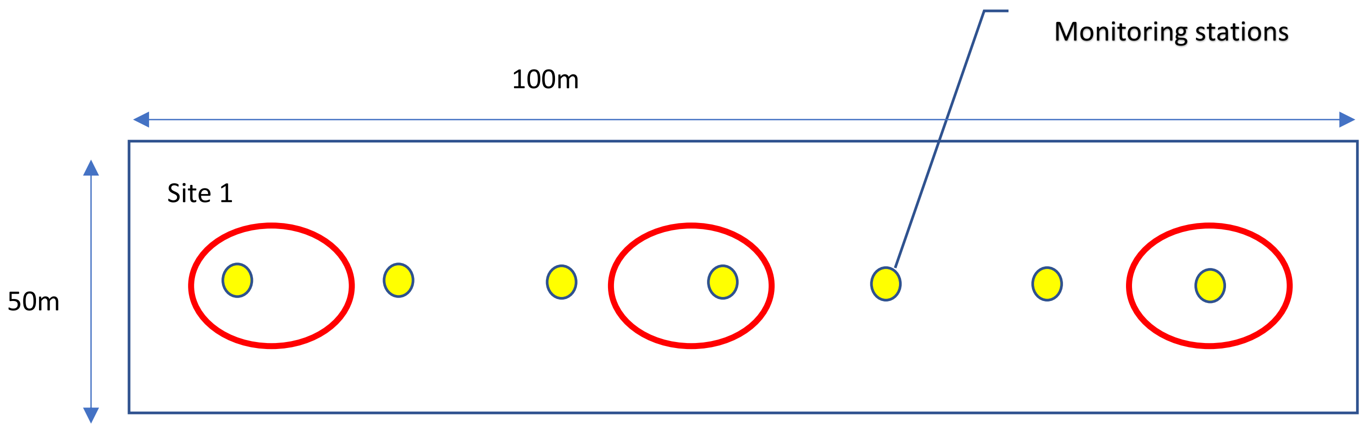


Diagram 4: This diagram illustrates an example in the positioning of the monitoring site.

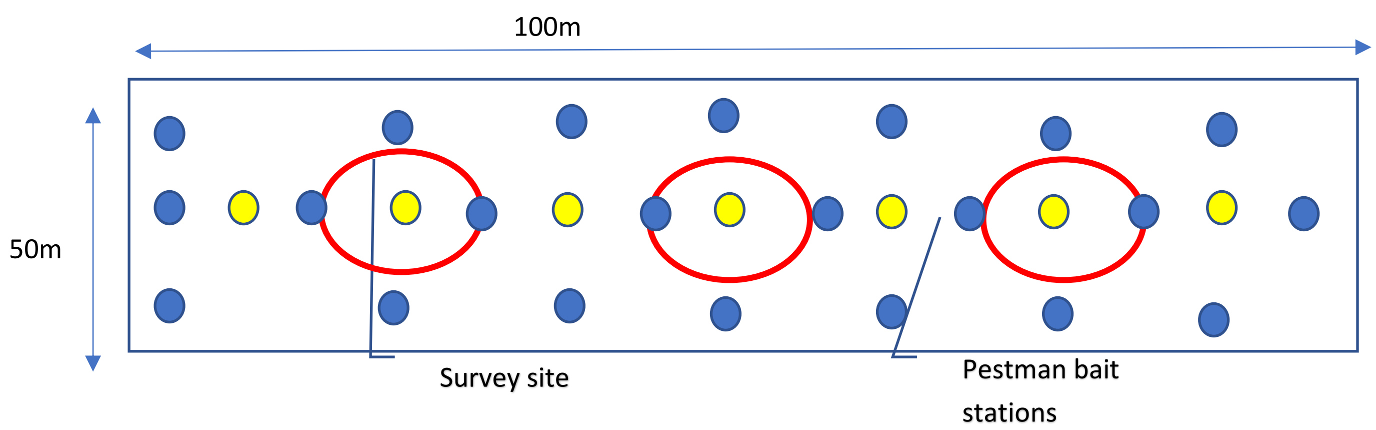


Diagram 5: This diagram illustrates an example in the positioning of the toxin and monitoring stations.

Health and Safety and Human Risk Assessment recommendations:

- Warning signs must be clearly visible at trial site when toxic bait is in use. Also radio and newspaper announcements will indicate the location and timing of the trials, as well as the style of the bait stations and ask people to be careful

- Non-absorbent nitrile gloves must be worn whilst handling the toxic bait
- Toxic bait must be disposed of by double bagging and place into the domestic rubbish
- Containers/equipment that have been contaminated with the toxic bait are either disposed of by double bagging and placed into the domestic rubbish. If it needs to be reused (e.g. tools) then it must be washed 3 times with water that drains into main sewage system, and ensuring that no waterway is contaminated. ONLY wash items if they are going to be reused.

Environment Risk Assessment recommendations:

- The bait must be 3 meters away from a water source that is used for residential / agriculture use or has aquatic invertebrates.
- Bait must not be placed in sensitive endemic habitats as effects are unknown.
- The bait must be in the environment for a limited time; this will be assessed during the scoping phase of the control.
- The bait must be placed at least 5 meters away from all water sources
- The risk to non-target invertebrates is considered and assessed as part of termite abundance testing (see above)

Recommendations:

Termite monitoring and control is a new initiative on St Helena, and this report explores various pilot methods for monitoring and managing this species. In the event of repeating this survey, an infestation scale would be developed. Direct or image-based techniques are both viable options. Direct assessment involves using a grid affixed to a plastic sheet and applied to the top and sides of the wood assessing the infestation. The image-based assessment is standardised by capturing the photographs from a consistent locations and angles throughout the survey. I would also document individual termite counts as they were observed on the wood and no visible damage to the wood occurred until approximately two months after initial observation. Weighing the wood would provide an internal assessment, given the minimal changes detected through visual inspection after they had established, which may indicate significant internal damage. However, this approach could disrupt the termite activity and potentially lead them to depart.

This control method would need a trial to provide a deeper understanding of its implementation, risks and effectiveness as a termite control. During the surveys at Pleasant Valley the termites took at least 3 months to infest a piece of wood this might be the same in other areas. Therefore, it may be best to deploy the toxin after 3 months rather than 2. A clear monitoring method should be identified before conducting the monitoring phase. As this will clearly indicate if the controls have been a success.

During the 2025/26, the St Helena National Trust, with funding from the FCDO will expand upon this survey by relocating the monitoring activities to the Peaks. This phase will assess their presence and map the termite's distribution and examining the environmental implications on the control method.

Acknowledgements:

This Cloud Forest Project '*Restoring St Helena's Internationally Important Cloud Forest for Wildlife, Water Security & People*' was funded by the UK Foreign, Commonwealth & Development Office (FCDO), and managed by the Royal Society for the Protection of Birds (RSPB), working in collaboration with local, and international partners. The local partners are the St Helena Government's (SHG) Environmental Management Division (EMD), Sustainable Development and Education departments and the St Helena Research Institute (SHRI), Connect St Helena and the Bottom Woods Met Office. The international partners are Arctium, the UK Centre for Ecology and Hydrology (CEH), the Royal Botanic Gardens Kew and Dr Quentin Cronk from the University of British Columbia (UBC).

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References:

Ashmole P. and Ashmole M. (2000) St Helena and Ascension Island: a natural history.
Pheidole megacephala (Big-headed Ant) Control Trial Plan
Key R., Fowler Liza., Pryce D. (2021) Terrestrial & Freshwater Invertebrates of St Helena.

Appendix:

Appendix 1. – Termite Survey Sheet

Dampwood termite (*Heterotermes spp.*)

Present and absent assessment form

Location:		GPS:		WT:	
Survey Date		Weather:			
Surveyors:		Picture taken:			
Monitoring station name:					

Site description:

Ground Coverage	
Vegetation coverage	
Bare ground	
Leaf litter	
Stones	
Standing deadwood	
Logs (condition of them, dry twigs, very dry twigs, semi-dry, wet)	

Status of the wood:	Intact, no damaged, holes in the wood

Invertebrate results

How many termites in the wood:	
How many termites on the wood:	
How many termites in the ground:	
General observation of the termites	
Additional invertebrates found on / around the wood:	

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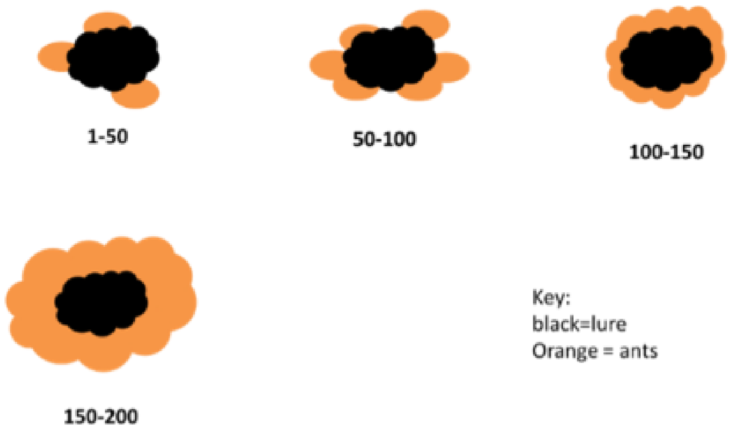
Appendix 2. Termite abundance scale adapted from the ant scale from the *Pheidole megacephala (*Big-headed Ant) Control Trial Plan



Documents attached:

Appendix 3. Visual evaluation of the monitoring station at different stages of the survey—before, during, and after—highlighting the infestation scale.

Appendix 4. Infestation scale on Pine pinaster, (Monitoring station Fir 3) Soft Wood at Pleasant Valley

Appendix 5. Infestation rate on Acacia melanoxylon, (Monitoring Station Blackwood 6) Hard Wood at Pleasant Valley

Appendix 6. Termite survey data

Appendix 7. Termite control sold on St Helena