

Monitoring pine marten den boxes

Guidance for effective camera trap setups



VWT Vincent
Wildlife Trust



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Acknowledgements

Thank you to John Martin and Johnny Birks for helping to put together this guide and sharing their wealth of experience with pine marten den boxes.

Thank you to colleagues at Vincent Wildlife Trust, NatureScot and Forestry England for providing information and feedback that has helped to shape this guide.



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Pine marten inspecting a VWT-style den box



1. Introduction

In many UK woodlands and plantations, pine marten den boxes represent a significant habitat enhancement because they provide a resource – elevated, insulated resting and breeding sites – that is currently scarce or absent due to the age structure and/or management history of the trees. Consequently, den boxes are typically an important focus of pine marten activity and so provide valuable opportunities for population monitoring. Den box monitoring enables an understanding of factors such as den box occupancy, breeding success and number of kits, identification of individual animals, behaviours at den sites and improving den box design.



Pine marten inspecting a Galloway Lite den box

2. Aim of this guide

This guide provides recommendations for using camera traps effectively and responsibly to monitor pine marten den boxes for volunteers and professionals. There is no ‘one-size-fits-all’ camera trap setup for monitoring a den box, yet there are steps that can be taken to ensure a camera trap setup works at its best to reliably capture the footage needed with minimal disturbance to pine martens. Recommendations in this guide consider the technical aspects of how camera traps work and reflect on the experiences of surveyors in the field. The use of thermal imagers is also briefly covered for checking pine marten presence in den boxes from a distance. When installing new den boxes, follow the guidance in Section 9 to select suitable camera trap trees for den box monitoring in the future.

Camera traps are an effective, non-invasive tool for monitoring an elusive species such as pine martens, although, like any wildlife monitoring tool, they are not perfect. The performance of camera traps varies widely across brands, models and how the camera has been setup: they may sometimes trigger late or even miss the action all together. Bear in mind that camera traps are only providing a snapshot of information. This guide can also be used to help troubleshoot and improve camera trap setups.



3. Precautions with monitoring a protected species

Den boxes should only be monitored to support the conservation of pine martens and not simply for the sake of monitoring. There is risk that any close approach to an occupied den box may influence the behaviour of the occupant(s). Monitoring decisions should always consider the trade-off between impact upon the animal and the benefit gained from the information. Previous den box monitoring has recorded female pine martens removing their kits from den boxes shortly after disturbance to the site.

Pine martens have full legal protection in the UK through their listing on Schedule 5 of the Wildlife and Countryside Act (1981). It is an offence to intentionally or recklessly disturb a pine marten when it is occupying a nest or den for shelter or protection. To monitor pine marten den boxes, permission must always be obtained from the landowner as well as the owner of the den box, who may or may not be the landowner. A den box should not be approached or monitored without prior consent. Many den boxes located in public woodlands and forests will likely already be the subject of ongoing monitoring. Once permission from the landowner and den box owner has been obtained, a den box may be monitored without a disturbance licence from a distance of 5m or greater in Scotland, England and Wales, providing that all due care is taken to minimise disturbance (see Section 8 below). The den box owner will determine the terms of monitoring that will ensure that the potential impact of disturbance is balanced with the value of the information collected.

If den box monitoring activity could lead to the disturbance of an animal and the information to be collected requires an approach within 5m of a den box, monitoring work must be carried out under the supervision of a person with a pine marten disturbance licence, or a pine marten disturbance licence must be obtained from the regional Statutory Nature Conservation Organisation (SNCOs) (e.g., Natural England, NatureScot, Natural Resources Wales). Those without a disturbance licence and not under supervision of a licenced person should not install a camera trap any closer than 5m to a den box in Scotland, England and Wales, taking all due care to minimise disturbance. Separate legislation applies in Ireland and Northern Ireland: to monitor den boxes in these regions, seek advice from regional SNCOs.

This guide does not offer advice on legal constraints associated with monitoring a protected species. The permitted activity on a pine marten licence can vary across individual licences and different regions. It is your responsibility to ensure you are working within the bounds of your pine marten licence or under the supervision of a person with a pine marten disturbance licence.



4. Types of den boxes

There are currently two main designs of pine marten den box in use, as well as variations of these designs that feature the same type of entrance holes. A familiarity with the basic design of each main type of den box helps with deciding how to position a camera trap.

VWT-style den box

The VWT-style den box is the original design of the pine marten den box with a central chamber large enough for a female to raise kits. The VWT box features chimney entrances on two sides of the central chamber, providing good thermal insulation and a choice of entrances and exits for the occupants.



VWT den box installation



Rear view of a VWT-style den box

Galloway Lite den box

The Galloway Lite box is a smaller, lighter alternative to the VWT den box, containing a smaller denning chamber within a recycled plastic container and a single entrance and exit hole between the box and tree trunk. The Galloway Lite is often used in conjunction with VWT-style boxes installed in the same forest, providing pine martens with a network of safe resting and breeding sites.



Galloway Lite den box



Pine Marten MK2 den box

The Galloway Lite is not currently in production, however there are similar alternatives available such as the Pine Marten MK2 den box made by Wildlife Boxes, featuring the same style of a single entrance and exit hole found on the Galloway Lite, yet with a larger denning chamber. The recommendations provided in this guide for monitoring a Galloway Lite box are the same for monitoring a Pine Marten MK2 box.

5. Applications of camera trap footage

There are a variety of ways to interpret den box camera trap footage depending on a project's aims and needs; some common examples are listed below.

Occupancy: At a basic level, camera trap footage can confirm whether a den box is currently in use.

Breeding and kits: Camera trap footage can be used to discern the success of a breeding season, capturing images of mothers and kits.

Identifying individual animals: Images of the distinctively patterned creamy-yellow bib fur on a pine marten can be used to tell individual animals apart. This can provide information on population numbers and/or identify the individual animals that are using a den box.

Behaviours: In addition to the above, observing how pine martens behave around den boxes can be informative. For example, animals will sometimes prospect den boxes before using them, which could indicate that they have not encountered a particular den box before or have recently entered the area.



6. Choosing equipment and recommended settings

Choosing a suitable camera

There is a wide selection of camera trap models available that will suit den box monitoring. When choosing a camera, there are several key features to look out for.

A fast video trigger A 0.5 second trigger or less for video is sufficient to capture any quick activity. Note that video trigger speed and photo trigger speed are usually listed as different speeds by manufacturers.

Clear video Look for sample footage of cameras online to get a sense of this. While two different cameras may offer the same resolution, the resulting picture clarity can appear very different. Look for a camera that produces clear daytime footage in colour and clear night-time footage in infrared mode (black and white).

Preview screen A built-in preview screen showing what the camera can see enables users to easily check camera aim on the target area during installation. This is especially important when monitoring den boxes: a well-aimed camera is much less likely to miss activity.



A Browning camera trap



Recommended settings

The following recommendations for camera settings apply to typical monitoring scenarios for den box occupancy, breeding and kits, identifying individual animals and behaviours.

Video mode Use the camera video function to help with determining behaviours such as whether a box is entered or exited by a pine marten. Photo alone can often only determine presence, whereas video captures more detailed information on behaviour. If a camera has a capture timer option, set this to all day: it may pick up pine marten footage night and day.

Recording duration 20-30 seconds of video per trigger should capture sufficient information for each event without capturing excessive amounts of empty footage.

Picture delay Use the shortest delay option between image captures so the camera is ready to record again as soon as it detects an animal. Cameras will typically have an option for no delay or a one second delay between captures.

Trigger sensitivity Use the highest sensitivity option on the camera. This is especially important for the type of medium-long range setups described in this guide, helping the camera trigger as soon as an animal is detected.

When to use photo mode Although it is harder to confirm behaviours when a camera is on photo mode, this can be a useful option if a camera trap is left monitoring a den box for long periods (e.g., more than 3 months) without servicing. The smaller file size of photos coupled with greatly reduced demand on battery power means that many modern camera traps will run unattended for months on photo mode. In this scenario, it is recommended to set the camera to capture 5 photos per trigger to help capture enough information.

Memory card

It is always hard to predict how active a den box will be. Ensure there is sufficient memory card space to record any activity over the time the camera is installed. For example, a 32GB memory card should be more than sufficient in scenarios where the memory card is changed every two months.



Batteries

Batteries are the number one cause of issues with camera traps. The type and brand of batteries used determines how a camera performs.

Lithium batteries are the best option Camera traps require bursts of power to work as intended. For this reason, lithium batteries work best and provide the longest life. Energizer Ultimate Lithium AA batteries are a tried and tested reliable option.

Rechargeable batteries can have mixed results NiMH rechargeable batteries are variable in performance and in some cases may not work at all. Many camera models will not work with rechargeable batteries. Only use rechargeable batteries that are recommended by the camera manufacturer or the shop that the camera was purchased from.

Avoid alkaline batteries Alkaline batteries are not recommended for use in camera traps as they provide inconsistent power and work poorly in colder temperatures, losing up to half their capacity in sub-zero temperatures.

Never mix batteries This carries the risk of a camera trap not triggering. The camera may appear to switch on and work fine, but when it comes to the bursts of power needed to record, the camera may perform slowly or not at all, especially with more power-hungry night-time footage.

Security

Depending on location, consider using a cable lock for camera trap security. Where a den box is close to a path or road, cameras may be easier to spot by passers-by. Many camera traps will have holes in the housing that fit the commonly used Master Lock 8mm (1.8m long) Python cable lock.

When leaving a camera locked to a tree for long durations, loosen the lock every 6 months. Tree growth will tension the lock over time, causing it to jam.



A camera trap secured with a Python lock



Useful tools

The following tools are not essential but can prove useful:

- A **thermal imager** can be used to determine if a den box is currently occupied from a distance.
- A **pruning saw** can be used for trimming away smaller branches that obscure the view of the camera. This is not recommended if a den box is suspected to be occupied, as this will cause added disturbance.
- Save the camera location and any name or identifier for the camera using a **GPS unit** or the **What3Words** phone app in areas where phone signal is good.



A Pulsar thermal imaging monocular



7. Checks to determine den box occupancy

Before approaching a den box, it is advised always to carry out checks from as far away as possible (ideally >30m) to determine whether the den box is occupied. There is risk that any close approach to an occupied den box may influence the behaviour of the occupant(s). Monitoring decisions should always consider the trade-off between impact upon the animal and the benefit gained from the information.

The most reliable way to determine occupancy is to obtain a clear view of the front and base of the box and view it through a thermal imager. Additionally, the presence of scats of the top of the den box may provide an indication of den use by a pine marten, however, this does not confirm current occupancy and there have been many recorded cases of animals present in boxes with no scats on the top. The top of the box can be viewed through binoculars on elevated ground from a distance (ideally >30m).



Thermal images of VWT and Galloway Lite den boxes containing pine martens

If a thermal signal is detected and/or scats are on the top of the box, approach the box assuming there is a pine marten inside.

When unable to check a den box with a thermal imager from 5m or greater, approach it no closer than 5m unless under licence.



Pine marten scats on top of a VWT-style den box



8. Minimising disturbance to denning pine martens

Unless it has been confirmed there is no animal currently present in a den box at the time of the visit as determined with the use of a thermal imager, due care should be taken to minimise disturbance to a den box location. Approach it assuming there is an animal present. Those without a pine marten disturbance licence should not approach within a 5m radius of a den box, unless under the direct supervision of an accompanying licensee, taking all due care to minimise disturbance.

The following steps can be taken to minimise disturbance:

Keep group numbers to a minimum When working in groups, all persons present should stay silent and >30m from the den box, ideally downwind to reduce the risk of human scent reaching the den box and causing stress to animals. One or two persons may approach the box to install a camera trap in total silence. A debrief, if necessary, should be done well away from the site and inside vehicles if possible.

Work quickly Pre-programme camera trap settings before approaching a den box. Spend as little time near the den box as possible installing a camera trap: ideally less than one minute and from a downwind position where possible.

Keep noise to a minimum Whisper if needing to speak and tread lightly. Close car doors quietly if parking on forest tracks near to den boxes.

Dogs Keep dogs >100m away from a den box or in vehicles if driving to a den box on forest tracks.

Toilet breaks Do not urinate within 100m of a den box.

Camera checks Revisits to the site to service the camera should be kept to a minimum. Typically, this should not be carried out more than once per month. When working in groups, all persons present should stay silent and >30m from the den box, ideally downwind. One person may approach the camera to service it.

Pre-emptively install cameras Pine martens with kits will typically be present in dens between February and June. When monitoring den boxes for breeding, consider installing cameras in January, so that human activity near to the den box will only be quick camera checks between February to June.



9. Setting up the camera

An effective camera trap setup is one that triggers reliably and captures clear images. Camera traps are designed to work most effectively for capturing images of animals on the ground where individuals enter the trigger detection range from either the left or right. Monitoring a den box is different to many typical camera trap setups, as the target area is elevated off the ground. The recommendations below are a guide to a series of considerations that will help with setting up an effective den box camera. For new den box installations, follow these guidelines to select suitable camera trap trees for future den box monitoring.

Field of view

Objective Select the most effective view to capture a pine marten entering and exiting a den box.

Choose the view of the den box that is required, bearing in mind that any setup will have blind spots as a single camera will only observe one side of the den box and tree.

When monitoring a Galloway Lite box or a similar design with a single entrance between the den box and tree trunk, aim the camera at the front or to the side of the box to see pine martens entering and exiting.



Side view of a Galloway Lite den box



When monitoring a VWT-style box with two entrances on the rear of the box, aim the camera at the rear of the box to see pine martens entering and exiting.

In many situations it is not possible to aim directly at the back of a VWT-style box due to limited options of trees to attach a camera to, rendering one of the entrances partially or completely obscured. Where this is the case, maintain a distance of 5m from the den box and look for field signs to indicate which side of the box the animal is mostly likely to enter, based on climbing opportunities created by branches below the box.

In some cases, it is possible to see which route an animal takes to the box from the claw marks and polishing on upper surfaces of branches close to the trunk. This does however require approaching within 5m of the den box and should only be carried out if it has been confirmed the den box is unoccupied with a thermal imager, under licence or the supervision of someone with a licence.



Offset camera view of a VWT-style den box with branches leading into one entrance/exit

Where possible, avoid aiming the camera in a direction that captures a lot of the sky or is aimed directly towards sunrises and sunsets, as this can result in over-exposure and lens flare.



Distance

Objective Select a tree for the camera installation at a range that minimises disturbance to the site and captures clear images.

In an ideal scenario, select a camera installation tree that is 5m from the den box. At this distance, a camera will capture a good balance of the den box and surroundings within the field of view, with clear, in-focus footage. Those without a pine marten disturbance licence should not approach closer than 5m and those with a licence should consider whether the potential additional disturbance to the animal is worthwhile within the 5m range.

Unless a den box has been installed with a specific camera trap tree in mind, there may not be any trees at the 5m range from the den box. In this case, look for a tree within a range of 5-8m from the den box. Beyond 8m will result in a loss of detail and overly widen the field of view, which can result in more obstructions such as branches between the camera and den box.

Most camera trap models will start to lose focus when closer than 3m from a den box. At this range, the field of view is much narrower too, limiting the amount of footage of behaviour that can be captured around the den box, such as entrance and exit routes.



3m between camera and den box: beginning to lose focus and narrower field of view



5m between camera and den box: in focus and showing more of the den box surroundings

Height and aim

Objective Install the camera at a height where at least the bottom half of the den box (or more if possible) is visible on the camera preview screen, with the field of view centred below or on the entrance(s) to the den box.

Install the camera at a height where it can still be serviced while attached to the tree, as this makes the camera setup and later checks quicker and easier. The use of ladders to install a camera trap for den box monitoring is not recommended in this guide for two reasons: ladder use increases the risk of disturbance to a den box site; and it's often impractical to transport ladders around a forest, limiting the accessibility of den box monitoring for volunteers.

Capturing the whole den box in the field of view will in some cases be challenging, due to the height that den boxes are installed. Capturing at least the lower half of the den box in the field of view will still provide clear evidence of pine marten entrances and exits.

Aim the camera so the field of view is centralised below the box or directly at the entrance(s). This helps a camera to trigger quickly and more reliably when an animal enters the field of view. The more centralised the field of view on the box entrances, the more likely the camera will record both entrances and exits by animals. Check camera aim via the camera preview screen or through test images.



Aiming the camera directly at or below den box entrances helps with reliable camera triggers.
Red zone illustrates aim at the target area.

Camera angle

In most scenarios, the camera should sit flush against the tree. It is not recommended to angle the camera up towards the den box as this can result in rain or snow sitting on the front of camera, which may obstruct the field of view and shorten the life of the camera through water damage. Camera traps are water resistant, not waterproof.



Troubleshooting

It is challenging to find a suitable tree to attach a camera to.

The camera installation recommendations provided in this guide are best-case scenarios, but options for trees to attach a camera to may be limited and no two locations will be identical. Well-thinned stands of more mature trees typically result in longer range setups (up to 8m), whereas denser, younger stands result in medium range setups (around 5m). So long as the camera is well aimed, medium and long-range setups can work effectively.

There are no suitable camera installation trees within the 5-8m range of the den box.

Option 1 Consider options to view the box from different angles. If it appears that the best climbing route for a pine marten into a VWT-style box is on one side of the tree, aim the camera at that side of the box.

Option 2 If resources allow, use a second camera from an alternative angle on a different tree.

Option 3 Choose a longer-range setup. Check the detection range of the camera model in the user manual: many modern camera traps will be able to capture clear images up to 10m, although at this range detail is lost and there will likely be more obstructions between the camera and box.

Option 4 If the camera has a tripod mount, consider using a telescopic bank stick with a camera tripod mount adaptor.

There appear to be signs of den box use (e.g., fresh scats on top) but there is no footage recorded on the camera.

Option 1 Adjust the height and angle of the camera, making sure it's centred directly below or on the den box entrances.

Option 2 Attach the camera to a different tree to observe the box from a different view.

Option 3 If resources allow, use a second camera from an alternative angle on a different tree.

It's difficult to see the detail of a pine marten bib pattern at 5m.

Working at a range of 5m will require a camera with very clear footage to discern between pine marten bib patterns. To capture clear footage of bib patterns, the recommended camera range is 3m, but this camera installation should only be carried out by a person monitoring a den box under a pine marten disturbance licence, or under the supervision of someone with a licence.

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