Planning a Badger Vaccination Project

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Animal & Plant Health Agency

Department for Environment Food & Rural Affairs

NATURAL ENGLAND

National Trust

THE wildlife TRUSTS

SECTION 1

Introduction

The BadgerBCG vaccine was licensed in 2010 and is recognised as an effective means of reducing the transmission of TB in badger populations. For a brief review of the science which underpins badger vaccination read the two page fact sheet which can be found here on the TBhub website https://tbhub.co.uk/tb-in-wildlife/tb-in-badgers/vaccination-of-badgers-against-tb/

Vaccinating badgers involves catching wild badgers in cage traps and injecting them with the BadgerBCG vaccine (see below):

Badger Vaccination

Badgers can act as a wildlife reservoir for *Mycobacterium bovis*, the bacterium which causes tuberculosis (TB) in cattle. Badger vaccination aims to reduce the transmission and spread of the disease in the badger population with the intention of reducing the risk of cattle contracting TB.

How are badgers vaccinated?

- Traps are deployed near signs of badger activity (setts, runs or latrines).
- Traps are usually locked open and pre-baited with peanuts (typically for 7-10 days).
- Traps are set to capture for two consecutive nights.
- Traps are checked in the early morning and captured badgers are vaccinated with BCG (the same vaccine used in humans), temporarily marked and released.

How often does vaccination take place?

Trapping for vaccination (as described above) takes place once per year at each sett or target area, typically for four years. It is unclear how long the vaccine is effective in individual badgers. Annual vaccination will result in some animals being vaccinated several times, but also aims to maintain and increase vaccine coverage by vaccinating new cubs or immigrants into the population.

What effect does the vaccine have on badgers?

The effects of badger vaccination by injection have been evaluated in several captive experimental studies [7-12] and during a four year field study in Gloucestershire [8-9]. Although vaccination with BCG will not guarantee protection from infection, meaning some badgers may still become infected, these studies provide good evidence for the following beneficial effects:

- **Vaccination reduces the likelihood of badgers developing lesions or excreting TB bacteria** [11],
- **Vaccination reduces the rate of new infections (measured using diagnostic tests) in badgers by 76%** [8],
- **Vaccinating more than 1/3 of adults in a badger social group reduces new infections (measured using diagnostic tests) in unvaccinated badger cubs by 79%** [8].

Will the vaccine work on badgers already infected with TB?

There is no evidence that vaccination will have either a positive or negative effect on badgers that are already infected with TB. Even if vaccination has no effect on infected badgers this does not mean that it cannot reduce TB in badger populations. Badgers typically live for 3-5 years. Over a four year programme, vaccination should reduce new cases of TB in badgers (as in the Gloucestershire field trial) and infected animals will gradually die off. The combination of these processes should lead to a reduction in the number of infected badgers in an area.

1 Deploying the trap

2 Baiting the trap

3 Catching and vaccinating the badger

4 Marking the badger

5 Releasing the badger

Badgers are a protected species in the UK (Wildlife and Countryside Act 1981, Protection of Badgers Act 1992). This means that a licence is required to trap (and mark) them to enable vaccination. In England, an application for a licence should be made to Natural England (NE), while vaccination in Wales requires a licence from the Welsh government. The act of injecting the vaccine is classed as an act of veterinary surgery, which means that those trapping and vaccinating badgers also need to be properly trained.

The details of the process involved in trapping and vaccinating badgers is covered by the accompanying document "The Badger Vaccination Process" and this will also be covered in detail by the approved training, which is required for those vaccinating badgers (covered in section 2.2 of this guide).

The purpose of this guide is to outline the steps which need to be considered by those applying for a badger vaccination licence in England. This guide was created by Dr Andy Robertson in 2020, in collaboration with the organisations listed below:

- Animal and Plant Health Agency
- Defra
- Natural England
- Cheshire badger vaccination project
- Derbyshire wildlife trust
- The National Trust

Over time the rules and guidance around badger vaccination may change, for the latest information on badger vaccination you should contact:

- Natural England: btbvaccination@naturalengland.org.uk
- APHA: badgervaccine@apha.gov.uk

Although this document outlines the process of vaccinating badgers in England, many of the steps and considerations are similar in Wales. For more specific advice on vaccinating badgers in Wales contact the Welsh Government.

SECTION 2

An outline of the planning process

2.1 Vaccination Licence

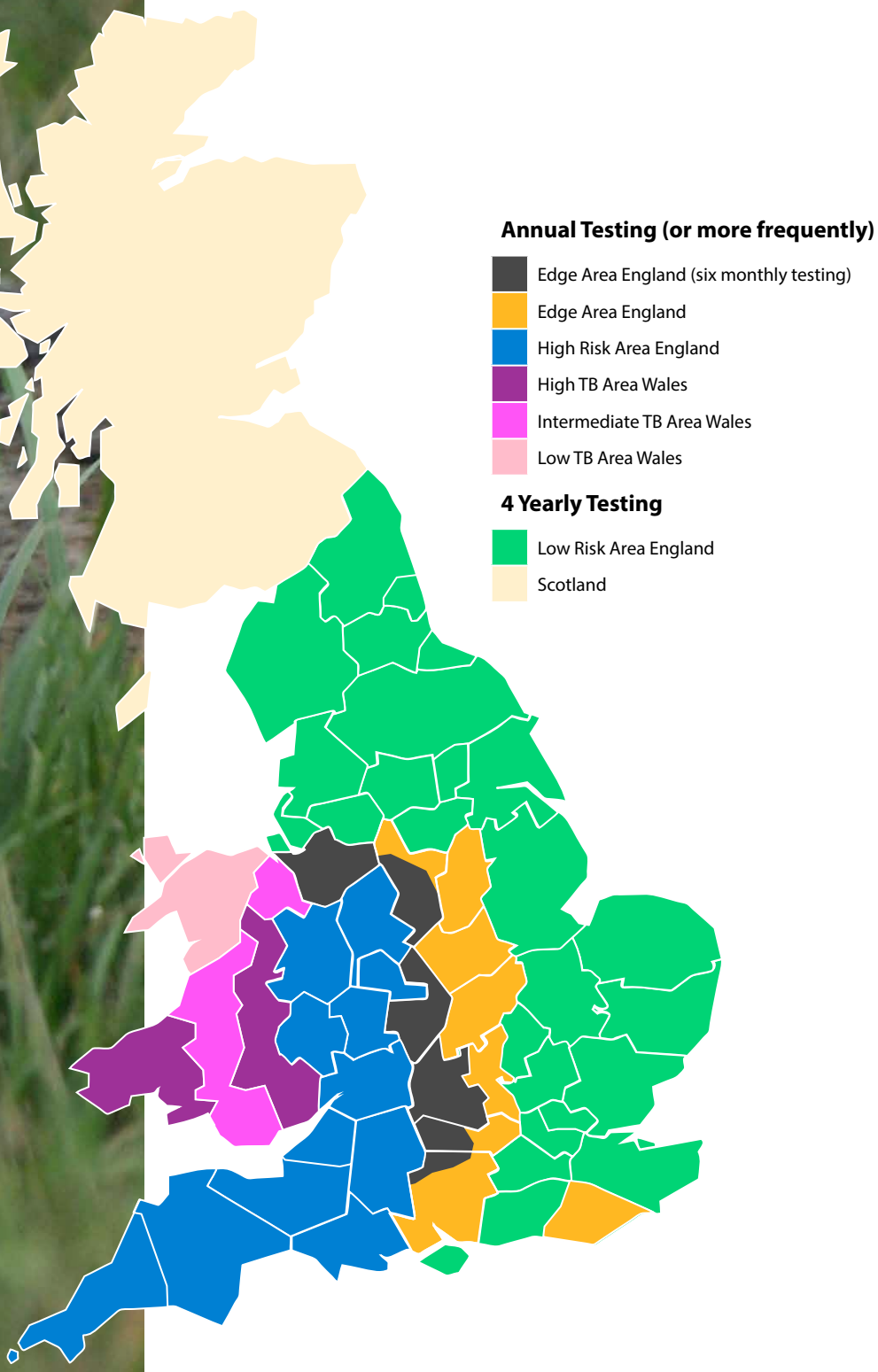
The first step: If you are considering planning a vaccination project then the first step you should take is to read the summary information on applying for a licence which can be found here https://www.gov.uk/government/publications/bovine-tb-control-licence-to-take-and-mark-badgers-for-vaccination

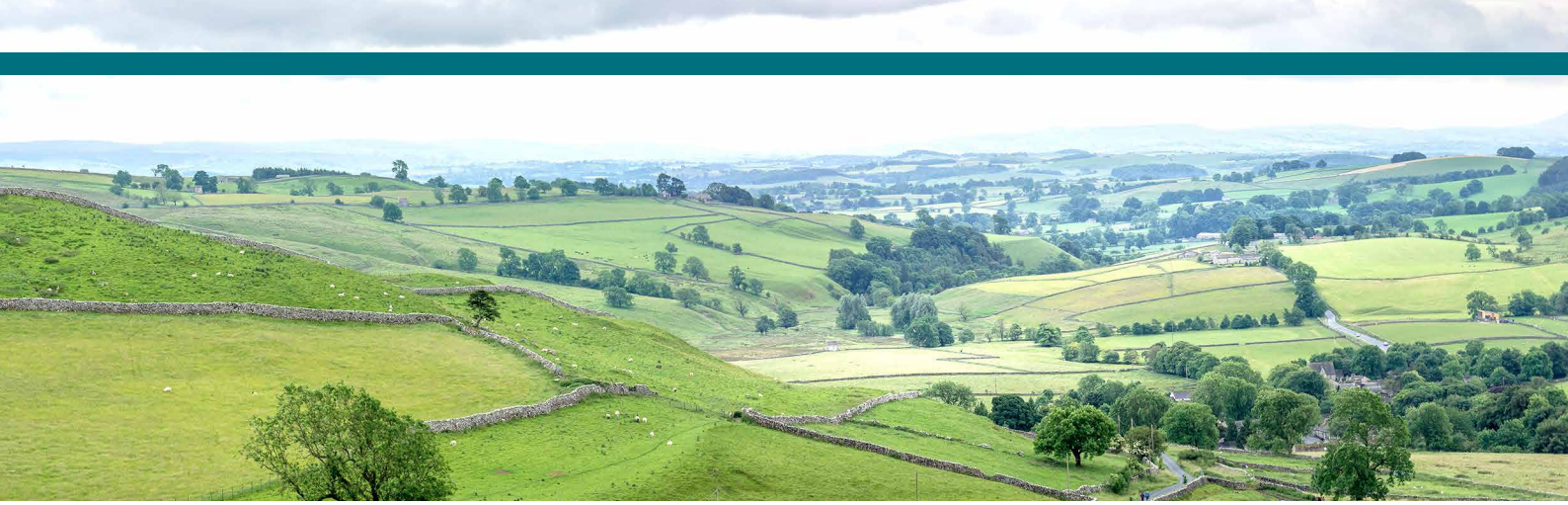
This website also contains links to download the licence application form and a landowner access agreement form which you will need for your application (see section 2.4). There are eight factors or criteria you will need to consider for your licence, these are detailed in the following sections and pages of this guide. For further queries on your licence you should contact Natural England by emailing them on: btbvaccination@naturalengland.org.uk.

1) Location: Is the application area within the High Risk (HRA) or Edge area?

England is divided into three risk areas for bovine TB: High Risk Area (HRA), Low Risk Area (LRA) and Edge Area. Wales is divided into High, Intermediate and Low Risk areas. This information can be found on the TBhub risk map: https://tbhub.co.uk/preventing-tb-breakdowns/bovine-tb-risk-map/

In England, licences to facilitate vaccination are generally only approved for vaccination programmes within the HRA or Edge area.





2) Training: Have all those intending to vaccinate completed the approved training course?

Different stages of the vaccination process will require adequate training, particularly setting traps and vaccinating badgers. Those trapping badgers will be required to attend a training course (or provide evidence of relevant experience). In order to vaccinate badgers by injection you need to be a qualified and registered veterinary surgeon, or a licensed 'lay vaccinator'. To become a lay vaccinator you need to successfully complete an approved training course (APHA's Module 3, Cage Trapping and Vaccination of Badgers) and obtain a Certificate of Competency.

For more information on training see section 2.2.

3) Veterinary support: Do you have a Prescribing Vet and a Directing Vet named on the application?

Prescribing Vet: Badger BCG is a prescription only medicine (veterinary, POM-V) and as such, can only be obtained via a prescription from a practicing veterinary surgeon.

Directing Vet: BadgerBCG must be administered under the direction of a veterinary surgeon, although this does not mean that the Directing Vet needs to be 'in the field' with those vaccinating. The Directing Vet has a duty of care to respond in case of problems arising through the process of vaccinating badgers. The Directing and Prescribing Vets can be the same person (this is preferable).

Attending Vet: In the event that the Directing Vet is unable to make a site visit his/herself, they can delegate the responsibility to attend to a nominated veterinary surgeon.

For more information on veterinary support see section 2.3.

4) Landowner consent: Do you have consent from landowners in the vaccination area?

You may be interested in vaccinating on your own land, or you may be asked to vaccinate by the landowner, or you may need to actively recruit famers or other landowners to join the project. Landowners will need to consent to badger vaccination happening on their land by signing a land Access Agreement.

If parts of the vaccination area fall within protected areas (such as Sites of Special Scientific Interest – SSSIs) a Habitat Regulations Assessment may need to be conducted to ensure no adverse impacts on the site.

Check www.magic.defra.gov.uk for the presence of protected areas, and contact btbvaccination@naturalengland.org.uk for any further queries. A failure to address this could delay your application.

For more information on signing up landowners see section 2.4.

5) Map of the site: Provide a map with the planned vaccination area with the boundary clearly marked.

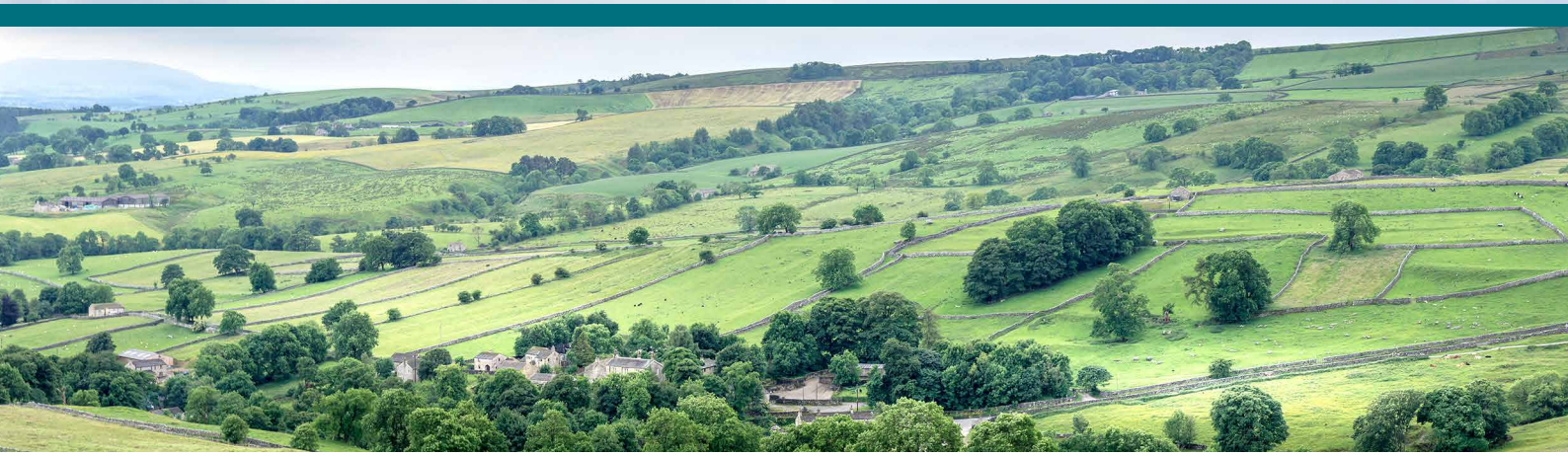
Submit a map of all proposed sites. The Magic Map Application is an ideal tool to provide detailed maps without the need for specialist mapping software: http://magic.defra.gov.uk/

There are also a number of software packages which can be used to create maps such as QGIS or ArcGIS.

6) Badger survey: Has a survey of badger activity been conducted across the site?

A field survey for badger field signs (setts, latrines and runs) will tell you where badger activity is concentrated and give an indication of the size of the badger population. It is also required as part of the licensing process.

For more information on conducting a badger survey see section 2.5.



7) Funding £££: Funding must be in place to sustain the programme for 4 years

Badger vaccination requires traps, bait and a range of other equipment and consumables including the vaccine itself. Funding options may be available to cover the costs of equipment or for staff time. You need to state how much funding you have available for the programme in your application.

For more information on funding and equipment see section 2.6.

8) Commitment: Are you able to commit to see the project through for the duration of the licence?

A four year vaccination project is a significant commitment. Make sure you are prepared to remain involved for the duration of the licence. Landowners also need to consent to vaccination for this period, although farmers may choose to leave the vaccination project before the final year.

9) Be prepared to collaborate with neighbouring vaccination campaigns.

Your campaign details will be shared with others running vaccination campaigns in your area. Where possible you are expected to:

- Share experiences
- Share resources (bait, traps, personnel etc.)
- Coordinate trap deployment where needed

Extra useful information on licensing

- Natural England aims to process your application within 30 working days.
- A successful applicant will receive a licence, a list of all persons authorised to trap and vaccinate and a list of all sites that can be vaccinated on.
- You can add and remove sites once a licence has started. Example: if a site no longer shows signs of badger activity.
- You can only trap and vaccinate badgers in England between the 1st May and 30th November for welfare reasons.
- Veterinarians can vaccinate badgers without the need for attending the training course, but they must attend the trap training module if they intend to set traps. If a vet is intending to vaccinate and is not named on the licence, they must be accompanied by the licence holder or an Additional Authorised Person (AAP).
- There is no size limit to a vaccination licence (can be 1 farm or 40), however if applying for BEVS funding then a minimum of 15 km^2 of contiguous land sign up is required.
- You may still be required to prove you are undertaking adequate biosecurity measures before a licence will be granted.

2.2 Training courses & personnel

Badger vaccination involves multiple stages and activities (see section 4). In some cases a vaccination project could be small enough that a very small team, or even a single person can undertake the whole process from start to finish. However, in most cases vaccination will require a large team of people. Depending on what activities people are involved with they may need to be named on the licence and they may need to undertake an approved training course. See below:

Activity	APHA Training modules	Training course required?	Licence requirements
Surveying	Module 1: Field surveying to support badger vaccination	Optional	Survey is submitted as part of applying for a licence. Surveyors do not need to be named on the licence.
Digging in or pre-baiting traps	Module 2: Pre-baiting and trap siting for badger vaccination	Optional	Do not need to be named on the licence
Setting traps	Module 2 or Module 3	Mandatory requirement*	You need to be named on the licence as a 'trapper'
Vaccinating	Module 3: Cage trapping & vaccination of badgers	Mandatory requirement	You need to be named on the licence as a 'vaccinator'

*Attending the APHA course on setting traps is not required if you can provide Natural England with evidence of other suitable training.

There is also a fourth module "Module 4: Refresher training". This is a half day course aimed at those who haven't vaccinated badgers since 2015 because of the vaccine shortage and those who have not been trained to vaccinate using the InterVax (BCG Sofia) ampoule vaccine.

Although training modules 1 and 2 are not required under all circumstances (see above) they are highly recommended. Accurate field surveys and effective trap placement are crucially important for badger vaccination. The key steps which require completion of a training course are setting traps and vaccinating badgers.

You cannot legally **trap** a badger unless:

- You attend and complete APHA training module 2 or 3, receive your certificate of attendance and provide this certificate to Natural England. OR...
- You have not attended training module 2 or 3, but can provide evidence to NE of sufficient experience of the trapping process, this could be gained by working with a vaccination project (or trapping badgers for other reasons). OR...
- The licence holder has added you to their licence as an 'Additional Authorised Person' (AAP). If you only plan on pre-baiting and not setting traps then you do not need to be listed as an AAP.

You cannot legally **vaccinate** a badger unless:

- You have attended the module 3 training course and hold a 'Certificate of Competence' and are named on the licence – known as a Lay vaccinator. OR...
- You are a qualified, registered veterinary surgeon and you are named on the licence. OR...
- You are a qualified, registered veterinary surgeon, not named on the licence but are vaccinating badgers, on site, in the presence of the licensee or an AAP.

To book a course or for further information

Contact APHA on:

badgervaccine@apha.gov.uk 020 802 62372

Tip: It may be possible to have the training provided on one of the parcels of land that you intend to survey and vaccinate on. In this way any practical advice given will relate directly to land being used in the licence.

Outlines of training courses

The courses are described in more detail at: https://www.gov.uk/guidance/bovine-tb-badger-vaccination-training

Module 1: Field surveying to support badger vaccination

The two day surveying training course is recommended, but is not a strict requirement for those undertaking badger surveys. In some cases people may already have experience conducting badger field surveys (either professionally, or as part of amateur wildlife groups). Training can also be cascaded (i.e. from more experienced surveyors) or undertaken while helping on other vaccination projects. Ideally, sett surveys need to take place in your area in early spring to take advantage of the fact that vegetation cover will still be low.

This training module teaches you how to:

- Identify badger field signs
- Read maps and produce survey maps
- Carry out field work safely
- Follow biosecurity guidelines during surveying
- Record badger sett activity and other field signs
- Interpret survey maps
- Survey different habitat types

Module 2: Pre-baiting and trap siting for badger vaccination

Effective trapping is crucial to the success of any badger vaccination project. Traps need to be correctly placed, pre-baited and properly set in order to catch a good number of animals. This two day course will instruct you on how to successfully trap badgers, ensuring that your vaccination project is as effective as it can be.

This training module teaches you how to:

- Assess sett activity
- Comply with the rules on badger trapping
- Carry out fieldwork safely
- Follow biosecurity guidelines when trapping
- Estimate the number of traps to deploy
- Plan where to site badger traps
- Dig in and set traps
- Pre-bait
- Interpret bait uptake during pre-baiting

Module 3: Cage trapping & vaccination of badgers

Having enough qualified vaccinators to deliver the vaccine is a key requirement of any vaccination project. Unless an adequate number of practicing vets are available it is likely that lay vaccinators will need to be trained. As vaccination is a four year process any personnel also need to be available for the whole process, or you may need to train additional vaccinators as the project progresses. See section 2.7 for advice on numbers of people required.

This training module teaches you how to:

- Comply with rules for badger trapping and vaccination
- Carry out fieldwork safely
- Follow biosecurity guidelines when you are setting traps or vaccinating
- Set traps
- Handle vaccines - how to store them, use the cold chain system, and keep records
- Reconstitute and use vaccines
- Assess badger welfare pre and post vaccination
- Vaccinate wild badgers - you will get hands on experience during the training

Module 4: Refresher training

The shortage of BadgerBCG in 2015 meant that Defra has sourced an alternate supply of BCG vaccine called InterVax BCG (or BCG Sofia). BCG Sofia comes in glass ampoules. BadgerBCG is presented in glass vials which are easier to use. Ensure you check what supplies are available through your Prescribing Vet to determine if further training is necessary.

This module is for lay vaccinators who were not trained to use InterVax BCG. This module teaches you how to reconstitute BCG Sofia in the classroom, and goes over other differences between the vaccine types. Module four is not an absolute requirement as this can also be cascaded within an organisation from vaccinators who do have experience of InterVax BCG.

It is not necessary to attend all 4 modules and course choice should be tailored to the specific needs of the project.

Using volunteers for badger vaccination projects

If you are vaccinating a large area you may decide to recruit volunteers to help deliver your vaccination project. These volunteers could potentially carry out the whole vaccination process, or they may help with certain activities such as pre-baiting or transporting traps. Below are some tips on how to recruit and manage volunteers for your project:

How to recruit volunteers

- Discuss with farmers/landowners as they may be willing to help with vaccination process.
- Advertise online or in local print media.
- Collaborate with a local wildlife group or conservation charity: they may have an established network of volunteers.
- Hold a volunteer evening to talk about the project and outline what will be involved.
- Get volunteers to sign a volunteer form with their details.

Managing volunteers

- Volunteers may have very different levels of fitness or ability – you will need to ensure that people are matched to the correct roles. In many cases volunteers may bring additional skills (IT, fund raising etc.) which will benefit your project.
- Volunteers may need to work on farmland. Trust with farmers and landowners is crucial for the success of vaccination projects. Volunteers need to be clear that they are going onto someone else's property to vaccinate badgers only.
- Health & Safety. Vaccination projects need to ensure that their volunteers are working safely to avoid any injuries. Volunteers will need to have read and signed relevant risk assessments for field work and vaccination.
- Volunteers, particularly those directly vaccinating badgers need to be properly trained and understand their roles and responsibilities.

2.3 Veterinary support for vaccination

Vaccinating any animal by intramuscular injection is an act of veterinary surgery. Specific legislation is in place to allow lay vaccinators to carry out vaccination, but any project will also need additional veterinary support.

Vaccinations can only be carried out under the direction of a local veterinary surgeon (see below). You need a Prescribing Vet and a Directing Vet named on the application (This can be the same person).

Directing Vet: Will need to be on call in the event of a veterinary emergency, for example to assess an injured animal or in the unlikely event of an adverse reaction to the vaccine. This is extremely unlikely to happen, but is a requirement of the licence. Depending on the size of your project you may need more than one Directing Vet.

Prescribing Vet: BadgerBCG is a prescription only veterinary medicine (POM-V). It must be prescribed by a practicing vet and must be delivered to a registered veterinary practice.

Defra may require an estimate at the end of each season (November) of the quantity of vaccine required by each vaccination group for the following year. This makes it possible for vaccine to be ordered in bulk at reduced cost.

Attending Vet: Nominated by Directing Vet to respond in case of emergency in the event that the Directing Vet is not available.

It is the responsibility of those trapping and vaccinating to request and pay for a visit from the Directing Vet if there is any doubt about the fitness of a trapped badger to be vaccinated and/or released or in the unlikely event of an adverse reaction to vaccination (none recorded to date). If the Directing Vet is unable to attend in person, he/she must delegate responsibility to an Attending Vet. Euthanasia of badgers must be carried out by a vet and only if deemed necessary on welfare grounds. This is a very unlikely occurrence.

How many Directing Vets will I need? This will depend partly on the size of your vaccination project. If you are vaccinating over a large area, with multiple trap rounds you may need more than one Directing Vet. Ideally Directing Vets should be under one hour's drive away from the vaccination area, so that they can respond to any emergency, although this is at the vets discretion.

Recommendation: If possible, the roles of Prescribing, Directing and Attending Vet should be carried out by the same person. If the role of Attending Vet is to be delegated to another vet(s) (e.g. out of hours) then you need to have a plan in place to ensure that all are aware of when and where vaccination activity is taking place.

What should you consider when choosing your vet?

If you do not know a vet in the local area you could try contacting a local veterinary practice or a wildlife hospital. It may be helpful, although not essential, for vets to have local knowledge of the TB situation in the area (in cattle). There will be a need for constant dialogue between those organising and undertaking vaccination and those carrying out supportive veterinary roles so that the vet (or vets) are aware of timing and when vaccination will take place.

Vets can also carry out vaccination: Private veterinarians can vaccinate trapped badgers themselves provided they get a licence to trap badgers from Natural England or they are accompanied by a person who is licensed. If they are setting traps to catch badgers they will need to attend the relevant training course (see section 2.2). Any vets conducting badger vaccination will need to be named on the licence, or accompanied by the licence holder or AAP.

2.4 Signing up landowners for vaccination

There are a number of reasons why you may be interested in running a badger vaccination project:

1) You are the landowner and want to vaccinate on your own land.

2) You have been asked by a landowner to vaccinate badgers on their land.

3) You are planning on running a vaccination project and are keen to sign up as many landowners as possible.

How big an area will you need?

Badger vaccination can be carried out over any size area, from a single farm to a large area of 100 km^2 or more. Generally the larger the area the better, but there is no minimum or maximum. However, if you are applying for funding then there may be specific funding requirements (see section 2.6). Ideally areas need to be as connected and contiguous as possible, i.e. one large block of land rather than several smaller isolated patches.

Landowners will need to give consent

Natural England requires documented landowner and occupier permission for all sites where trapping and vaccination of badgers is to take place. If you are the landowner of the site(s) listed then please record this on your licence application.

If the applicant is not the landowner/occupier, then a land "Access Agreement"form will need to be signed, providing the landowner/occupier's details and signature, giving you permission to vaccinate on their land. This form can be found at www.gov.uk/government/publications/bovine-tb-control-licence-to-take-and-mark-badgers-for-vaccination.

It is an applicant's responsibility for ensuring that permission for trapping and vaccination of badgers to take place has been obtained. Any delay in obtaining permission will delay consideration of your application.

As badger vaccination is a four year process, the Access Agreement provides permission for a four year period. However, the landowner/occupier can terminate the agreement part way through the four year period for any reason (See the Access Agreement form for more details).

How do you get people to sign up to your vaccination project?

There are a number of ways that you could recruit landowners to a vaccination project. A good first step would be to consult a map to identify your target areas of land which would be good to recruit. These could be areas of woodland or areas of land where badger setts are already known to occur. Alternatively you could focus on areas where cattle are located, or TB in cattle is concentrated. This can be checked using the website www.ibTB.co.uk. Local wildlife charities or groups may have knowledge of where badgers are found in your area, so may be able to help with this (e.g. Wildlife Trusts or Badgers groups).

Door to door: One of the best ways to get people involved is simply to ask. If you have local knowledge of the farmers in your area you may be the best person to do this, or there could be certain people you know who have connections within the community.

Through your local veterinary surgery: Your local farm vet may be responsible for the care of many farms in your area and may be able to broach the subject on your behalf and even provide some additional information on the vaccination process itself. Add an advert in your local Veterinary Surgery's newsletter, calling for anyone interested to get in touch.

Local newspaper or farming press: Get an advert in your local newspaper or farming press outlining the project and calling for anyone interested to get in touch.

Create a website: It is useful if you can direct people to a website providing details of the vaccination project. If you are partnered with a larger organisation (such as the National Trust or Wildlife Trusts) it may be possible to add a vaccination page to their local website.

Hold a farmer meeting: One other option could be to host an open meeting in a pub or village hall. You could arrange this alongside a local vet practice, APHA, farming groups, via the NFU, or advertise in the local press. At the meeting you could discuss several topics either as formal presentations or informal discussions around a table. Topics to discuss could include:

- An outline of what the badger vaccination process involves (as illustrated in this guide – section 4).
- Describe your proposed area – a map is a good way to illustrate this.
- Discuss landowner consent, and how you will work with landowners to deliver the project with minimum disruption. Also make it clear that farmers are free to leave the project in the future if they decide to.
- Funding and local support. Outline how the project will be funded and what other local groups or organisations have given the project support.
- Invite your local vets along as this will be a good opportunity to discuss their potential involvement as Prescribing and Directing Vets.
- If you combine the meeting with local APHA or veterinary surgery there could also be talks on other topics relevant to TB control.

TIP

The badger vaccination fact sheet at the end of this document is a useful tool for engaging with landowners – feel free to print out several copies and hand them out at meetings.

Contact Natural England and APHA

You should contact Natural England to find out whether other vaccination projects are active in your area. This would help either fill in some gaps or increase the area size and effectiveness of the vaccination project btbvaccination@naturalengland.org.uk. Contact APHA via email on badgervaccine@apha.gov.uk. They may be able to provide better information on TB in your area, as well as advice on recruiting landowners. Depending on the size of your project they may be willing to send a representative to give a talk on badger vaccination at one of your meetings.

2.5 Conducting a badger survey

Why is a sett survey important?

Sett surveys are an important step in planning a vaccination project. The survey will determine the degree of badger activity within the area, which gives an idea of population size and the scale of the operation that needs to be undertaken. Surveys will also help to identify focal points in the landscape where badger activity is concentrated, such as setts, runs and latrines. These will be the key areas targeted for trap placement and vaccination. Placing traps at random without a survey is very unlikely to catch good numbers of badgers so this information is crucially important for ensuring a successful project.

TIP

A recommended first step before conducting the survey is to ask the landowner (if you are not the landowner yourself). They may have a good idea of where setts or other areas of activity are located, which will assist you with your survey.

The survey is also important as this is needed to produce a clearly marked map displaying active setts and field signs, which is required by Natural England as part of the process of applying for a licence for vaccination.

When should you carry out a sett survey?

Sett surveys ideally need to take place in your proposed vaccination area in early spring (Feb/March – May). Badger activity will be increased during this time post winter but vegetation cover will be at its lowest and signs of badger activity are easier to identify. A thorough sett survey is required for the first year of vaccination only. In subsequent years a full survey is not required, only a check of current sett activity levels.

Who can complete the sett survey?

You do not need to have specific training or hold a licence to conduct a survey, but surveyors should be familiar with badger field signs and have a reasonable level of physical fitness. It is also useful if surveyors are familiar with the land being surveyed, as they will have a better idea of where activity may be concentrated. APHA runs a training course on badger surveying which will provide detailed guidance on the survey process (see section 2.2 – training courses for more information). Several wildlife groups and commercial providers also offer survey training.

What do you need to undertake a sett survey?

All you need is a map of the land being surveyed (at a suitable scale), a note pad, pens or pencils and the correct PPE (boots, water proofs or sun cream depending on the weather). For clarity it may be useful to use a set of red, blue and green coloured pens to colour code the different field signs recorded. Locations of badger setts need to be recorded ideally with a 10 figure grid reference, this could be obtained either using a GPS or phone.

If you want to create an electronic version of your survey map you can use Magic Map (https://magic.defra.gov.uk/) or other free GIS software such as QGIS.

Additional survey tips

- Make sure you know the specific landownership boundaries of the area you are surveying to avoid trespassing. You may wish to carry a completed consent form from the landowner with you in case of challenge.
- Check with the landowner whether there are any potentially dangerous livestock or other areas to avoid. Make sure you are aware of any local shoots.
- Practice good biosecurity. Disinfect your shoes/boots as you enter/leave a site. An approved list of disinfectants for bovine tuberculosis (M. bovis) can be found here: http://disinfectants.defra.gov.uk/DisinfectantsExternal/Default.aspx?Module=ApprovalsList_SI

Undertaking the survey

There are three key field signs that you will need to record as part of your survey these are:

1) Setts **2)** Latrines **3)** Runs (or prints)

The survey should involve walking all field boundaries (hedgerows, fences etc.) as setts and latrines will often be located along these 'linear features' in the landscape. If badgers are regularly crossing a boundary there may also be a visible trodden route or 'run'. Follow strong runs into fields as they may lead to other setts or latrines. Larger areas of woodland or scrub will need to be searched systematically. Again use runs as a guide. If badgers are regularly entering/leaving an area of woodland there will be a strong run emanating from the woodland edge and following these runs may lead to setts or latrines.

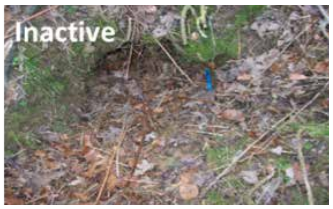
You will need to record all setts, runs and latrines on your survey map. Other field signs such as prints or feeding signs may also be useful, but Natural England requires these three (setts, runs and latrines) to give a good indication of activity present on the surveyed land. Collate your results and return to Natural England as part of your application (btbvaccination@naturalengland.org.uk).

Badger setts

Badgers live in burrow systems called setts. Typically each social group of badgers will have one main sett and several smaller outlier setts in their territory. Setts are commonly found on well drained slopes, in woodland edges or hedgerows. Setts vary in their appearance, but typically can be identified by:

- 25-35cm diameter entrance (hole) shaped like a sideways D, flat bottomed and wider than it is tall.
- Large spoil heaps with a furrow.
- Clear runs (paths) between sett entrances.

Several different field signs will help to identify if a badger sett is active. These include: 1) entrances smooth and cleared of sticks/debris, 2) fresh digging or spoil, 3) bedding (grass or hay dragged into holes), 4) fresh prints. Inactive setts are typically blocked with leaves and sticks.



Recording badger setts

If using the recommended colour scheme use a red dot/circle for setts (**Red for Bed**). Record the number of active, partially active and inactive entrance holes. This will help to identify which setts have recent badger activity

Example: 2/3/1 = 2 active holes, 3 partially active holes and 1 inactive hole.

Badger latrines

Badgers usually deposit their faeces in small pits or holes in the ground called latrines. Generally a latrine will consist of several pits, although in some cases there may only be one or two. Latrines are used as territorial markers at boundaries between social groups and are typically found next to fences, hedges or prominent features like trees or pylons. Badger faeces often contains indicators of their diet such as partly digested wheat or maize.

Recording latrines

If using the recommended colour scheme use a green dot/circle for latrines (**Green for latrine**). It is useful to record the number of pits containing fresh faeces versus those containing old faeces within the latrine (e.g. L 2/1). If you plan on checking badger signs regularly then this can give you an indication of how frequently badgers are using that latrine and is a useful guide for placing a trap if repeatedly used.

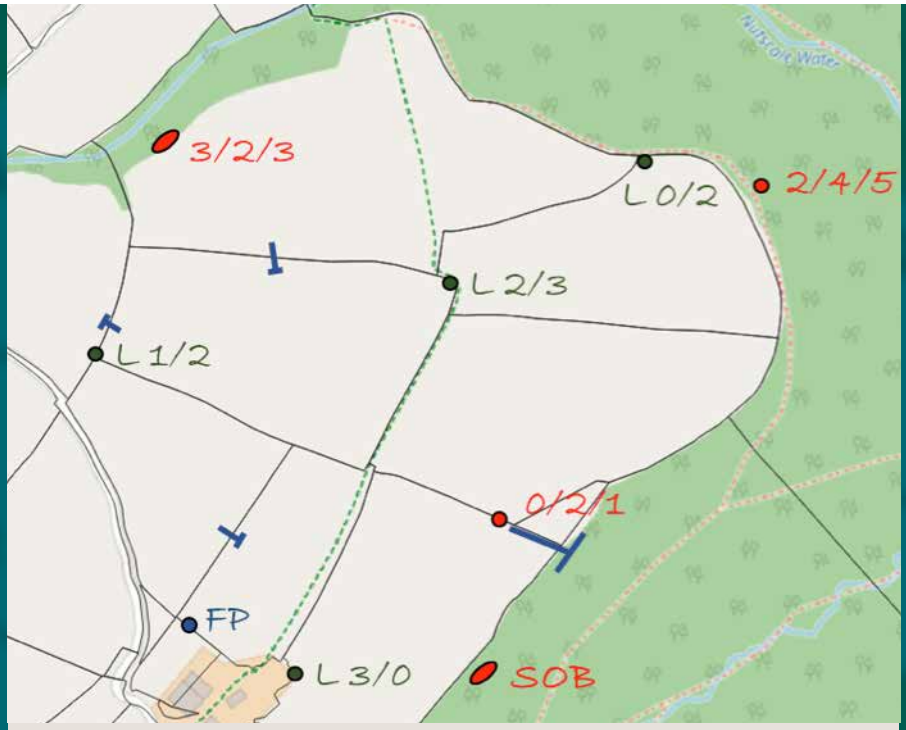
Badger runs and prints

Badgers are creatures of habitat and will regularly use the same paths producing runs which are often visible in long grass, or at points where they cross fences or hedges. You can often see clumps of badger hair (grey with a black tip) where a run passes under barbed wire fencing.

Prints typically have a 'kidney' shaped pad with five toes in a line above, in some cases only the four largest toes are visible.

Recording badger runs

Runs should be recorded as a line on the map indicating the run through a hedgerow or leading across a field. If using the recommended colour scheme use a blue line shaped like a 'T' (**Blue for run-through**).



An example survey map

Figure 1. An example of a field survey map with typical notes that a surveyor may record. **Red circles** are setts, with the number of **active** / **partially active** / **inactive** holes recorded. **SOB** means sett over boundary (i.e. a sett could be clearly seen over a fence, but it was not possible to record the number of holes as this was outside of the survey area). **Green circles** are latrines with the number of fresh / old pits recorded. **Blue lines** are runs, and in one corner **FP** (foot print) has also been recorded.

How much badger activity would you typically expect in an area?

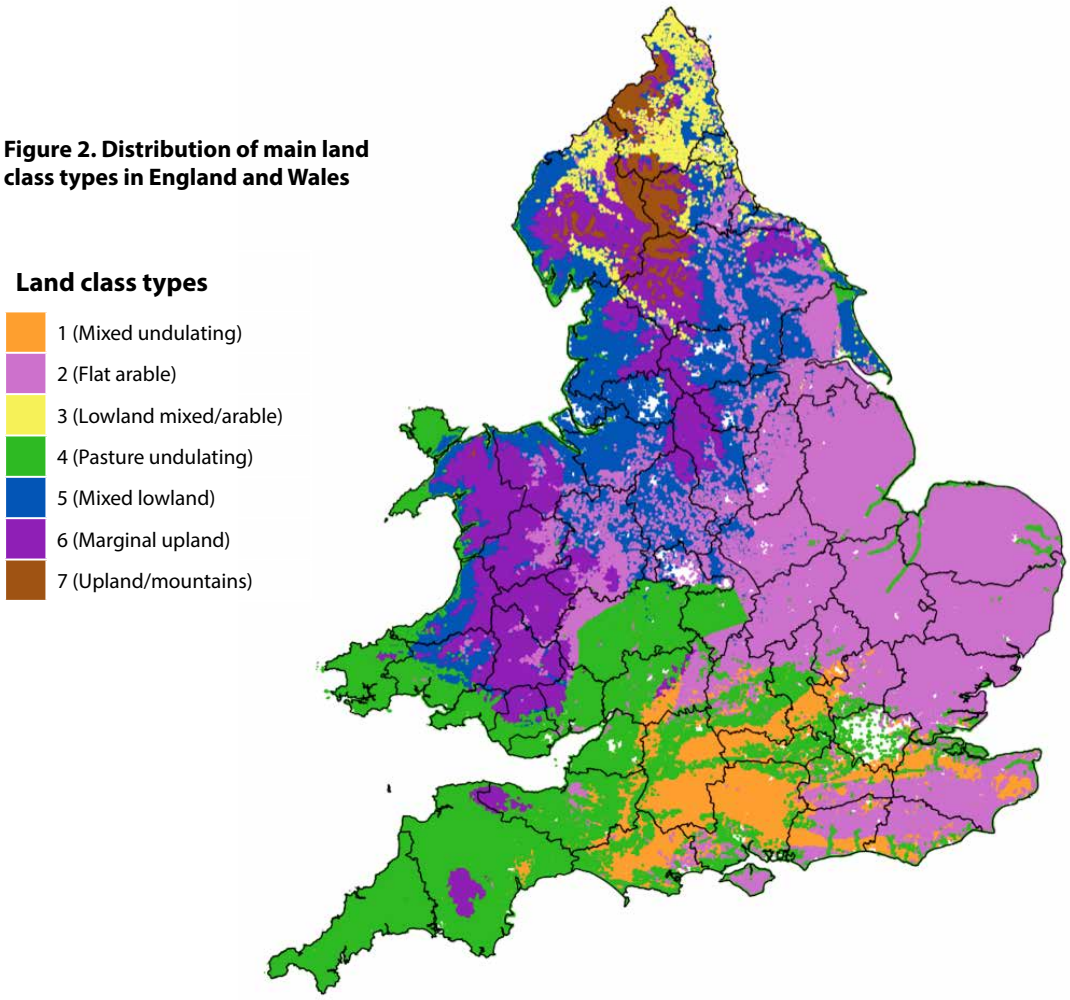
The national badger survey of England and Wales provides a useful estimate of social group density and size in broad habitat categories in England and Wales (Judge et al. 2017). The numbers in the table below will provide broad average measures of badger abundance in each 'land class', but within each class there will be significant variability depending on local conditions. Also note that this survey was conducted prior to the roll out of culling in England, so the numbers below will apply to undisturbed (unculled) badger populations. In culled areas numbers may be substantially lower.

Table below. Summary of the results of the national badger survey of England and Wales (Judge et al. 2017). Displayed are several measures of badger activity or abundance. Main setts refer to large breeding setts used by badger social groups.

Land class	Description	Average number of main setts per km^2 (lower - upper 95% CI)	Average badgers per social group (min - max)	Badgers per km^2 (lower - upper 95% CI)
1	Mixed undulating land	0.87 (0.73 - 1.00)	6.5 (1 - 16)	5.65 (2.15 - 8.15)
2	Flat arable land	0.41 (0.35 - 0.48)	6.3 (2 - 26)	2.58 (1.12 - 4.04)
3	Lowland mixed / arable land	0.34 (0.09 - 0.60)	2.7 (2-3)	0.92 (0.19 - 1.65)
4	Undulating pasture land	0.76 (0.68 - 0.83)	7.9 (1 - 20)	5.98 (4.57 - 7.39)
5	Mixed lowland	0.34 (0.26 - 0.41)	7.5 (2 - 15)	2.51 (1.23 - 3.79)
6	Marginal upland	0.3 (0.21 - 0.39)	4.2 (1-9)	1.26 (0.76 - 1.76)
7	Upland / mountains	Badgers typically not found in this habitat type		

Note: 95% CI refer to the 95% confidence intervals, a measure of uncertainty or variability on the figure. There is a 95% probability that the true figure lies within this range.

Figure 2. Distribution of main land class types in England and Wales



Estimating survey effort

Badger surveys could be conducted by the landowner or by volunteers, contractors or members of a vaccination project. We estimate that highly experienced surveyors could individually cover 1 km^2 per day to conduct a thorough badger survey. However, this is likely to be much less for inexperienced surveyors so it may be worth allowing for 0.5 km^2 - 0.7 km^2 coverage per day, depending on how experienced your surveyors are.

Many other factors will affect how long the survey process takes:

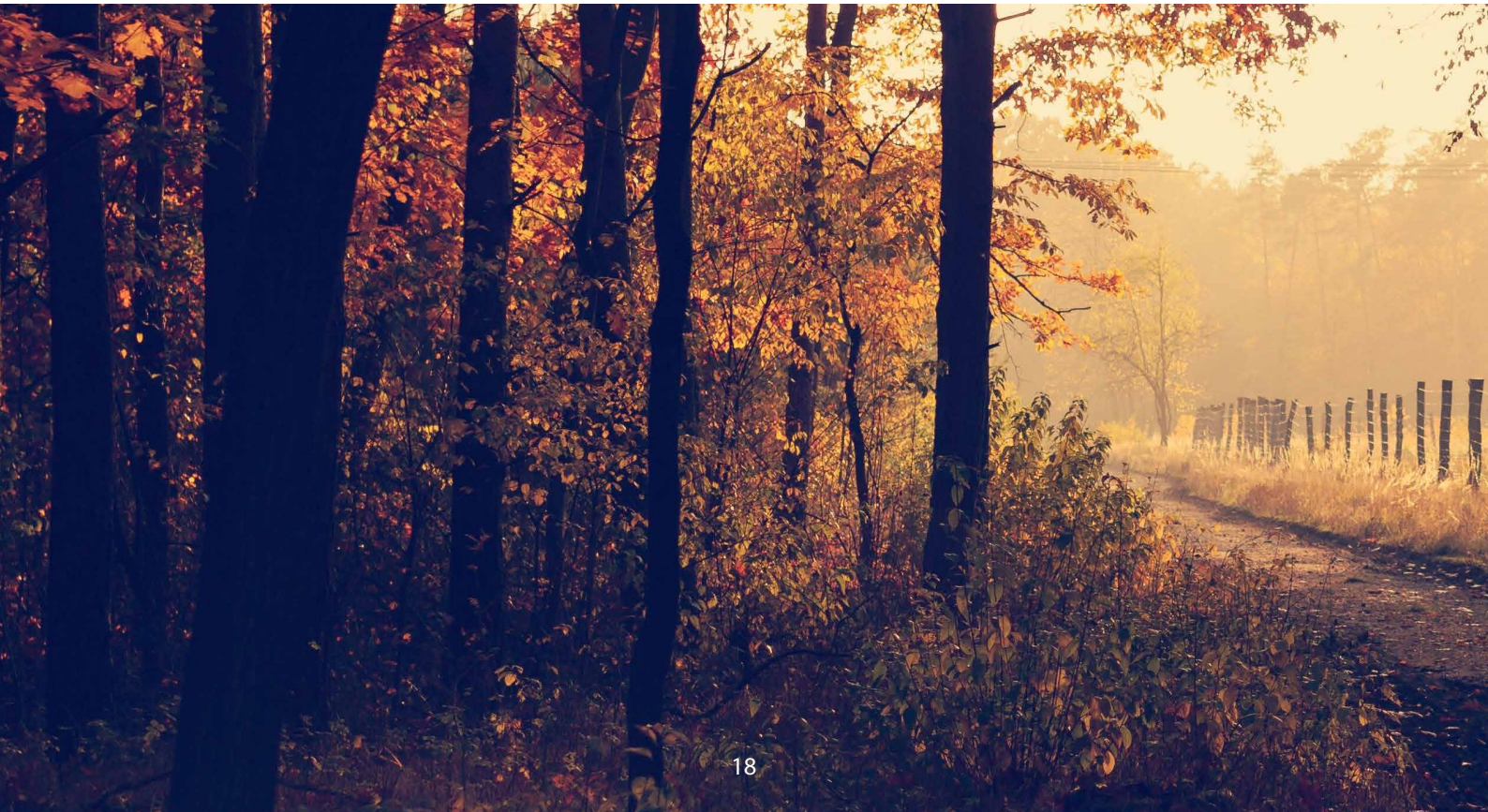
- Whether surveyors will be allowed to work alone or whether working in pairs is mandatory.
- Habitat suitability: Some proportion of your proposed area may be unsuitable for badger trapping, e.g. densely urbanised areas, treatment works, banks of railway lines etc. Within the outline of your proposed area, try to estimate how much of it will actually require surveying when estimating total surveying effort.
- Fitness of surveyors: Anyone with a reasonable level of fitness can undertake a badger survey, but the level of fitness will affect the speed that they survey. The gradient (how hilly the land is) will also affect surveyor speed.
- Presence of woodland: in order to effectively survey a woodland area we recommend using a sweeping approach whereby multiple surveyors walk through an area of woodland at staggered spatial intervals. This is much more effective than one surveyor having to walk back and forwards through a wooded area, however it does rely on the availability of multiple surveyors.

TIP

Surveying blocks of woodland can be a daunting task. If badgers are present in the woodland there will be runs emanating into the surrounding farmland. A good first step is to walk the outside edge of the woodland. Follow any runs you find and they may lead to latrines or setts. If there are no runs or signs of animals leaving the woodland it is unlikely there will be badgers present.

Important note: You will not receive a licence unless the following evidence is provided to Natural England in your licence application:

- A detailed badger survey showing the location of the vaccination area and any badger runs, latrines and setts.
- Details of who did the survey and when it was undertaken.



2.6 Equipment and finances

There are several costs associated with running a badger vaccination project, these include training costs (if individuals need to attend the various training modules – see section 2.2), equipment costs and also additional costs for travel or vehicle usage. Generally costs can be broken down into two components:

1) **Equipment / consumable costs.** This includes cage traps, bait, vaccine and other equipment required for vaccination. Some of these are initial set up costs in year one (e.g. cage traps and training) while others are recurring costs each year (e.g. bait and vaccine). The equipment costs will depend on the size of the area vaccinated, along with the size of the badger population within that area (i.e. badger density).

2) **Staff / delivery costs.** This includes the cost of paying staff or contractors, along with any travel or subsistence costs. This will also vary depending on the size of the area, along with the delivery model used (external contractors, internal staff, or volunteers).

The first year of a vaccination project is likely to be the most expensive, as this is the year that major pieces of equipment need to be purchased and when staff or volunteers need to be trained. Subsequent years (2-4 onwards) are likely to be much cheaper

Costs of training

The following costs are based on estimates and may vary. The Animal Plant and Health Agency (APHA) will tell you the actual cost when you contact them to book your place.

Contact APHA on:

badgervaccine@apha.gov.uk

020 802 62372

Modules - Expected cost per trainee:

1) Field surveying to support badger vaccination **£405** (2020)

2) Pre-baiting and trap siting for badger vaccination **£540** (2020)

3) Cage trapping & vaccination of badgers **£1,560** (2020)

Costs of equipment and consumables

There is variety of equipment and consumables which are required for a vaccination project. In the first year of the project, key pieces of equipment such as cage traps, vaccine fridges, wires, spades and buckets will need to be purchased. This equipment will be reused every year, while other consumables such as syringes, vaccine, peanuts, PPE (personal protective equipment) etc. will need to be purchased repeatedly throughout the project, depending on numbers of animals captured. The most expensive pieces of equipment for vaccination are cage traps (approx. £50 - £80), vaccination fridge (£500-1000 this may not be required if the vaccine is stored at a vet practice), portable vaccine fridges (£300 – 500) and the vaccine itself (£40 – 45 per dose).

Equipment	Approximate price
Badger Traps	£60 - 80
Wickets	£120
Peanuts (bait for trapping)	£30 - £50 per sack (Good quality)
Disinfectant wipes	£10
Stock spray (for marking badgers)	£10 per can
Disinfectant (Fam30)	£40 for 5 ltrs to be diluted
Curved surgical scissors (for fur clipping badgers)	£20
Vaccine and Dilutent	£48
Portable fridge	£500
Permanent Storage Fridge	£500 -1000 (unless stored at vets)
Temperature data logger	£100 (unless stored at vets)
Needles and syringes	£30 for both per 100
Sharps bin	£5 plus disposal costs by vet
Biohazard waste bin	Biohazard waste sacks £20 per roll
Insurance	Entirely individual
Rubber Mallet	£5
Digging spade	£10 - 20
Pliers	£5
Wire cutters	£5
2/3 ply Garden twine	£1 per roll
2mm plastic coated wire	£8 per roll
Clay pots (to stop pests digging at bait)	£2 each
Camera Traps	£40-100
Pressure Washer	£200
Travel/fuel costs	45p per mile

Bait quantity

A double handful of peanuts (150-200g) is the recommended amount of bait required to bait a badger trap. In some cases rodents and other non-targets may take bait, which may increase the amount required.

Assuming up to 14 days of bait, this equates to 2.1 to 2.8 kg of peanuts per trap.

The amount of bait required will therefore depend on the number of cages deployed. Assuming 10 traps per km^2, this equates to 21 to 28 kg, or 0.8 to 1.1 25kg bags of peanuts per km^2. Figures for this and lower / higher trapping densities are below:

Number of traps per km^2	Estimated number of 25kg bags of peanuts per km^2
5	0.4 - 0.6
10	0.8 - 1.1
15	1.3 - 1.7

Example costs for vaccination projects

Large scale, government delivered vaccination projects can provide approximate costs for vaccination, although these costs include a significant amount of government staff costs which can be expensive. For example, the Badger Vaccine Deployment Project (BVDP) in Gloucestershire cost an average of £2,448 per km^2, for government staff to deliver vaccine deployment (APHA 2015). https://www.gov.uk/government/publications/badger-vaccine-deployment-project-lesson-learned-report

In its final year of delivery, the Intensive Action Area (IAA) in Wales cost £3,201 per km^2, two thirds (67%) of which were government staff costs. Published costs for vaccination projects conducted by charitable organisations, are typically much lower than government run projects, due to lower staffing costs. For example, the Zoological Society of London estimates a cost of £653 per km^2. Costs per unit area are dependent partly on scale, with smaller independent projects typically more expensive than larger projects. Small scale vaccination projects of 2 km^2 or less typically have relatively high area costs (in some cases >£5,000 per km^2). However, in some cases reports vary in which items they include, which can make comparisons difficult. See example costs in the table below.

Costs per km^2	IAA	APHA (estimated)	Cornwall (ZSL)
Staff costs and training	2,189	1,505	417
Travel and subsistence	652	252	49
Equipment / vaccine	226	260	187
Total cost per km^2	3,201	2,017	653
% cost staff	68%	75%	64%

The first year of a vaccination project is likely to be the most expensive, as this is the year that major pieces of equipment need to be purchased and when staff or volunteers need to be trained. Subsequent years (2-4 onwards) are likely to be much cheaper.

A worked example of vaccination costs for a 20 km^2 area:

Initial set up costs (these could potentially be shared across other projects):

- Cage traps x 80 = £4,800
- Purchase of vaccine fridges and other misc equipment =£3,000
- Training staff (4 licensed vaccinators) = £6,000

Approximate set up costs = £13,800

Annual consumables cost:

- Vaccine (60-120 doses) = 2,700 -5,400 (at £45 per dose)
- Bait £800
- Syringes, masks and other misc equipment = £1,000-1,500

Total = £4,500 – £7,700

Initial set up costs + 4 years of consumables = £31,800 – £44,600 for 4 years.

This is equivalent to £400 - £560 per km^2 per year for the four year period.

Additional costs will include any staff time, mileage or consumables, which will depend on the delivery model.

Funding vaccination projects

Vaccination projects may be funded by specific landowners or organisations who are willing to pay a fee for the badgers on their land to be vaccinated. There are several companies nationally offering badger vaccination as a commercial business using this funding model.

In other situations vaccination projects may need to actively raise funds to pay for part, or all of a vaccination project.

In the TB Edge Area (check your risk area here: https://www.tbhub.co.uk/risk-map/) you may be able to apply for government funding, such as BEVS (Badger Edge Vaccination Scheme) funding, which covers up to 50% of vaccination costs. For more information on vaccination funding visit www.gov.uk.

Below are a few other ideas of how to raise money for vaccination projects:

- **Collection boxes.**
- **Christmas markets**, or a stall at a local farmers market selling crafts or other produce.
- **Fundraising websites:** There are a number of websites that can be used to advertise your projects or raise funds, these include: www.Justgiving.com. If your project has its own dedicated website on another platform you could also add an option to donate money.
- **Supermarkets:** Some supermarkets are willing to advertise local causes which people can vote/chose to donate to using tokens. Schemes include Tesco 'bags of help' and Waitrose 'community matters'.
- **Sponsored events:** Volunteers or other members of vaccination projects could conduct sponsored events such as walks or runs to raise money.
- **Affiliate with a local wildlife charity or group**. This may give your project more credibility and familiarity which helps to gain support. Large organisations may also have access to funding or volunteer resources which may help your project, this could include other badger vaccination projects.

2.7 Estimating the labour effort required for vaccination projects

There are a number of factors that will affect the labour required for badger vaccination, these include:

- Experience and physical fitness of those involved.
- The level of badger activity in the area (as this will determine the number of traps).
- How spread out activity is within the area (i.e. are the setts close together or spread out at multiple isolated locations).
- The accessibility of the setts / locations. Ideally setts can be easily reached by vehicle, but in some cases badger setts may be up steep banks or in woodland some distance from the nearest track.

Digging in traps

A good starting estimate would be that 1 person can site and dig in a 20 cage trap round (approximately 2 km^2) in a day, although with more experience this number could be increased. For example, experienced APHA experts could in ideal conditions (i.e. if traps were close together and accessible) could site around 50 cages. Standard badger traps weigh approximately 10kgs, so those carrying traps to setts need a reasonable level of physical fitness.

Pre-baiting

As above the number of traps that can be pre-baited will depend on the specific person or conditions. On average one person could pre-bait 20-30 (2-3 km^2) cages in an afternoon (2-4 hours), depending on how spread out they are. Under more ideal situations it may be possible to pre-bait more than this.

Checking traps and vaccinating badgers

A good starting estimate would be that 1 person (or 2 if lone working is not permitted) can vaccinate 10-20 cages (1-2 km^2) in a single vaccination morning. More experienced field staff, subject to the specific operating circumstances, could vaccinate up to 25-30+ cages per morning.

One consideration is how far apart the cages are placed, if the traps are all close together, vaccinating all trapped badgers will be much quicker than if cages are spaced out at large distances from each other and a long walk is required.

This guide was created by Dr Andy Robertson
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