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Animal & Plant Health Agency

Department for Environment Food & Rural Affairs

NATURAL ENGLAND

National Trust

THE wildlife TRUSTS

Planning a Badger Vaccination Project

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SECTION 1

Introduction


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 [1,2] and during a four year field study in Gloucestershire [3–5]. 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** [1,4].
- **Vaccination reduces the rate of new infections (measured using diagnostic tests) in badgers by 76%** [4].
- **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%** [4].

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.

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):

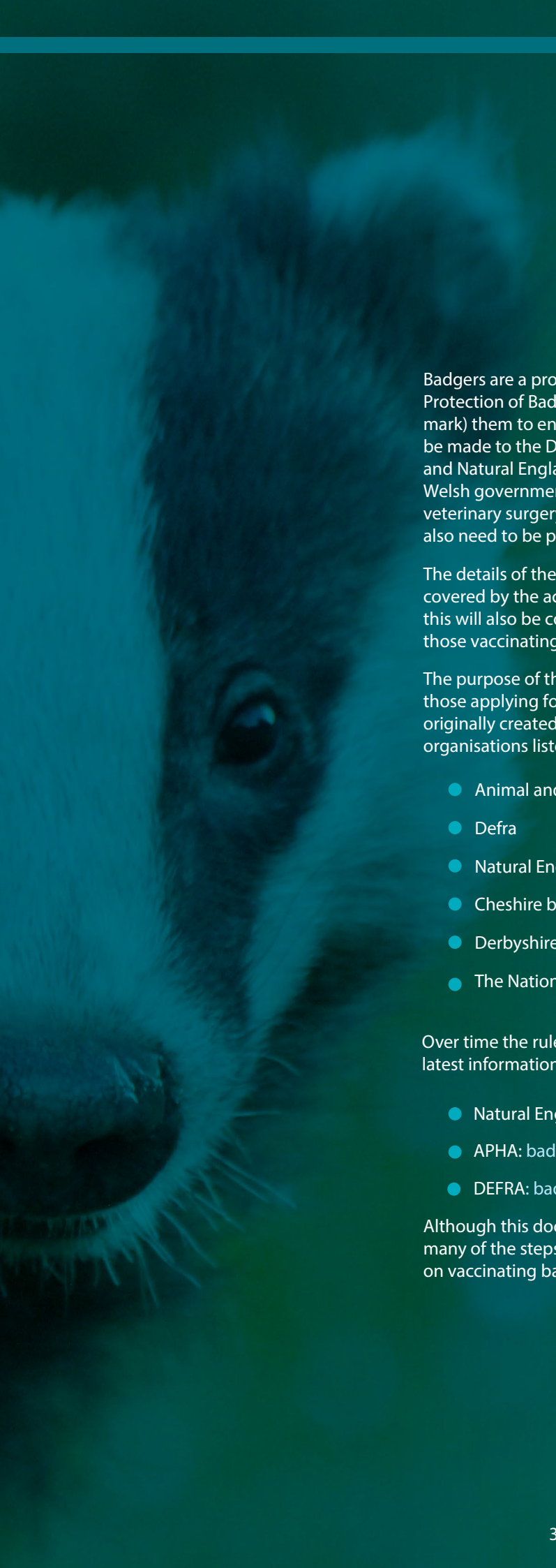

1 Deploying the trap


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 the Department for Environmental, Food and Rural Affairs (DEFRA) and 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 originally 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
- DEFRA: badger.vaccination@defra.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

2.0 Vaccination Licence

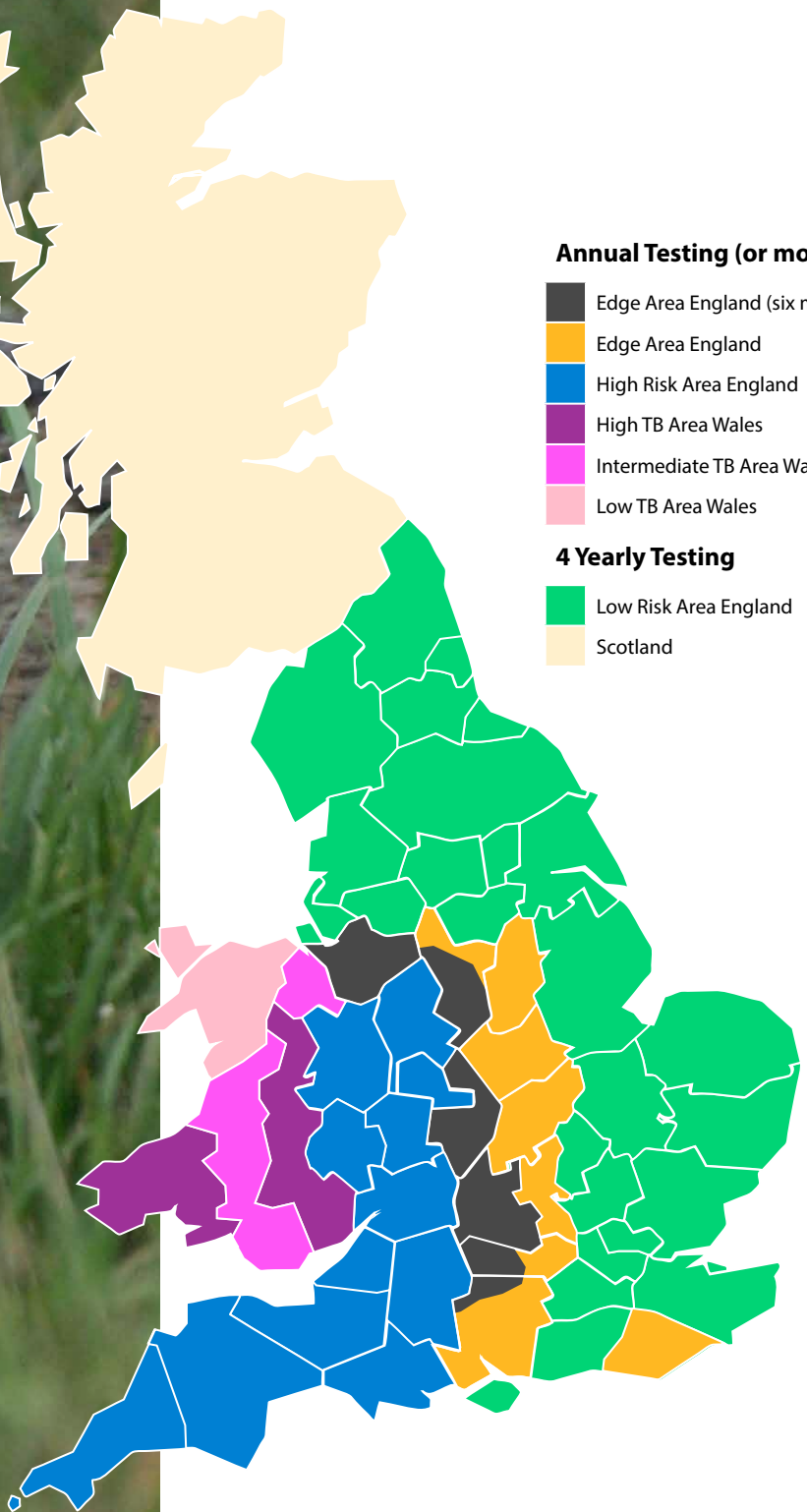
The first step: If you are considering planning a vaccination project then the first step you should take is to read the summary information on applying for a licence which can be found here https://www.gov.uk/government/publications/licences-to-cage-trap-and-mark-badgers-for-bovine-tb-vaccination

You will need to complete certain training for your license depending on what activity you will be undertaking (trapping, vaccinating, and/or marking). For further enquiries about the license contact DEFRA on badger.vaccination@defra.gov.uk.

2.1) Where and When: before starting your project you should consider at what time of the year you will be conducting it and where in the country.

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/

The DEFRA class license has no restriction on which areas you can vaccinate in. However, in England you can only vaccinate badgers during the open season from 1st of May to 30th November. In Wales the season is from 1st May to the 31st of December. Trapping of badgers outside of this season is prohibited as cold wet winter weather may compromise badger welfare. Trapping rates during winter are also lower and there is a risk of trapping female badgers with dependent cubs



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, digging in or pre-baiting traps	Module 1: Supporting skills for badger vaccination	Optional	Do not need a licence
Trapping	Module 2: Cage trapping for badger vaccination	Mandatory requirement	You need a CL48 license
Marking	Module 2: Cage trapping for badger vaccination	Mandatory requirement	You need a CL49 license
Vaccinating	Module 3: Vaccinating badgers	Mandatory requirement	You need a CL48 license

Although training modules 1 is not required under any circumstances (see above) it is 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 equivalent training), and receive your confirmation of license registration

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

- You have attended the module 3 training course (or equivalent training) and hold a 'Certificate of Competence' and are known as a Lay vaccinator. OR...
- You are a qualified, registered veterinary surgeon in the presence of the licensee.

To book a course or for further information

Go to: https://www.gov.uk/guidance/bovine-tb-badger-vaccination-training

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: Supporting skills for 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: Cage trapping 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: Badger Vaccination

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.

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

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 will need a Prescribing Vet and a Directing Vet (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 are accompanied by a person who is licensed. If they are setting traps to catch badgers or marking badgers after vacciantion they will need to attend the relevant training course (see section 2.2).

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.. 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

All trapping and vaccinating activity requires documented landowner and occupier permission for all sites where activity will take place.

If the applicant is not the landowner/occupier, 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.

It is a licensee's responsibility for ensuring that permission for trapping and vaccination of badgers to take place has been obtained.

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, APHA, and DEFRA

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 or DEFRA on badger.vaccination@defra.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)

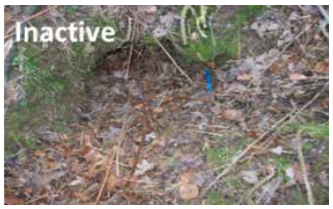
The survey should involve walking all field boundaries (hedgerows, fences etc.) as setts and latrines will often be located along these 'linear features' in the landscape. If badgers are regularly crossing a boundary there may also be a visible trodden route or 'run'. Follow strong runs into fields as 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.

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.

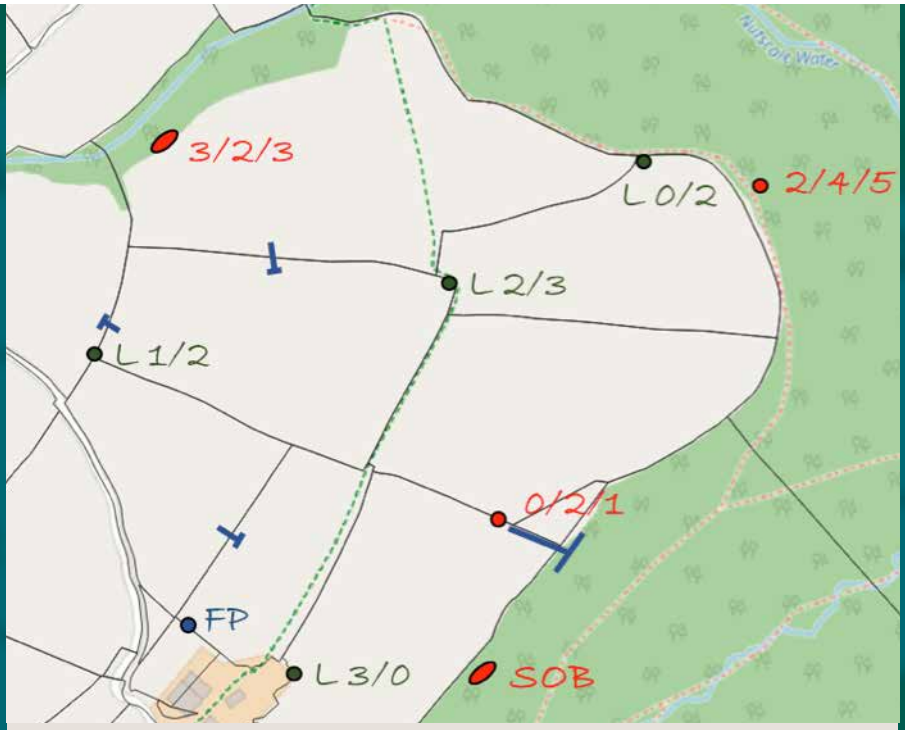
Badger runs and prints

Badgers are creatures of habit 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?

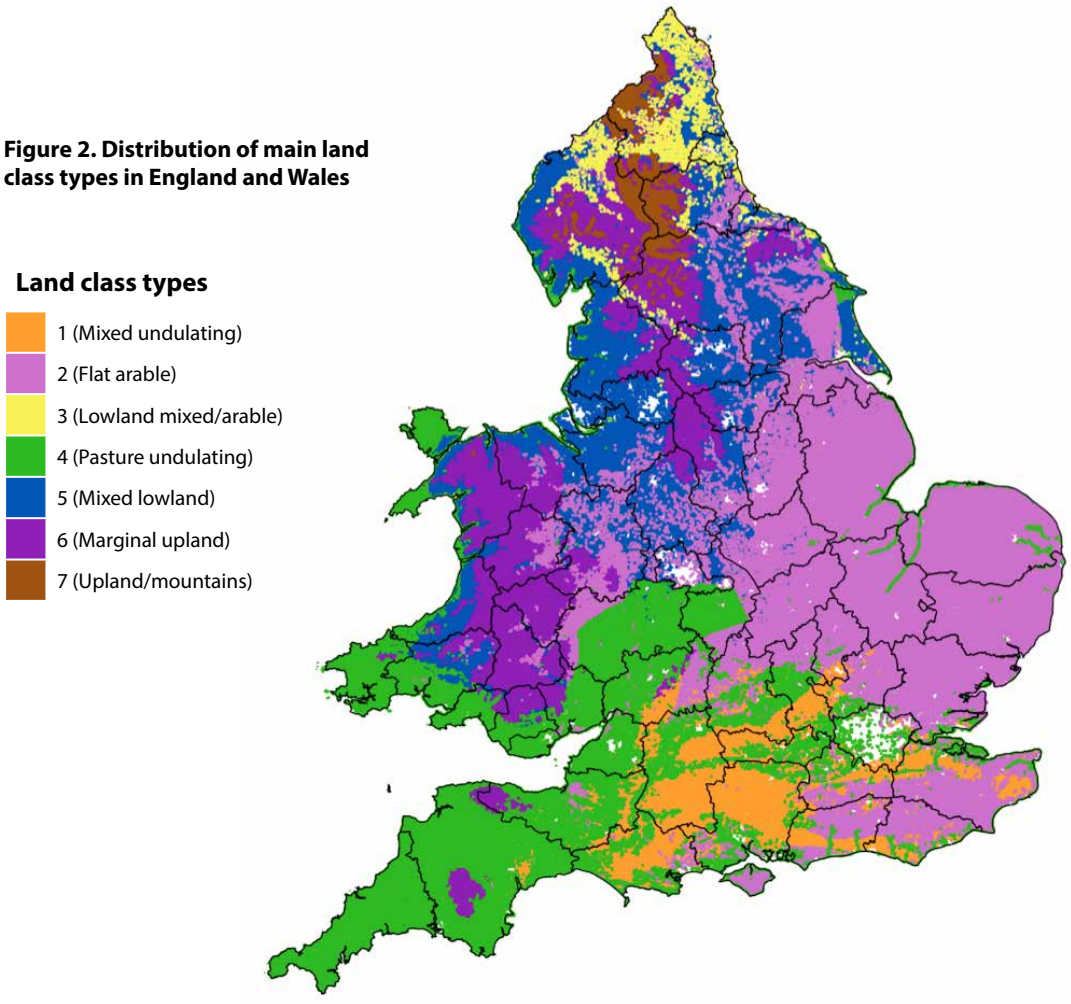
The national badger survey of England and Wales provides a useful estimate of social group density and size in broad habitat categories in England and Wales (Judge et al. 2017). The numbers in the table below will provide broad average measures of badger abundance in each 'land class', but within each 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

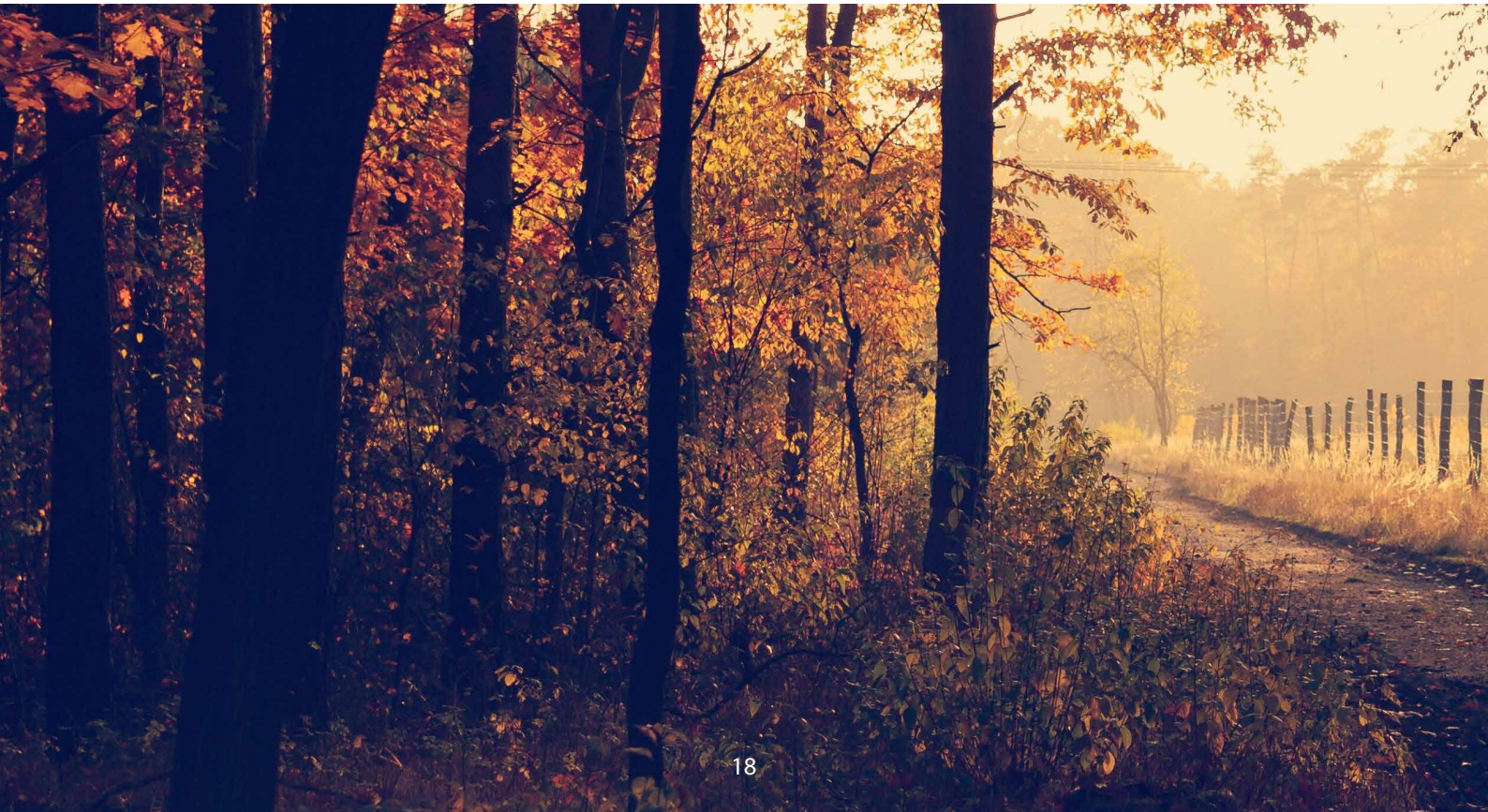
Badger surveys could be conducted by the landowner or by volunteers, contractors or members of a vaccination project. We estimate that highly experienced surveyors could individually cover 1 km^2 per day to conduct a thorough badger survey. However, this is likely to be much less for inexperienced surveyors 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.



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

Costs vary per area and trainer. For the most up to date costs, contact your local trainer and APHA:

badgervaccine@apha.gov.uk

020 802 62372

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. £125 - £175 with VAT and delivery) and the vaccine fridges (£~1000).

Equipment	Approximate price
Badger Traps	£124.00
Wickets	£82
Peanuts (bait for trapping)	£45 per sack (Good quality)
Hand disinfectant sprayer	£17
Stock spray (for marking badgers)	£5 per can
Disinfectant (Fam30)	£65 for 5 ltrs to be diluted
Curved surgical scissors (for fur clipping badgers)	£5
Vaccine and Dilutent	£8 a vial
Portable fridge	£500
Waterproofs	£50-150
Temperature data logger	£30-50(unless stored at vets)
Needles	£2.50 per 100
Syringes	£14.00 per 100
Biohazard waste sacks	£45 per roll
Sharps bin	£1.50plus disposal costs by vet
Insurance	Entirely individual
Digging spade	£12
Nitrile gloves	£14 per box
Wire cutters	£9
2/3 ply Garden twine	£4 per roll
2mm plastic coated wire	£4 per roll
Shoulder strap for carrying cages	£7
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 non government 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%

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 = £10000
- Purchase of vaccine fridges and other misc equipment =£3000
- Training staff (4 licensed vaccinators) = £6000

Approximate set up costs = £19000

Annual consumables cost:

- Vaccine (60-120 doses) = £600-£1200 (£10 per dose)
- Bait £800
- Syringes, masks and other misc equipment = £1000 - £1500

Total = £2400 – £3500

Initial set up costs + 4 years of consumables = ~ £30000 - £35000 for 4 years.
This is equivalent to £300 - £400 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 certain TB areas (check your risk area here: https://www.tbhub.co.uk/risk-map/) you may be able to apply for government funding. For more information on vaccination funding visit www.gov.uk.

Below are a few other ideas of how to raise money for vaccination projects whihc may be particularly suitable :

- **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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