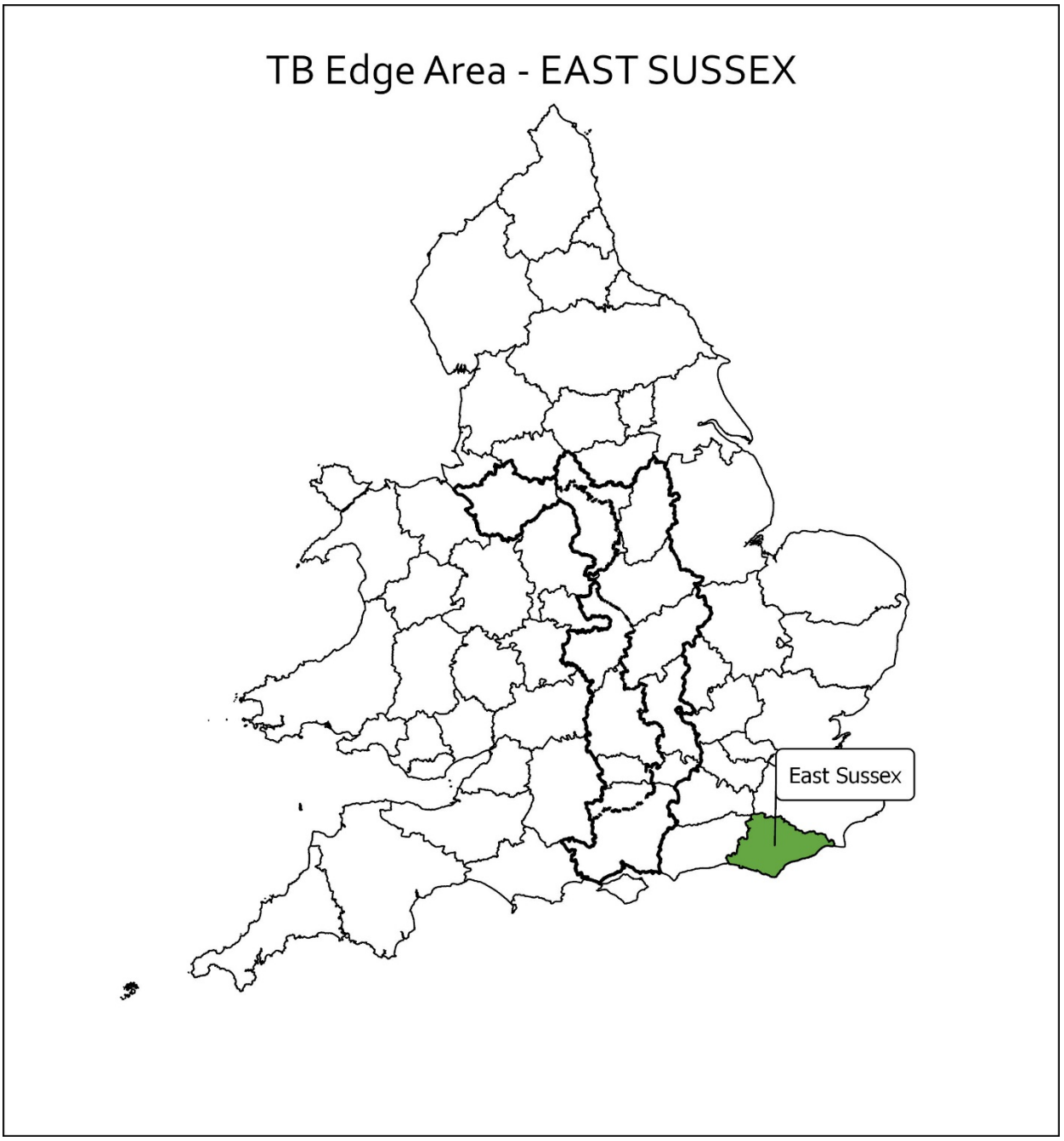
Animal & Plant Health Agency

Year End Descriptive Epidemiology Report: Bovine TB Epidemic in the England Edge Area

Delivery Area: Southern

Name of County: East Sussex

Year-end report for: 2018



Contents

Executive Summary

1. The Edge Area has a low but recently rising incidence of infected herds. **East Sussex** is part of the Edge Area that was established in 2013 as part of the Government's strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. Originally, only the northern and eastern parts of the county were included in the Edge Area established in 2013. The rest of the county was part of the High Risk Area (HRA) until 1st January 2018, when the HRA portion of East Sussex was incorporated into the Edge Area. This end of year report describes the bovine tuberculosis (TB) epidemic in the whole county of East Sussex in 2018.

2. **Local cattle industry**. East Sussex has a relatively low cattle density and is predominantly made up of small beef herds with a mean of 86 cattle per holding. There are only 16 herds with over 501 cattle and these are mostly dairy herds.

3. **New breakdowns of TB**. There have been 14 new Officially Bovine Tuberculosis Free Status Withdrawn (OTFW) and 13 new Officially Bovine Tuberculosis Free Status Suspended (OTFS) breakdowns in 2018. The annual herd incidence and prevalence rates are at their highest since 2009 at 5.1% and 3.5% respectively.

4. **Risk pathways for TB infection**. The most likely infection source for cattle in the endemic area (former HRA) is contact with infected wildlife and in the non-endemic area (original Edge Area) is movements of undetected infected cattle. Overall the weighted source of infection for all TB incidents is: wildlife 37%, cattle movements 24%, and undetermined source 10% (highest of all Edge Area counties).

5. **Role of other species**. Historically badgers were found to be infected with genotype 13:a within the former HRA part of the county, and probably continue to play a role in TB transmission to cattle in this area as evidenced by more genotype 13:a breakdowns in 2018. However, this endemic area appears to be stable with little evidence of expansion over the last few years. Anecdotally, there are relatively few reports of badgers on farms in the original Edge Area of the county but there are many wild deer sightings, although their role in TB transmission in East Sussex is unclear. There have been no TB incidents in domestic species other than cattle in 2018 in East Sussex.

6. **Disclosing tests**. The majority of OTFW breakdowns in 2018 were disclosed by radial testing (6/14 – 43%) and annual routine whole herd surveillance tests (WHT) (4/14 – 28%). Overall, for OTFS and OTFW breakdowns combined, 44% (12/27) were disclosed by WHTs and 30% (8/27) by radial tests. Pre-movement tests disclosed 11% (3/27) of breakdowns.

7. **Impact of TB, reactor numbers**. There has been a moderate increase in the number of TB incidents from 23 in 2017 to 27 in 2018 but a significant increase in interferon gamma and skin test reactors from 87 in 2017 to 295 in 2018. The average number of reactors disclosed per breakdown is also at its highest at 11. These increases are partly due to policy changes with the implementation in January 2018 of radial skin testing of herds within 3km of all OTFW breakdown herds in East Sussex and mandatory interferon gamma testing of all herds with OTFW breakdowns.

8. **Risks to the Low Risk Area (LRA)**. This remains unchanged and the endemic areas in East Sussex remain stable. Cattle movements are the main risk factor, mitigated somewhat by pre- and post-movement testing.

9. **Risks from the High Risk Area and/or other adjacent Edge Area counties.** There are no adjacent HRA or Edge Area counties but long distance cattle movements remain a driver of disease as there is a shortage of cattle locally to supply the beef fattening units in East Sussex.

10. **Forward look**. Continued increases in the number of TB incidents and number of reactors are to be expected due to the policy changes described above in the short term. However, in the long term this should have the effect of reducing the length of TB breakdowns and preventing them becoming chronic. The uptake of vaccination projects for badgers, improving farm biosecurity and taking advantage of the free advice available to cattle farmers in the Edge Area from the TB Advisory Service is to be encouraged. Despite these initiatives the target of East Sussex becoming OTF by 2025 appears to be too ambitious and therefore remote.

Introduction

A key action in the implementation of the Government's objective to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038 was to recognise the different levels of TB in different parts of the country and to vary the approach to control accordingly. To this end three management regions or zones were established in 2013. Overall, the Edge Area has a low but recently rising incidence of infected farms and control efforts are seeking to slow down and reverse geographic spread, and reduce the incidence rate, with the aim of obtaining OTF status for this area as soon as possible. This report describes the epidemiology of bovine TB in East Sussex which forms part of the Edge Area. (See Appendix 1).

Changes to the Edge Area in 2018

On 1st January 2018 the Edge Area boundary was expanded westwards to absorb fully into the Edge Area the former HRA parts of the five previously split counties of Cheshire, Derbyshire, Warwickshire, Oxfordshire and East Sussex. The reports for those five counties will focus on incidents of bovine TB in the whole county, but noting key differences between the old and new parts where relevant.

Annual surveillance testing continued in the whole county of East Sussex. From January 2018, herd surveillance was enhanced with the introduction of targeted testing of herds within a 3km radius of OTFW breakdown herds.

Cattle industry in East Sussex

Herd Types

East Sussex has 561 cattle holdings with 434 being in the original East Sussex Edge Area. As shown in Figure 1, the majority of holdings (59%) have a small number of cattle (1- 50). Only 5% (26 holdings) have over 350 cattle on the holding and 11 of these are in the original Edge Area portion of the county. The majority of cattle holdings have beef cattle, 62%, with dairy cattle and dual purpose breeds representing 21% and 17% of cattle holdings in East Sussex, respectively (See Figure 2). The cattle density of 21 to 40 cattle per square kilometre is concentrated in the centre of the county with a surrounding band of low cattle density. Neighbouring LRA counties of West Sussex and Surrey have similar densities whilst Kent has a very low cattle density.

Markets

There are two main cattle markets that provide a valuable outlet for cattle and selling of stores; Hailsham Market in East Sussex and Ashford market in the neighbouring LRA county of Kent. These markets are relatively low volume so the larger dairy and beef finishing herds have to source their cattle from further afield. This poses a risk of introducing TB infection into East Sussex from the HRA and from Wales where the cattle density is much higher.

There are several small slaughterhouses for cattle, one located in Tottingworth in East Sussex and others in the neighbouring LRA county of Kent (at Charing and Tunbridge Wells). A larger abattoir (ABP Guildford) is located in the neighbouring LRA county of Surrey.

Approved Finishing Units

There is one AFU (without grazing) in operation in East Sussex.

Common Land

There are small areas of common land in East Sussex but there have been no TB incidents associated with cattle grazing this land in 2018.

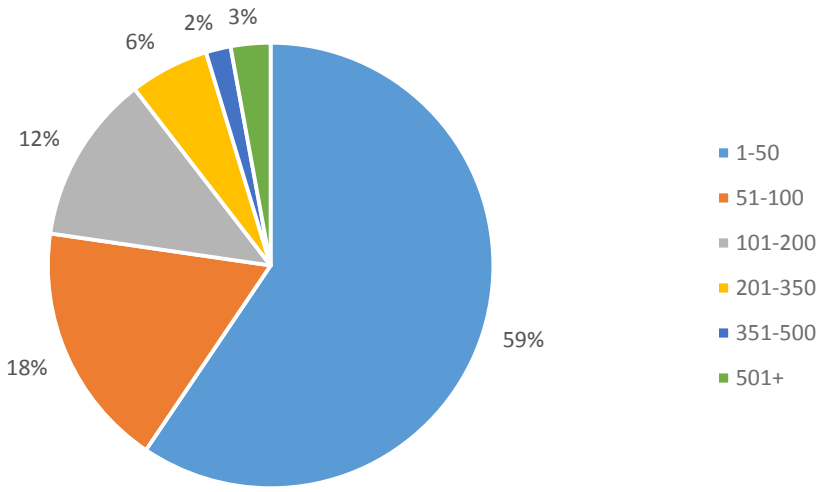


Figure 1: Proportion of cattle holdings by herd size in East Sussex in 2018 (n=561)

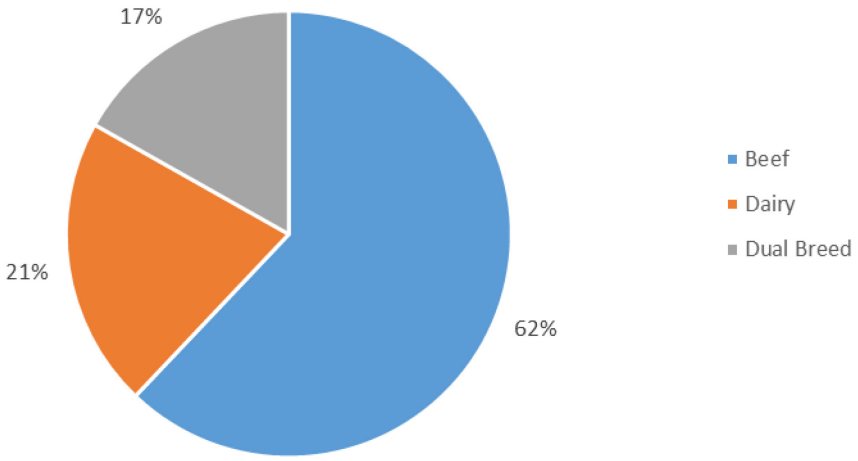


Figure 2: Proportion of cattle holdings by breed purpose in East Sussex in 2018 (n=832).

(Note: the total number of holdings in Figure 1 varies from the total number of holdings in Figure 2 because holdings are counted more than once when cattle with different breed purposes are present.)

Overview of bovine TB epidemic in East Sussex

History of bovine TB in East Sussex

Three measures are used to assess the level of bovine TB in this report.

Firstly, the number of new herd breakdowns that were disclosed in each year.

Secondly, the annual herd incidence rate, reported as the number of new incidents per 100 herd-years at risk (100 HYR). This is the number of new TB incidents detected in the year, divided by the time those herds were at risk of contracting TB. The 100 HYR incidence rate is used in this report as it

accounts for different intervals between tests in herds that other incidence measures, such as new TB incidents per number of herds or tests do not[1].

Thirdly, the annual end of year herd prevalence. This is the number of herds under restriction due to a TB incident at the end of the reporting year, divided by the number of active herds at that same point in time, and provides a snap shot of the burden of TB on the local cattle industry.

For all three measures, both breakdowns where lesions at post-mortem or *M. bovis* in tissue samples have been identified (officially tuberculosis free status withdrawn, OTFW) and breakdowns where lesions at post-mortem or *M. bovis* in tissue samples have not been identified (officially tuberculosis free status suspended, OTFS) are included. However, TB incidents in Approved Finishing Units (AFUs) without grazing are not included in the prevalence and incidence calculations in the Edge Area reports due to the limited epidemiological impact of these cases. Furthermore, herds restricted due to an overdue test rather than a TB incident are also excluded from calculations.

The county of East Sussex was previously split between the Edge and HRA. The former HRA portion of East Sussex was bounded by the A22 in the north and east and by the county border in the west. This area generally mirrors the area of East Sussex considered to be endemic for the *M. bovis* genotype 13:a and its associated mutations 13:c and 13:d to the east of river Ouse but south of A27. The rest of the county which is comprised of mostly the original Edge Area is regarded as not being endemic for *M. bovis* and the sources of the TB breakdowns were mostly attributed to movements of undetected infected cattle. Since the beginning of 2018 the Edge and HRA of East Sussex have been combined into the new Edge Area comprising the whole of East Sussex.

Figure 3a illustrates the annual number of new TB breakdowns in the whole county of East Sussex and shows an increase over the last year from 23 to 27. This is the largest number of new breakdowns from 2009-2018. Figure 3b illustrates the same data differentiated between the current and original Edge Area. Again, over the last year there has been a small increase in the original Edge Area from 12 to 14 breakdowns. However, the numbers are relatively small and the highest annual number of breakdowns in the original Edge Area, 15, actually occurred in 2015.

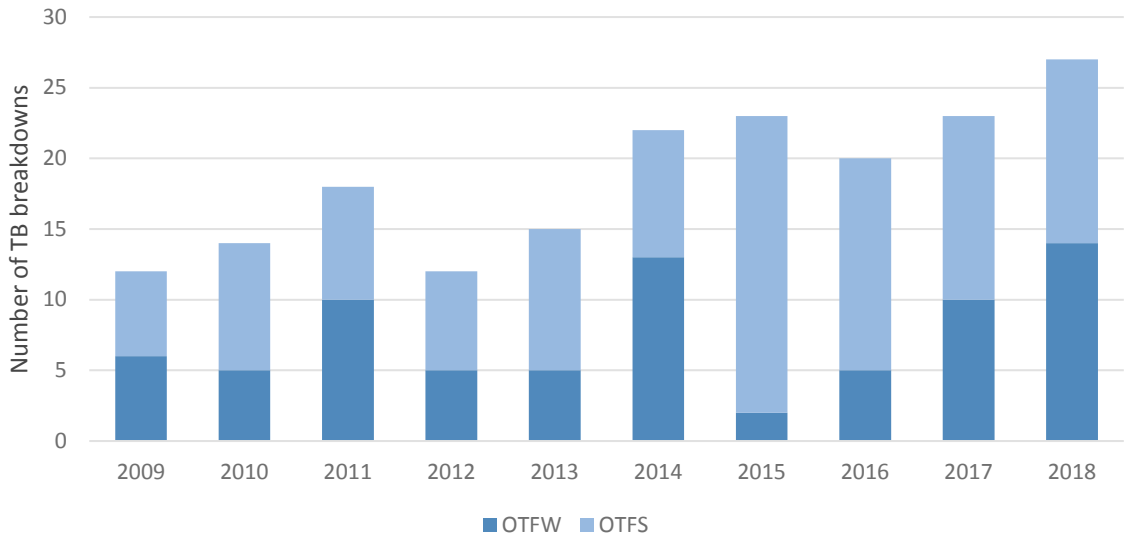


Figure 3a: Annual number of new TB breakdowns in East Sussex, 2009-2018

[1]The 100 HYR incidence rate measure is described further in 'Bovine tuberculosis in Great Britain in 2018: Explanatory Supplement to the annual reports' https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2018

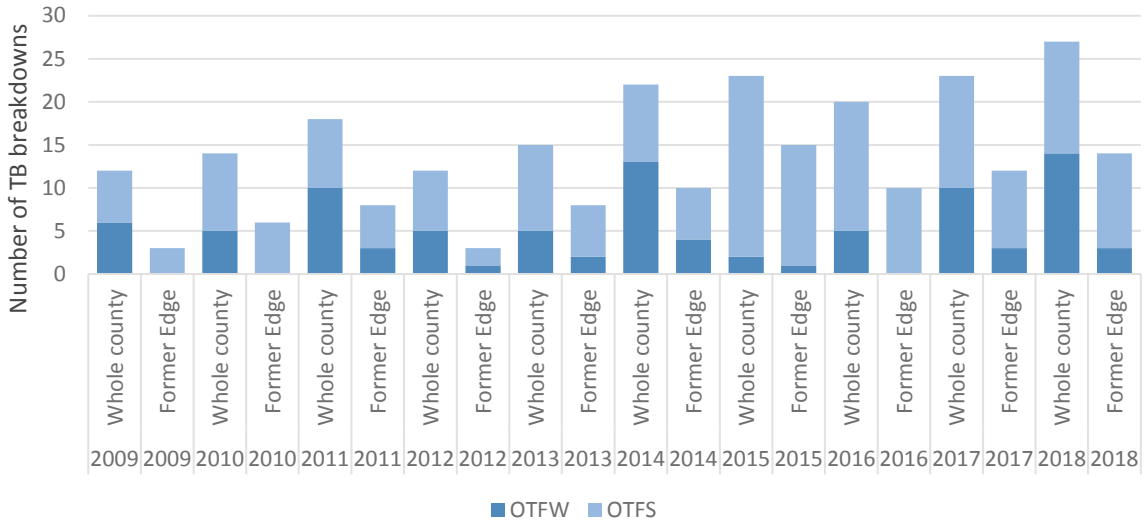


Figure 3b: Annual number of new TB breakdowns in East Sussex, 2009-2018 showing the split between Former Edge and Whole County

In 2018 the ratio of OTFW compared to OTFS breakdowns was 14 OTFW : 13 OTFS compared to 10 OTFW :13 OTFS in 2017. The number of OTFW breakdowns in the original Edge Area has remained stable with three in 2018 and three in 2017 (see Figures 3a and 3b).

The incidence rate of TB is gradually increasing. Figures 4 and 5 show that the annual incidence rate per 100 herd-years at risk was 5.1 in 2018 compared to 4.6 in 2017. This is the highest incident rate in the last decade.

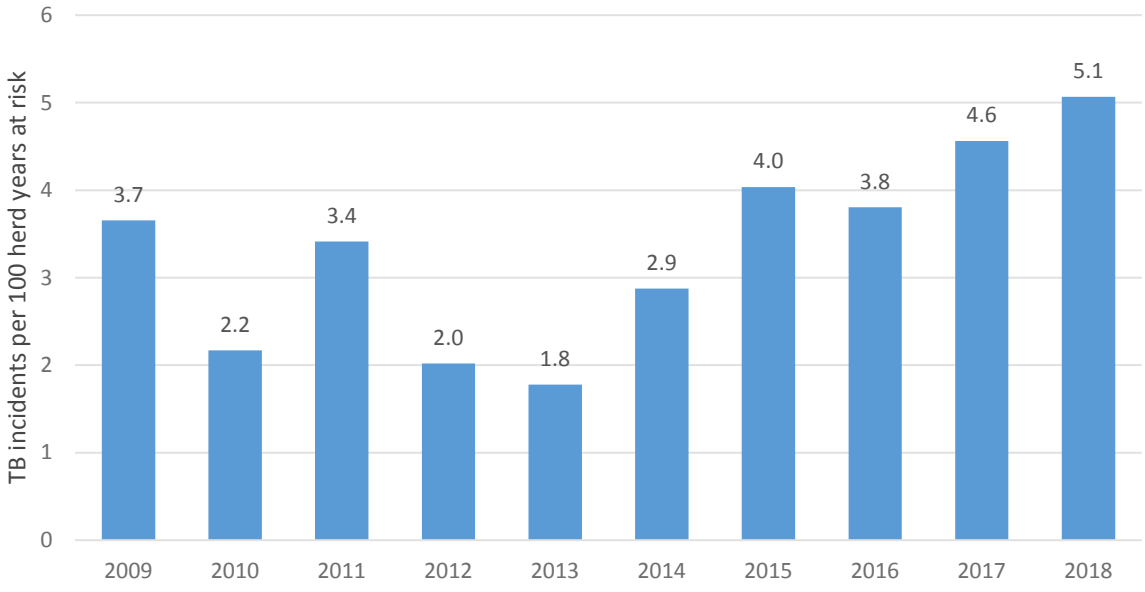


Figure 4a: Annual herd incidence rate (per 100 herd-years at risk) for all new breakdowns (OTFW and OTFS) in East Sussex, 2009-2018.

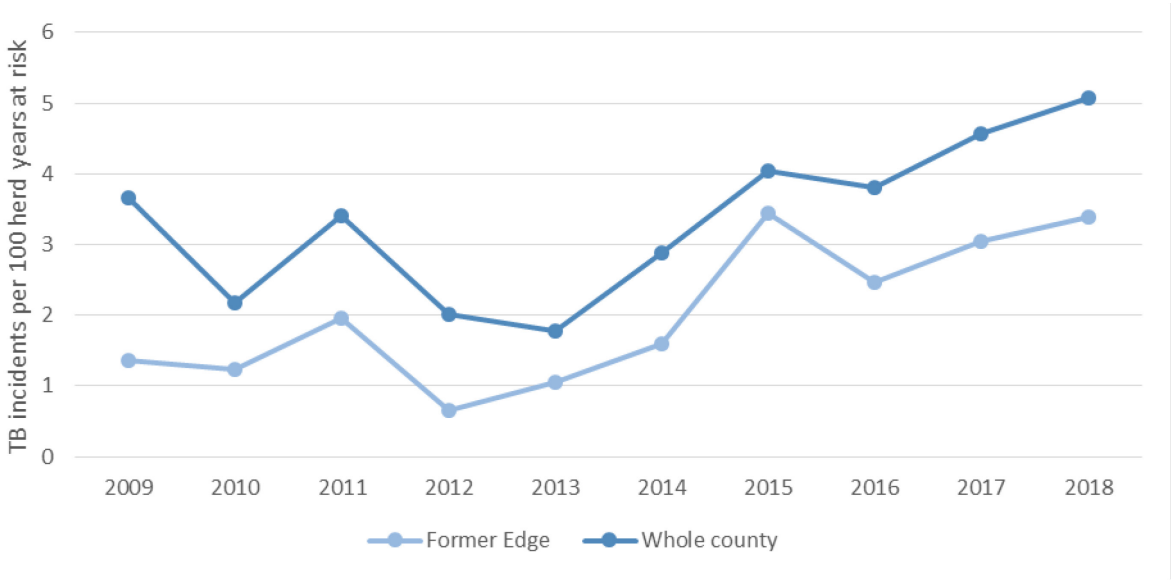


Figure 4b: Annual incidence rate (per 100 herd-years at risk) for all new breakdowns (OTFW and OTFS) in East Sussex 2009-2018 showing output for previously split county

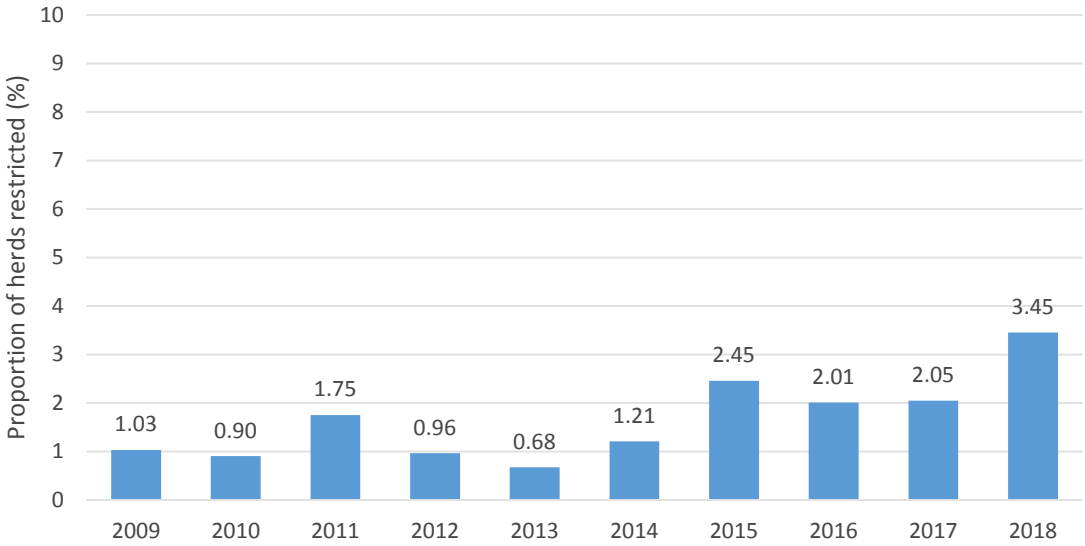


Figure 5a: Annual end of year prevalence of restricted herds in East Sussex, 2009-2018 (whole county).

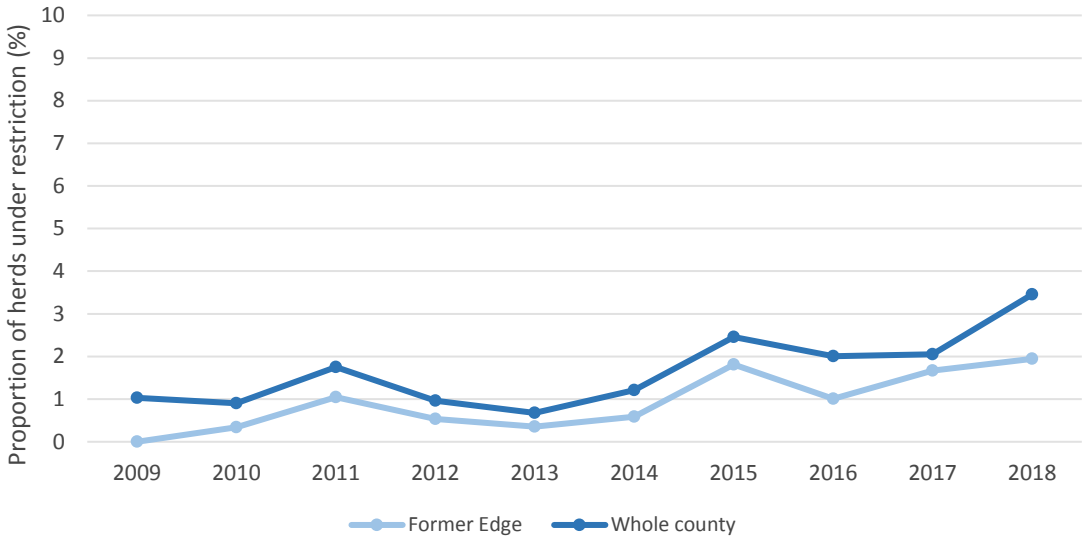


Figure 5b: Annual end of year prevalence of restricted herds in East Sussex, 2009-2018 (previously split county).

Increases in the incidence rate in the original Edge Area portion of the county have been mostly responsible for the increase in the incidence rate of the whole county over the last six years as illustrated by Figure 4b. In contrast, the incidence rate in the former HRA portion of the county has been relatively stable over the last decade although there have been small increases over the last three years from 1.3 to 1.7 TB incidents per 100 herd years. There appears to be a cyclical increase in TB incidence every three to four years but the overall level is gradually increasing. This cyclical pattern is also seen in other Edge Area counties and may reflect the introduction of new policy control measures.

Geographical distribution of bovine TB cases (new and ongoing) in East Sussex

Figure 6 shows the distribution of OTFW breakdowns new and ongoing in 2018 in East Sussex. There is some clustering of breakdowns in the former HRA portion of East Sussex but as this is in the part of the county with a lower cattle and holding density, the clustering of breakdowns may be due to another factor such as presence of *M. bovis* infected badgers. All except one, of the 2018 OTFW breakdowns are located in the lower cattle holding density area of the county. There are two ongoing (pre-2018) OTFW breakdowns located outside the former HRA portion of the county and in the higher cattle holding density area. The majority of OTFS breakdowns in the original Edge Area of East Sussex appear to be located in the centre of the county, which corresponds to the area with a higher density of cattle holdings. Ten of the twelve OTFS breakdowns are located in the original Edge Area of the county and only two in the former HRA portion of the county.

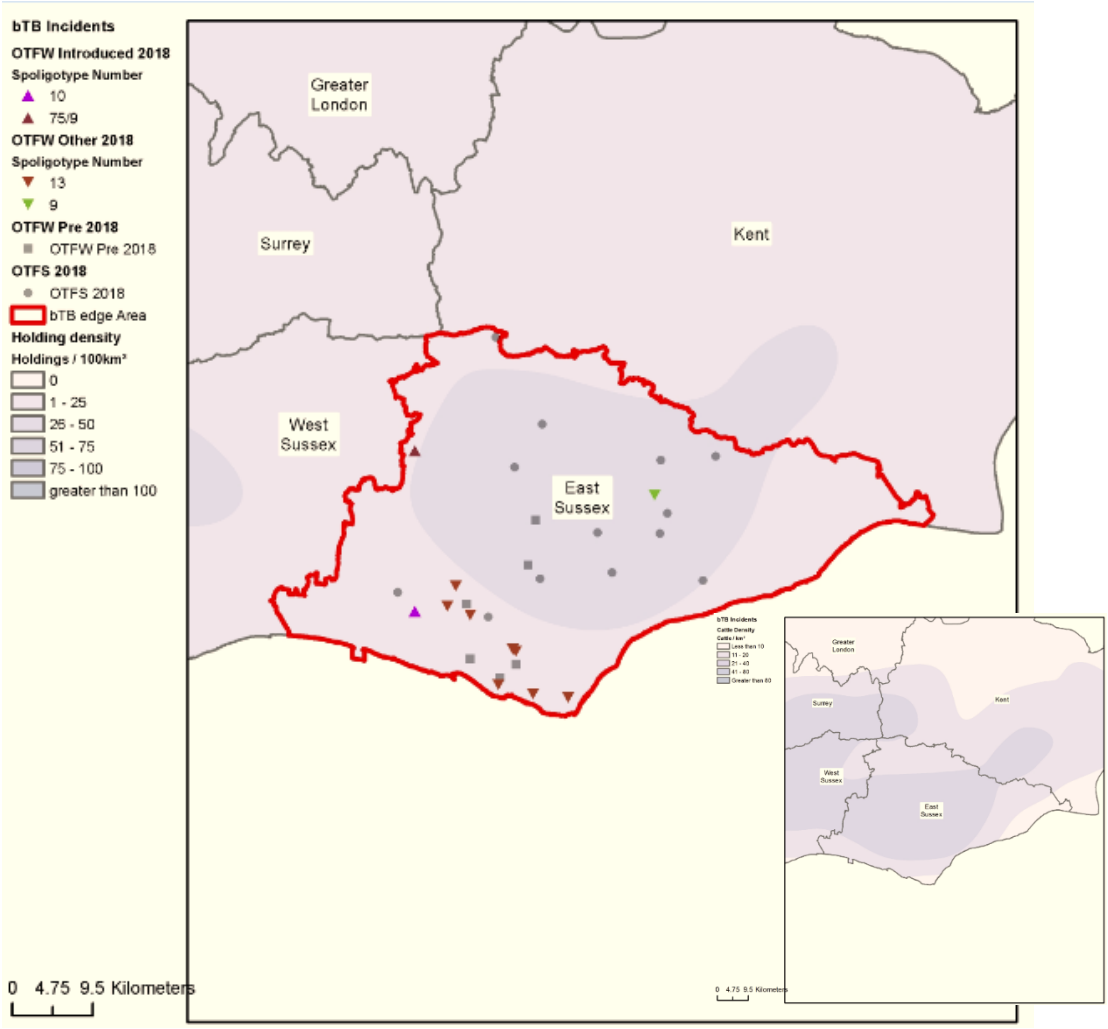


Figure 6: Geographical distribution of all new TB breakdowns (OTFS and OTFW) in East Sussex in 2018 and pre-2018 OTFW breakdowns still ongoing at the end of the report

period overlaid on a cattle holding density map, with a cattle density map for the area inset.

The OTFW breakdowns in East Sussex where wildlife were considered as a source with 75% or greater certainty are all located within the former HRA portion of the county, as shown in Figure 7. This suggests that the area of endemicity is not expanding even though the number of TB breakdowns within the endemic area is increasing. The *M. bovis* genotypes detected are 13:a and 13:c. These two genotypes are related to each other and 13:c is regarded as a mutation of 13:a (see discussion in next section).

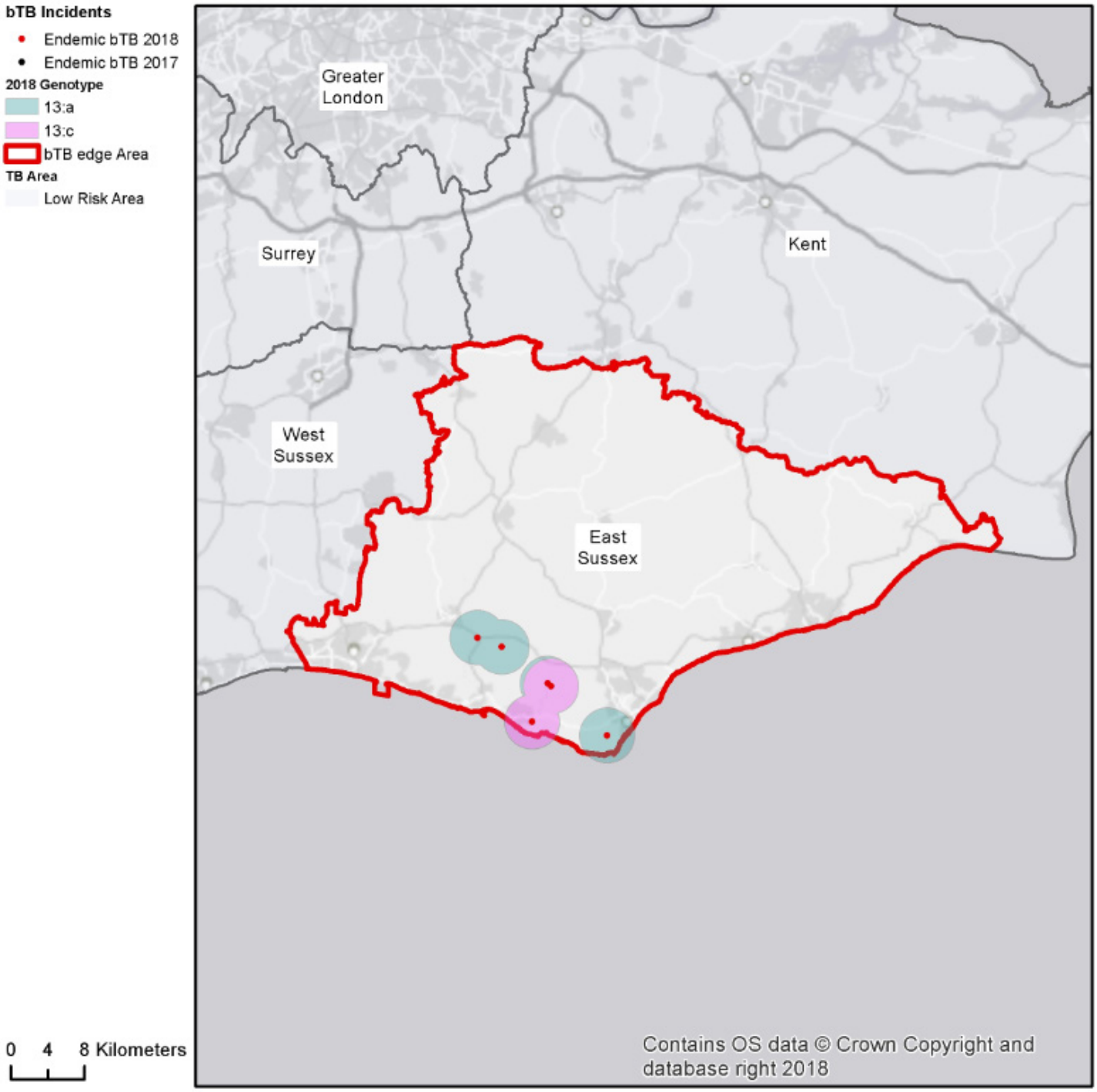


Figure 7: *M. bovis* genotypes detected in East Sussex, where a wildlife source was attributed with a 75% certainty or above, as an indication of endemicity within local wildlife populations (OTFW breakdowns only).

As can be seen from Figure 8, the breakdowns in the former HRA portion and therefore endemic area in the south of the county were mainly attributed to contact with wildlife. There were two breakdowns in the former HRA portion of the county attributed to local cattle spread. This is consistent with spread in an area where there is a high density of breakdowns and therefore there are more likely to be contiguous cattle already infected with *M. bovis*. There were no breakdowns in the original Edge area portion of the county attributed to local cattle spread. Movement of undetected infected cattle was attributed to two of the OTFW breakdowns in the original Edge Area of the county and one of these breakdowns was of a genotype that was out of its home-range. There is no culture nor genotype result available for the other breakdown. Movements of undetected infected cattle are thought to be the main driver of disease in the original Edge Area of East Sussex, although many of the OTFS and some OTFW breakdowns in the original Edge Area were of an undetermined source.

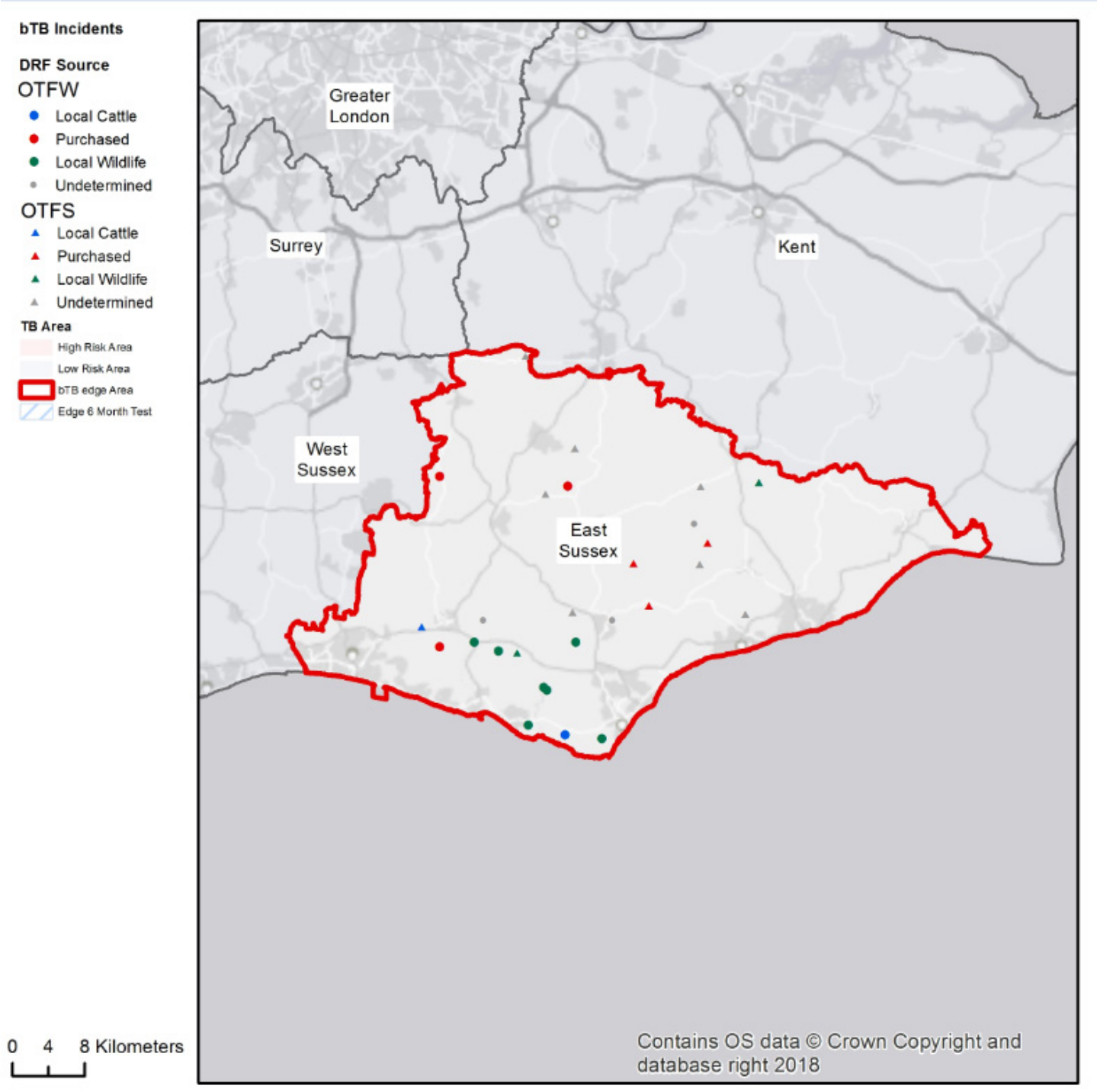


Figure 8: The source of infection recorded with the highest level of certainty,

for all TB breakdowns (OTFW and OTFS) that started in 2018.

Descriptive epidemiology of bovine TB in East Sussex

Characteristics of bovine TB in East Sussex

There appears to be some correlation between likelihood of experiencing a TB breakdown and herd type specifically dairy. Nine breakdowns were in each of the three herd types: dairy, beef suckler and beef fattener units (Figure 9), however there are far fewer dairy herds than beef herds. There were 68 herds with over 200 cattle and 20% of these had a TB breakdown in 2018 (14 breakdowns). There were 500 herds with fewer than 200 cattle and 0.6% of these had a TB breakdown in 2018 (13 breakdowns). This suggests that larger herds are more likely to have a breakdown.

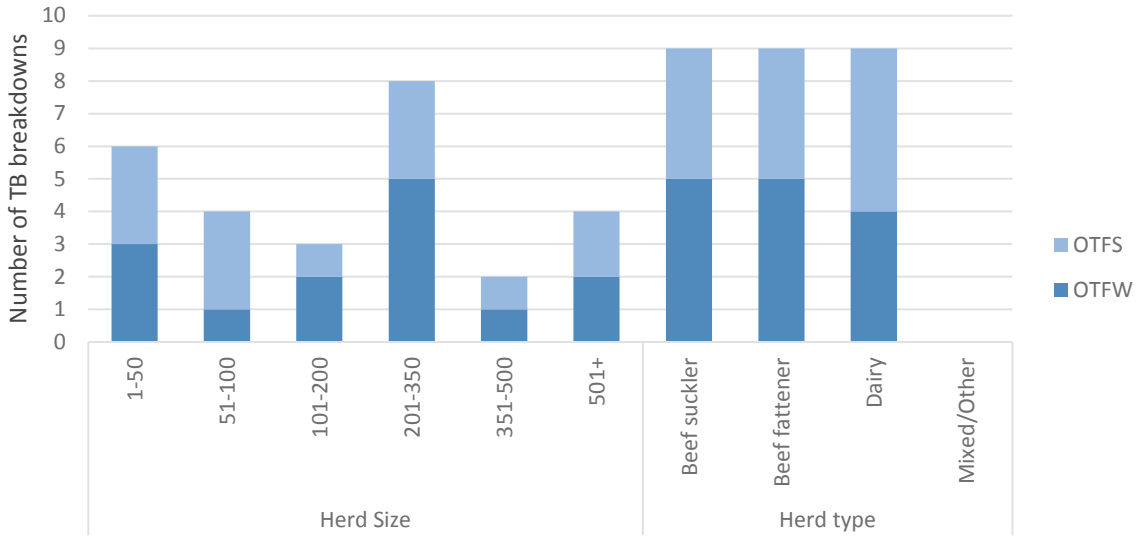


Figure 9: Number of new TB breakdowns (OTFW and OTFS) in East Sussex, by cattle herd size and type.

The number of new TB breakdowns disclosed per month appeared to have a seasonal variation with a large proportion occurring February to April, and late summer, as shown in Figure 10. Factors accounting for this include, as shown in Table 1, the monthly number of TB tests performed (fewer between May and August), the cattle housing period (cattle to cattle spread within the same airspace and sharing of water and feed troughs accounting for the February peak), and exposure at grazing (peak in September).

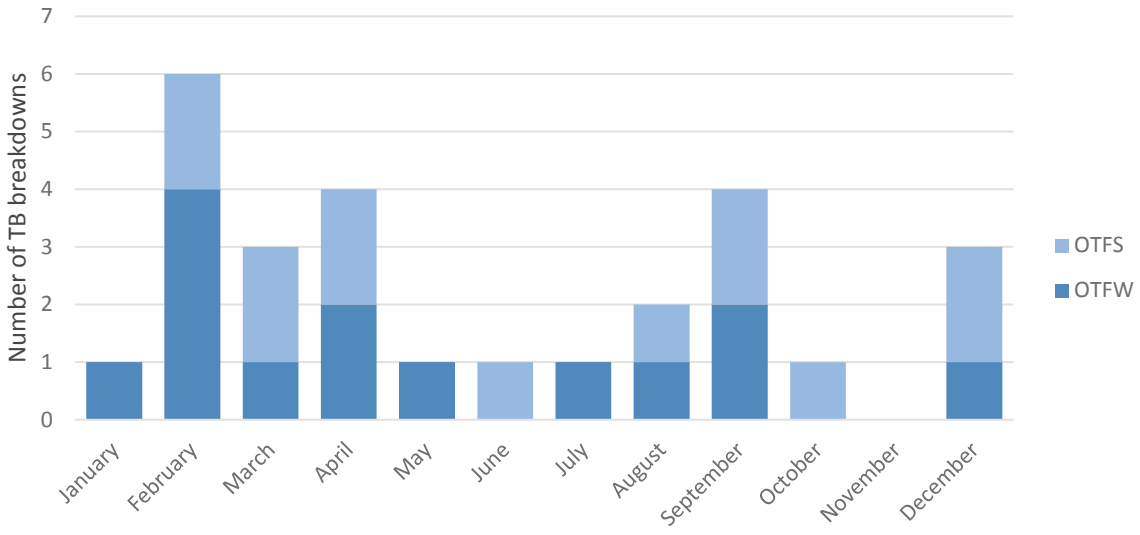


Figure 10: Number of new TB breakdowns (OTFW and OTFS) in East Sussex, by month of disclosure.

Category of TB Test	1	2	3	4	5	6	7	8	9	10	11	12
Gamma				515	735	1118	79	166	51	79	253	286
TB Skintest	8140	7151	7570	6861	4649	3511	5315	3337	7441	7916	6841	7078

Table 1: The number of TB tests performed in East Sussex by month in 2018.

The genotypes of OTFW breakdowns are dominated by genotype 13:a (and its mutation 13:c) as shown in Figure 11. The home-range for 13:a is within the former HRA portion of East Sussex and so it would be expected to be the dominant genotype. The other four genotypes detected (one of each) were all out of home-range genotypes.

The six breakdowns with genotype 13:a were all located within the former HRA portion of East Sussex and within the home-range of this genotype. Consequently, the possible risk pathways in all cases included exposure to infection by badgers, although many quoted other sources as possible risk pathways such as residual infection, contiguous spread and movement of cattle.

The two breakdowns with genotype 13:c were both located within the former HRA portion of East Sussex and within the home-range of 13:a. Genotype 13:c isolates are not found in any other areas of the UK. There have been four isolates of 13:c since 2014, from three different farms in East Sussex.

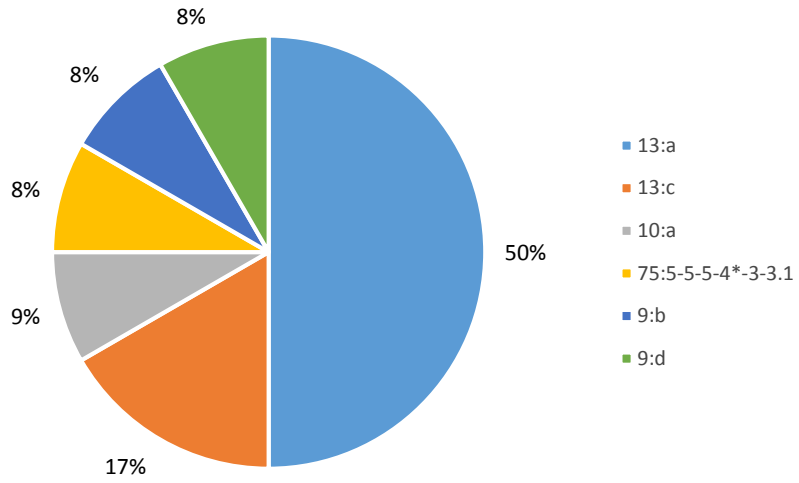


Figure 11: Genotypes of *M. bovis* (OTFW only) identified in East Sussex in 2018 (n=12).

The mean duration of breakdowns which resolved in East Sussex during 2018, as shown in Figure 12, was 214 days (7.1 months) for OTFW herds and 216 days (7.2 months) for OTFS herds. This is longer than in 2017 which was 6.5 months for OTFW herds and 4.3 months for OTFS herds in the former Edge Area. This may be partly explained by the 2018 figures now including the former HRA portion of East Sussex.

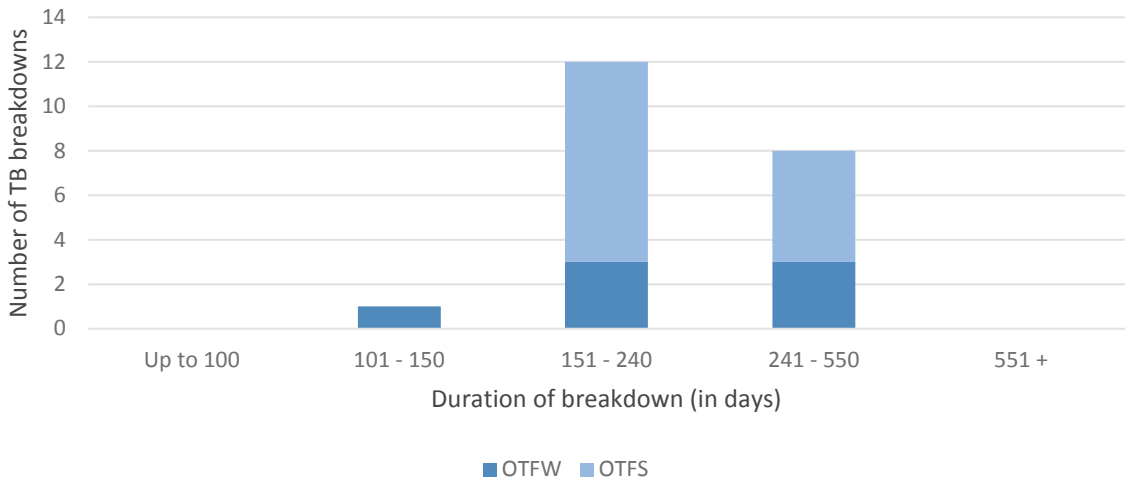


Figure 12: Duration of TB breakdowns (OTFW and OTFS) closed in East Sussex in 2018.

Risk pathways for TB infection in East Sussex:

Establishing the route of entry of infection into a herd experiencing a new TB incident can be challenging. The Animal and Plant Health Agency (APHA) aims to complete an epidemiological assessment of all TB incidents in the Edge Area (both OTFW and OTFS), including a thorough on-farm investigation. However where resource constraints exist, as many new incidents as possible are randomly selected or triaged for an investigation visit. Scrutiny of routinely collected data such as cattle movements and *M. bovis* genotypes (available for OTFW incidents only), combined with data from the on-farm investigation and knowledge of the local area epidemiological situation provides information which enables APHA case vets to assess and then rank the possible disease pathways.

A mathematical algorithm based on risk pathway data was used for the 2018 period to determine the relative contribution of different sources for each breakdown herd. However, this methodology also included those incidents where certainty about risk pathways was lower because of gaps in the epidemiological evidence. The effect of uncertainty has been increased by the inclusion of OTFS herds, where by definition, no genotype was determined. Therefore the relative proportions of each risk pathway are very approximate, and broad generalisations only can be made from these data.

A more detailed description of this methodology is provided in the Explanatory Supplement.

As shown in Figure 13, badgers accounted for 37% of incidents as the weighted source of infection. The majority were due to incidents detected in the former HRA and endemic area of the county as shown by the green dots and triangles in Figure 8. There was one OTFS breakdown in the north east of the county which was attributed to wildlife. However, the investigation for this breakdown suggested that wildlife was a possibility, together with a non-specific reaction due to Johne's disease (*Mycobacterium avium* subspecies *paratuberculosis*) being present in the cattle herd, and so the source of this infection was uncertain. There were no breakdowns where badgers were considered to be the definite source of infection because of lack of information. To increase the level of certainty, it would be necessary to have genetically identical isolates of *M. bovis* from badgers and cattle originating from the same area. As there is not currently routine surveillance of badgers (found dead badger survey) in this area, genetic identification is not possible (see Appendix 4).

Infection due to cattle movement or purchase accounted for 24% of incidents as the weighted source of infection. The majority were due to incidents in the original Edge Area or non-endemic area of the county as shown by the red dots and triangles in Figure 8. Two OTFW breakdowns were located in the original Edge Area. One of these breakdowns was on the border with West Sussex and the actual location of the reactors was on a farm in West Sussex although farming under an East Sussex CPH and so included in this report. This farm had a reactor with genotype 9:d and whole genome sequencing (WGS) has shown an identical isolate from a farm in Wales from where this animal was purchased. Another reactor, an Irish import, on the same farm on the East Sussex-West Sussex border, had genotype 75:5-5-5-5-4*-3-3.1 which WGS showed to be very closely related to another isolate on a different Welsh farm. There was no direct connection with this Welsh farm, but both the East Sussex farm and the Welsh farm import cattle from Republic of Ireland (ROI) suggesting a common source in ROI as a possibility. Infection due to the purchase of cattle from herds with undetected infection was considered to be a definite source in this case (see Appendix 4). The other OTFW breakdown in the original Edge Area whose source of infection was attributed to cattle movements does not have a culture result but cattle movements into the herd were thought to be the likely source of the infection, as this herd purchased cattle from a herd in Oxfordshire with a previous history of OTFW breakdowns. Cattle movements were considered as the most likely source of infection for a breakdown in the former HRA portion of the county where genotype 10:a was isolated. The other breakdowns attributed to cattle movements were OTFS breakdowns situated in the original Edge Area of the county (see Figure 8).

Contiguous spread accounted for 8% of incidents as the weighted source of infection. The majority were due to incidents in the former HRA (endemic) area of the county as shown by the blue dots and triangles on Figure 8. In only two incidents, this was considered to be the most likely source of the infection (see Appendix 4).

Other or undetermined sources accounted for 10% of incidents with most located in the original Edge (probable non-endemic) area of the county and were mainly OTFS breakdowns.

Residual infection, fomites and other wildlife account for the rest of the sources. None of these were considered the most likely source of infection but were just possibilities. It is difficult to be precise in OTFS breakdowns without a culture result and without evidence that TB is endemic in the area.

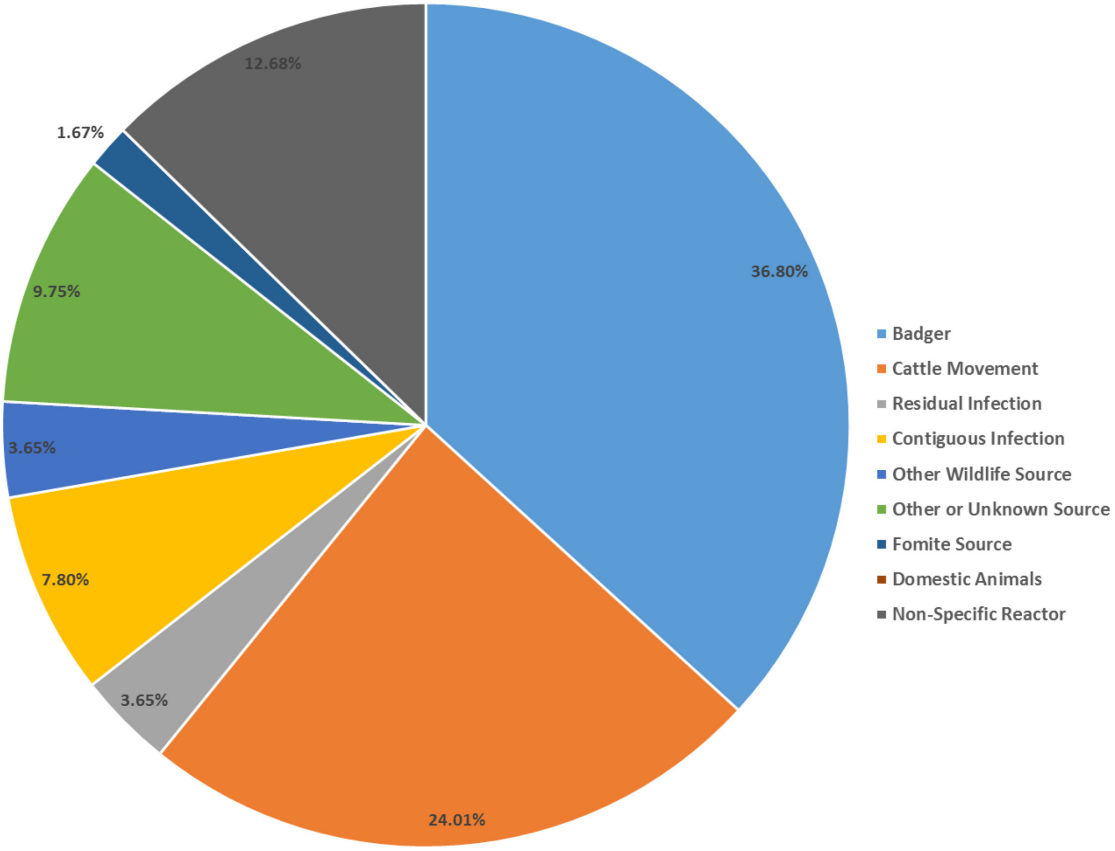


Figure 13: Summary of the weighted source of infection attributed for all incidents (both OTFW and OTFS) in East Sussex, which started in 2018.

Figure 14 illustrates that weighted source of infection is not affected by the type of herd. Wildlife was the most common source of infection in all types of herds although this data must be interpreted with caution as the numbers involved are very small. One incorrect source allocation can distort the figures by a large degree.

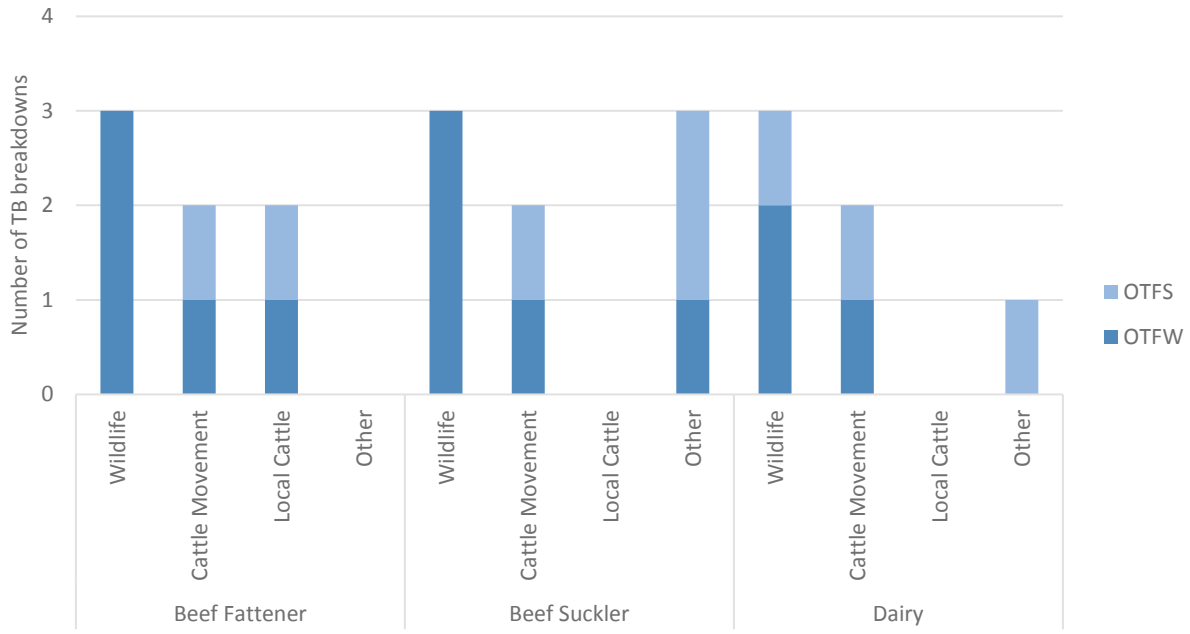


Figure 14: Source of infection recorded with the highest level of certainty for all TB breakdowns (both OTFW and OTFS) in East Sussex, by herd type.

Role of other species in East Sussex

Badgers and other wildlife

Figure 15 illustrates that genotype 13:a has been found in the badger population since 1989 and up until the latest badgers were typed in 2010. There is no recent data for badgers so it is not clear if the infection of 13:a in badgers is becoming more widespread. However, as the infection of cattle with 13:a and its mutations 13:c and 13:d generally remains confined to the south of the A27 (except for the occasional incursion which can usually be attributed to cattle movements) it appears that the endemic area for 13:a and its mutations remains stable. There was a 13:a isolate in a badger just north of the A27 and A26 junction in 2010 and there have been TB cattle breakdowns with 13:a in this area in recent years suggesting that the endemic area for 13:a has crept slightly north west. However, there does not appear to be definite evidence to suggest that the creep has progressed in the 2018 period. Historically, genotype 9:l has been found in cattle herds to the west of the River Ouse which appears to have acted as a barrier keeping the two endemic genotypes (13:a and 9:l) separate.

There has been one OTFW breakdown that has been attributed to badgers as the most likely source of infection situated north of the A27 but there is no culture result for this breakdown at the time of writing. Previous reports have suggested that the physical barriers of the A27 and railway to the north, and River Ouse to the west may have reduced spread of infected wildlife. Anecdotally, farmers with TB breakdowns in 2018 report few badger sightings in the original Edge Area of the county but report more badgers in the former HRA (endemic) area.

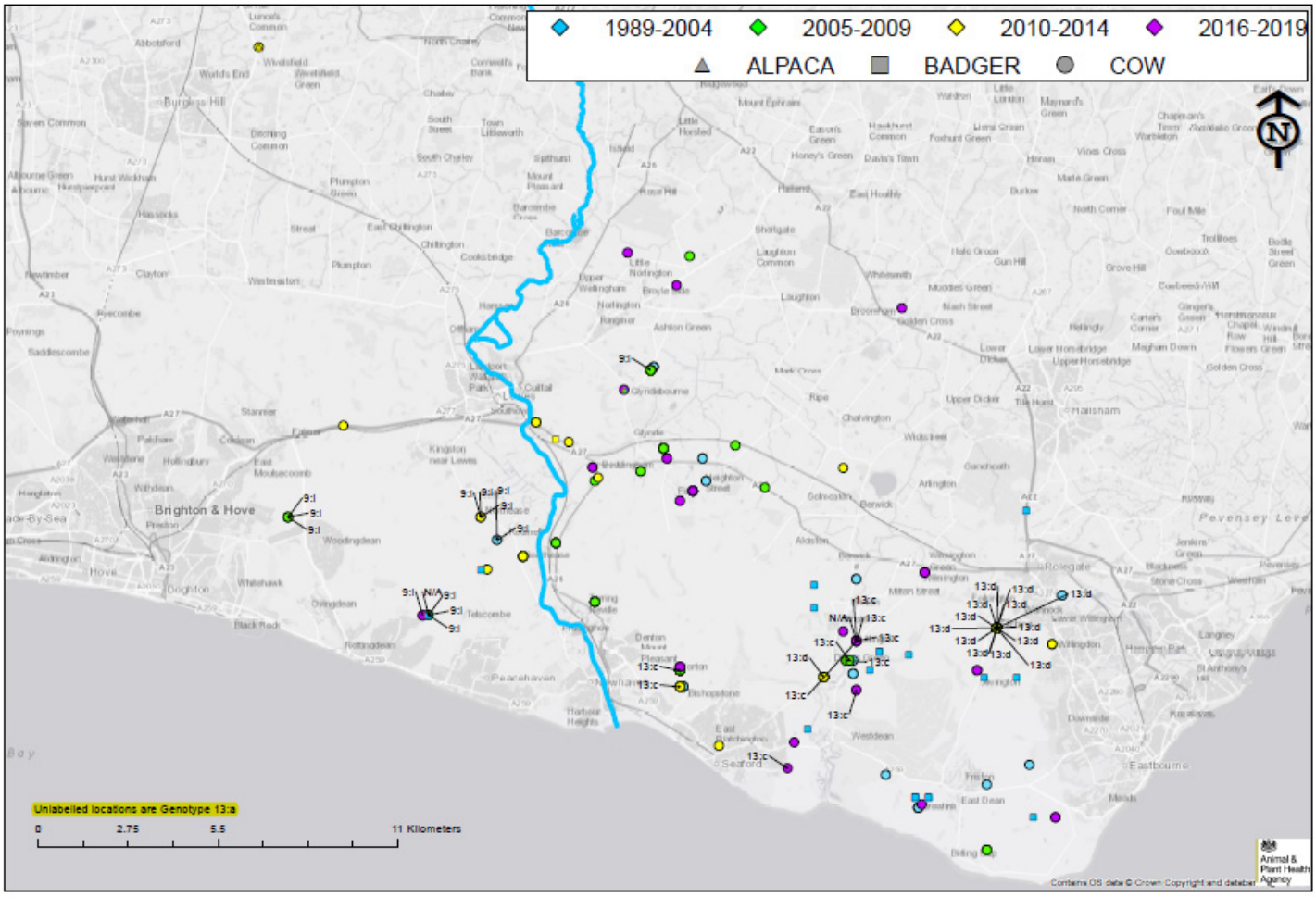


Figure 15: Endemic *M. bovis* Isolates in East Sussex found in cattle, badgers and alpacas from 1989 to 2019. Note that the unlabelled locations are genotype 13:a.

Badger vaccination may be a method by which TB could be controlled in the badger population in East Sussex especially as there were relatively few badger related cattle breakdowns.

There have been no *M. bovis* isolates found in wild deer in 2018 although anecdotally farmers report the presence of deer frequently in the area. It is not clear what role wild deer play in transmission of TB infection to cattle in East Sussex.

Other domestic species

There have been no isolates of *M. bovis* found in other domestic species in East Sussex in 2018. Isolates of genotype 13:a in alpacas were last found in 2012 on a farm situated north of the A27.

Detection of cases in East Sussex

With reference to Figures 16a and 16b, routine surveillance testing (WHT) disclosed most TB breakdowns in East Sussex in 2018. In comparison with 21 breakdowns disclosed by WHT in 2017, a smaller number (12) were disclosed by WHTs in 2018. However, radial testing of herds located within 3km of OTFW breakdowns was introduced in 2018 and disclosed eight breakdowns. Radial and WHT combined (20 tests) in 2018 accounted for a similar number of disclosing tests as WHTs (21 tests) in 2017. It is not clear if radial testing has increased the total number of TB breakdowns disclosed in 2018 because the breakdowns were likely to have been disclosed at the WHT. However radial tests will have disclosed disease earlier. Pre-movement tests accounted for three breakdowns in 2018 whereas no breakdowns were disclosed by this test type in 2017. A herd check test and a post-import test of cattle

from Northern Ireland/Republic of Ireland (PII) accounted for one breakdown each in 2018. This illustrates the importance of continuing with these types of tentyst to disclose TB infection at the earliest point and therefore minimise disease spread.

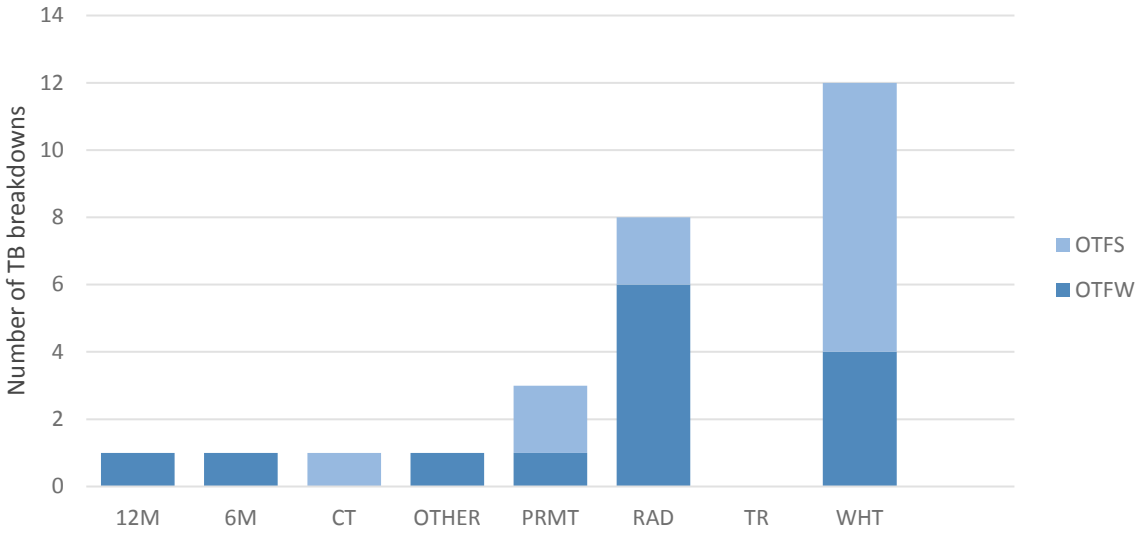


Figure 16a: Number of TB breakdowns (OTFW and OTFS) in East Sussex in 2018, disclosed by different surveillance methods (surveillance method types are further described in the Explantory Supplement[1]).

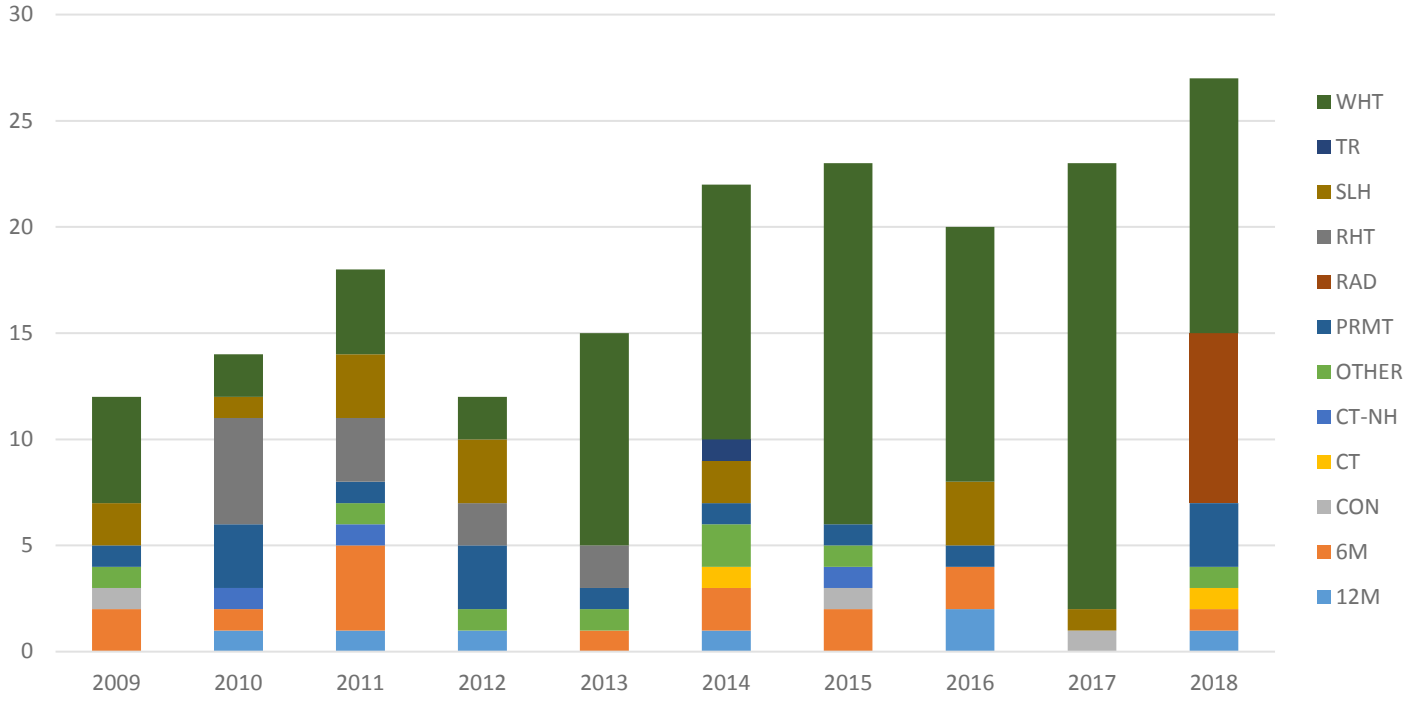


Figure 16b: Number of TB breakdowns (OTFW and OTFS) in East Sussex in 2009-2018, disclosed by different surveillance methods (surveillance method types are further described in the Explantory Supplement[1]).

As shown in Figure 17, one of the 13 OTFS breakdowns in 2018 had a history of TB breakdown in the previous three years compared to four of the 14 OTFW breakdowns. This could suggest that a recurrent breakdown may be more likely to be OTFW than OTFS. This could be due to factors such as i) OTFW

breakdowns being more likely to be in the endemic area of East Sussex and so more likely to be re-infected from wildlife and ii) certain farms may be more likely to repeatedly purchase infected cattle due to their stock replacement policy.

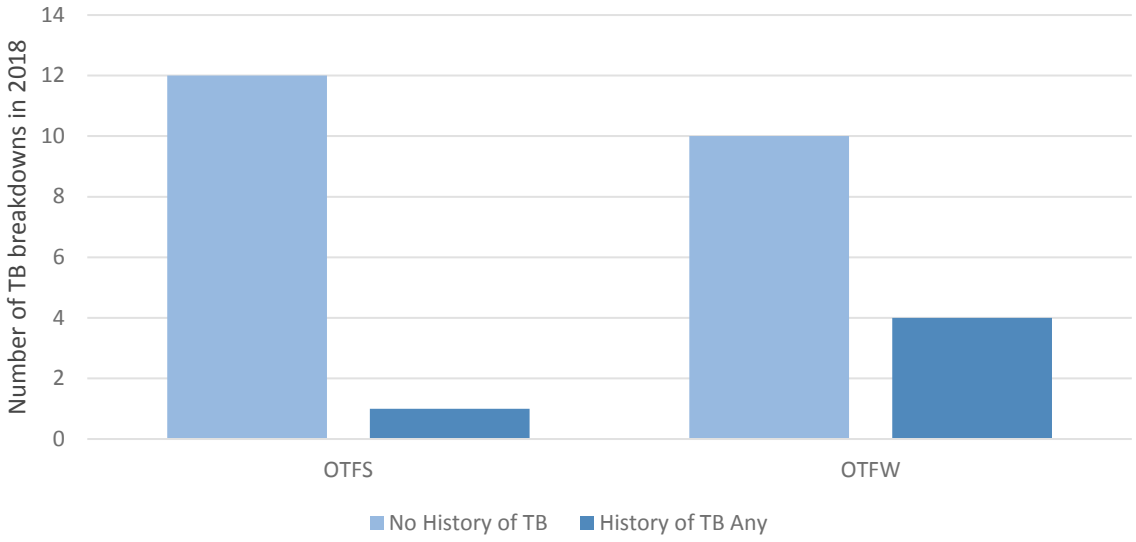


Figure 17: Number of TB breakdowns (OTFW and OTFS) in East Sussex which experienced a breakdown in the previous three years.

Burden of bovine TB

The number of reactors detected by interferon gamma testing has increased substantially in East Sussex in 2018 as shown in Figure 18. In 2018, 149 interferon gamma positive cattle were disclosed compared to only nine in 2017. This may be a result of the change in policy in 2018 to include the former HRA part of East Sussex in the Edge Area where mandatory interferon gamma testing applies to all OTFW breakdowns. Therefore the number of herds eligible for mandatory interferon gamma testing rose from three in 2017 to 14 in 2018. Similarly 146 skin test reactors were detected in 2018 compared to 78 in 2017.

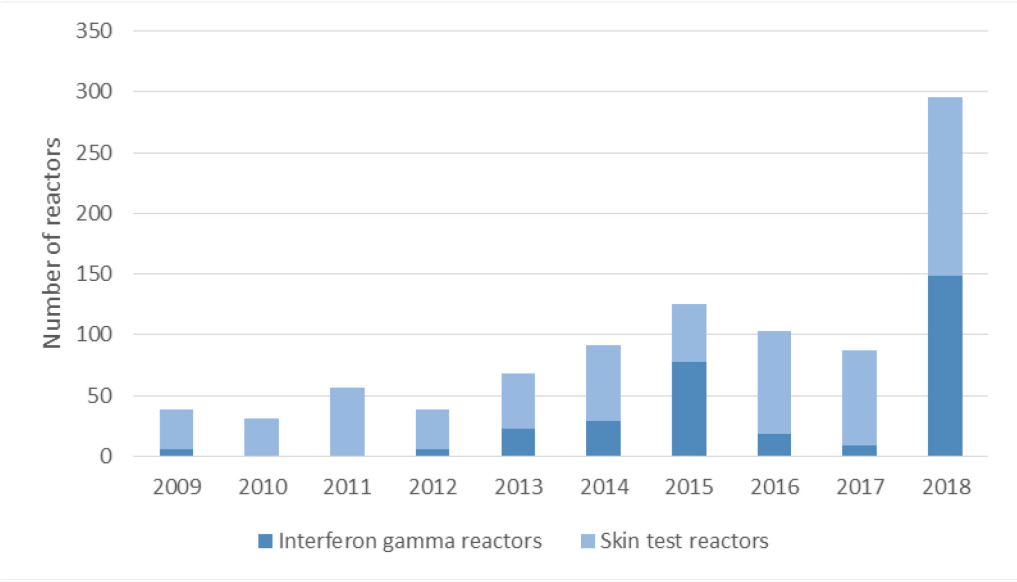


Figure 18: Number of reactors detected by interferon gamma and skin tests in East Sussex, from 2009 to 2018

The number of reactors (total of skin test and interferon gamma) disclosed per breakdown has increased from almost four in 2017 to 11 in 2018 but this data includes reactors disclosed in ongoing

breakdowns from previous years so the figures will be inflated. The number of reactors removed per 1000 animal tests (total of skin and interferon gamma tests) was 3.7 in 2018 compared to 1.4 in 2017.

Key drivers of the bovine TB epidemic

The number of TB breakdowns in East Sussex has increased in 2018 from 23 in 2017 to 27. This is not a huge increase considering the increased testing introduced in January 2018 in the form of radial testing around OTFW breakdowns.

There has only been one *M. bovis* isolate of genotype 13:a north of the A27 near Glyndebourne but this is still within the former HRA of East Sussex. There is very little evidence to suggest that the endemic area has expanded in the last 12 months.

No TB breakdowns were disclosed as a result of spread tracing tests.

Incidents in the former HRA portion of the county have increased, usually with a likelihood of wildlife attributed infection and genotype 13:a and 13:c breakdowns. There were eight in 2018, six in 2017 and five in 2016. Wildlife infection within the former HRA portion of the county therefore appears to be a potentially significant driver of disease.

There were four incidents with out of home-range TB isolates in 2018 compared to none in 2017, 2016 and 2015. Three of these four incidents could be attributed to cattle movements. Movements of undetected infected cattle are a potential driver of disease particularly in the original Edge Area of the county. The more local risk of cattle movements from the endemic area of East Sussex must also be reduced by adoption of informed purchasing and good biosecurity.

There was a relatively high proportion of breakdowns for which a source of infection could not be attributed (almost 10%) compared to other counties which range from 0% in Oxfordshire, Hampshire and Buckinghamshire to 7% in Nottinghamshire (see Figure 13 for the weighted figures). This is partly explained by the lack of genotype information, and small sample size where each breakdown has a larger impact on the percentage figures.

County summary

The endemic area of East Sussex remains relatively stable and there is little evidence to suggest that this area has expanded during 2018. The endemic area remains confined to the south of the county where there is a relatively low density of cattle. There are no recent data for TB prevalence in wildlife in the area. Therefore this report is reliant on cattle data as an indicator of the likelihood of the home-range genotypes of 13:a, 13:c and 13:d becoming more prevalent outside their home-range in herds where cattle movements are not considered to be a source of the incident. There were no cattle isolates of genotypes 13:a, 13:c and 13:d outside the former HRA portion of the county.

The TB incident rate in East Sussex has increased during 2018 and is at its highest since 2009. In addition the number of interferon gamma and skin test reactors detected and removed has substantially increased over the last year. One potential explanation for this is the policy change in 2018 resulting in the incorporation of the former HRA portion of the county into the Edge Area and therefore application of statutory interferon gamma testing to all OTFW breakdowns in East Sussex. In addition, in January 2018, radial testing became applicable to herds situated within 3km of an OTFW herd. This has increased the number of skin tests being completed in the county. There are relatively more TB incidents in large herds compared to small herds. There is a trend towards a decrease in the number of herds in East Sussex but an increase in herd size – this may have an effect of raising the number of TB incidents.

At present the raw data would suggest that the disease picture is deteriorating but it is not as simple as this due to the changes in interferon gamma and skin testing policies. The new measures are necessary to reduce the likelihood of infected cattle remaining undisclosed in the herd. It must be expected that the statistics will show an increase in reactor numbers and TB incidents in the short term in order to make disease control gains in the longer term.

Summary of the risk to the Low Risk Area (LRA) and any mitigating factors

East Sussex is unique in that it is surrounded by the LRA and so could pose a risk to the bordering counties of West Sussex, Surrey and Kent.

There have been three OTFW breakdowns in West Sussex in 2018, two of which were attributed to movements of undetected infected cattle and the other from contiguous spread.

There were no OTFW breakdowns in Surrey in 2018.

The risks to the LRA surrounding East Sussex do not appear to be related to movements of infected wildlife as the endemic area of genotypes 13:a, 13:c and 13:d remains stable. There have been no breakdowns in East Sussex in 2018 with genotype 9:l, so there is again no evidence to support that wildlife infected with this genotype are a threat to adjacent LRA.

The spread of disease from the endemic area towards the LRA border is also mitigated by the low cattle density in the area thereby reducing the chances of cattle to cattle interactions, and badger to cattle interactions.

Post-movement testing of cattle moved into the LRA from East Sussex also helps to mitigate against introduction of TB through movements of cattle.

Summary of the risk to the Edge Area from the HRA

There is no HRA adjacent to East Sussex now that the whole of East Sussex is part of the Edge Area.

There are risks from purchasing cattle from the HRA. Informed purchasing of cattle must be encouraged and biosecurity measures implemented at farm level to mitigate against these risks. Long distance movements of cattle will continue as there is a paucity of cattle available locally to supply the beef fattening units in the county.

Summary of the risk to East Sussex from the adjacent Edge Area counties

There are no adjacent Edge Area counties and risks of introduction are mitigated against in the form of informed purchasing of cattle and biosecurity measures.

Assessment of effectiveness of controls and forward look

Incidents of OTFS breakdowns across the original Edge part of the county were randomly distributed and many had no obvious source of infection. The clustering of TB incidents in the endemic part of the county suggests that the endemic area has continued to be a problem. However, the number of breakdowns has increased in 2018 and the number of reactors removed dramatically increased due to the introduction of mandatory interferon gamma testing in OTFW breakdowns in the former HRA portion of the Edge Area, and radial skin testing in the whole county. This increase was to be expected and it is hoped that, although there will be an increase in disease parameters in the short term, it will enable the long term goal of TB eradication to be achieved by removing more infected cattle at an earlier point in the TB breakdown and so reducing the likelihood of chronic breakdowns developing. However as the disease picture is on the increase it seems unlikely that this will be achieved by 2025.

Cattle measures alone will not eradicate bovine TB in East Sussex. The introduction of best practice on-farm biosecurity to minimise cattle to badger interactions, informed purchasing and the uptake of badger vaccination in the Edge Area is to be encouraged. The availability to farmers of free advice on prevention and management of TB in their herd from the TB Advisory Service (TBAS)[2] is also welcomed and to be encouraged.

[2] TB Advisory Service
http://www.tbas.org.uk/

APPENDICES

Appendix 1: Overview of risk and surveillance areas of England and Edge Area objectives and controls

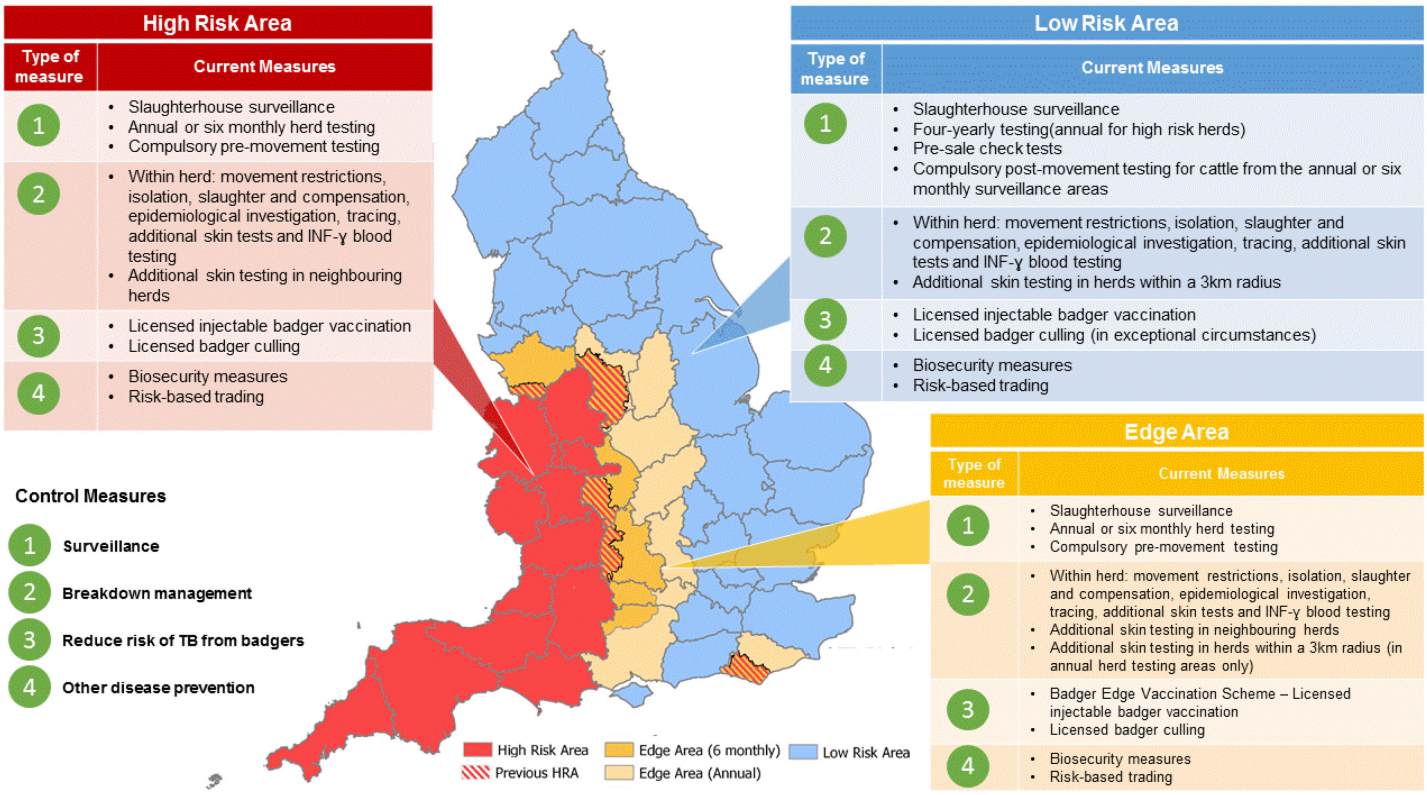


Figure A1: Bovine TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Tuberculosis-Free Status for England[3].

1.1 Policy objectives for the Edge Area:

Short to medium term:

- slow down geographic spread
- maintain crude herd incidence of OTFW breakdowns <2% overall by 2019
- begin to reduce the incidence rate

Longer term:

- reduce geographic spread of bTB and push the Edge Area boundaries westward
- reduce OTFW herd incidence to <1% by 2025
- attain OTF status (crude incidence of indigenous OTFW herd breakdowns <0.1%) for the lowest incidence counties in the Edge Area.

1.2 Key Control Measures

Surveillance:

- six monthly or annual routine herd testing
- additional targeted surveillance of cattle herds located within a 3km radius of new OTFW breakdowns in annual testing sections of the Edge Area (radial testing)

[3] http://www.tbhub.co.uk/wp-content/uploads/2017/09/infographic-TB-measures.pdf

- slaughterhouse surveillance

Management of cases (‘breakdowns’):

- increased sensitivity of breakdown herd testing:
  - all breakdown herds must pass two consecutive short interval skin tests at severe interpretation to regain OTF status, irrespective of post-mortem and bacteriological findings
  - mandatory IFN-gamma parallel testing of herds with OTFW breakdowns
  - enhanced management of herds with persistent breakdowns
- enhanced epidemiological investigation and data analysis
- information sharing - location of breakdown herds publicly available (via ibTB interactive mapping tool)[4]

TB controls in the wildlife reservoir (badgers):

- licensed badger culling in high incidence sections of the Edge Area
- government grants for licensed voluntary badger vaccination projects using injectable badger BCG (Badger Edge Vaccination Scheme - BEVS)

Other measures:

- compulsory pre-movement skin testing of cattle moved between herds
- promotion of herd biosecurity measures to reduce the risk of new breakdowns

[4] ibTB interactive mapping tool - https://ibtb.co.uk/

Appendix 2: Cattle industry in the Edge Area of the region

Number of cattle premises by size band in the Edge Area of the region at 1 January 2018

(RADAR data)

Cattle per premises	1-50	51-100	101-200	201-350	351-500	501+	All	Mean	Median
Number of premises	330	99	68	32	10	16	561	85.9073 1	35

Finishing units registered in East Sussex:

	Grazing	Non-grazing
Number of Approved Finishing Units (AFUs)	0	1
Number of Pre-movement Testing Exempt Finishing Units (EFUs)	0	1

The AFU had one slaughterhouse case in 2018.

The EFU is small and currently has no stock.

Common land in East Sussex: There are small areas of common land but there have been no TB incidents associated with cattle grazing this land in 2018.

Cattle/herd purpose:

Note that for the row entitled “Holdings”, this is the number of holdings where breeds of that type are present as recorded on the Cattle Tracing System (CTS) and does not represent, for example, the number of dairy farms.

	Beef		Dairy		Dual purpose		Unknown		Total
	Number	%	Number	%	Number	%	Number	%	Number
Cattle	31146	64.6	15630	32.4	1401	2.9	17	0.0	48194
Holdings	516		175		140		1		

Appendix 3: Summary of the East Sussex headline cattle TB statistics

Herd-level statistics	**2016**	**2017**	**2018**
Total number of cattle herds live on Sam at the end of the reporting period	649	635	609
Total number of herd tests carried out in the period	594	570	649
Total number of OTF cattle herds TB tested during the period for any reason	526	507	516
Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of TB02 restrictions)	626	606	578
Total number of cattle herds that were not under restrictions due to an ongoing TB breakdown at the end of the report period.	635	621	588
Total number of new TB breakdowns detected in cattle herds during the report period	20	23	27
OTF status suspended (OTFS)	15	13	13
OTF status withdrawn (OTFW)	5	10	14
Of the OTFW herd breakdowns:			
How many can be considered the result of movement, purchase or contact from/with an existing breakdown based on current evidence?	1	2	4
New OTFW breakdowns triggered by skin test reactors or 2xIRs at routine herd tests	0	3	4
New OTFW breakdowns triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, etc.)	0	0	4
New OTFW breakdowns first detected through routine slaughterhouse TB surveillance	0	1	0
Number of new breakdowns revealed by enhanced TB surveillance (radial testing) conducted around those OTFW herds (may not be applicable to every county in the Edge Area)			
OTFS	N/A	N/A	2
OTFW	N/A	N/A	6
Number of OTFW herds still open at the end of the period (including any ongoing OTFW breakdowns that began in a previous quarter)	5	5	12
New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0

Animal-level statistics (cattle)	**2016**	**2017**	**2018**
Total number of cattle tested in the period (animal tests)	62090	61896	79092
Reactors detected:			
tuberculin skin test	85	78	146
additional IFN-gamma blood test reactors (skin-test negative or IR animals)	18	9	149
Reactors per breakdown	5.2	3.8	10.9
Reactors per 1000 animal tests	1.7	1.4	3.7
Additional animals identified for slaughter for TB control reasons			
DCs, including any first-time IRs	0	13	0
Private slaughters	2	1	3
SLH cases (tuberculous carcases) reported by FSA	5	2	1
SLH cases confirmed by culture of *M. bovis*	5	2	1

Appendix 4: Suspected sources of M. bovis infection for all the new OTFW and OTFS breakdowns identified in the report period

Source of infection	Possible (1)	Likely (2)	Most likely (4)	Definite (8)	Weighted contribution
Badgers	7	5	9	0	36.8%
Cattle Movements	6	0	7	1	24.0%
Contiguous	3	1	2	0	7.8%
Residual Infection	5	0	0	0	3.7%
Domestic Animals	0	0	0	0	0.0%
Non-specific Reactor	6	1	1	0	12.7%
Fomites	2	0	0	0	1.7%
Other Wildlife	2	1	0	0	3.7%
Other or Unknown Source	3	0	1	0	9.8%

Appendix 5: Overview of the bovine TB Control Programme in East Sussex

Summary of TB control measures specific to East Sussex:

5.1 Edge Area Testing Policy

- Annual whole herd surveillance testing (no change from previous year).
- A new radial testing policy commenced on 1st January 2018. This provides additional targeted surveillance of cattle herds located within a 3km radius of new OTFW breakdowns.
- Mandatory interferon gamma testing is deployed in all OTFW breakdown herds in the Edge Area.
- No discretionary interferon gamma testing was employed in OTFS breakdowns in 2018.
- One farm situated in the former HRA portion of the county has a persistent OTFW breakdown with genotype 13:a that has been ongoing since December 2016. Twenty animals with visible lesions and 13 with non-visible lesions have been removed to date.

5.2 Unusual TB breakdowns

- One OTFW breakdown without a culture result situated just north of the A27 has been ongoing since January 2018. There have been 132 skin test and interferon gamma test reactors removed from the breakdown herd to date. The source is thought to be most likely due to infected badgers but without a culture result and genotype it is hard to be precise about this. There have been many cattle movements onto the farm in the last four years although none have been from farms with a history of TB infection within the last three years which reduces the likelihood of this as source but does not eliminate it.
- One OTFW breakdown was from a producer-retailer of unpasteurised (raw) milk. The breakdown was concluded after removal of 31 skin and interferon gamma test reactors.

5.3 Other Testing Measures

- Two herds have overdue TB skin tests in East Sussex which are being dealt with by APHA and the Local Authority. These incidences of overdue testing are of limited disease significance due to the small size of the herds involved.

5.4 Other Control Measures

- A local meeting with the National Farmers Union (NFU) and farmers was held in East Sussex to discuss TB issues, particularly the introduction of radial testing.