Sidmouth
ARBORETUM

HEDGES OF
THE SID VALLEY
2020

Hedges of the Sid Valley 2020

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With thanks to all the volunteer surveyors, and to Jon Ball, Diana East and Jan Metcalf for their help with editing this report.

Contents

"The hedges of Devonshire are proverbially large and rich. Sidmouth is closely surrounded with them like so many green and flowery zones. Elms, ashes, and oaks are interspersed in great numbers in almost every enclosure… In the vernal and autumnal parts of the year, the numerous lanes which intersect and divide this rich valley, are truly delightful. The country then seems a universal garden; the air is full of fragrance; and the eye is gratified, almost beyond conception, with an incalculable diversity of shrubs and flowers: the deep banks are literally covered with vegetable mosaic."

A Descriptive Sketch of the Beauties of Sidmouth, Edmund Butcher 1810

Introduction

In 2014 Sidmouth Arboretum undertook a survey of the valley's trees[1]. The survey revealed that, apart from nearly half a million trees, there are over 500Km (300 miles) of hedges currently enclosing farmers' fields in the Sid Valley, and they play an important role in the valley's appearance and ecosystems.

Although this is a small, self-contained valley, the diversity of form, structure and quality of our hedges is wide, possibly more so than in areas of intensive farming such as parts of North West Norfolk.

Apart from the loss of the large Elm trees to Dutch Elm Disease, the landscape described by Edmund Butcher is still recognisable 200 years later. It is a landscape of small fields, now used mainly for grazing, surrounded by hedges with many standard trees. The history of the valley's hedges is dealt with in a separate Arboretum document, Hedgerows 2020 Historical Changes (Appendix 5), but this report is based on the survey of the present condition of the valley's hedges.

Summary of Aims

The Hedge Survey had four main aims:

1) Establish the diversity of woody species in the hedgerows
2) Establish the scale of standard trees in our hedgerows
3) Establish the floral diversity in our hedgerows.
4) Estimate the age of hedges

Using a computerised geographical information system, Arboretum chairman Jon Ball made a random selection of 100 fields across the valley, and then selected one side of each field to be surveyed.

Thank you to the volunteers who have been out estimating the dimensions of the hedges, their state of maintenance, the presence of standard trees and the maximum size of those trees, the variety of woody species in the hedge, and the range of herbaceous plants associated with the hedges. In Devon, the term hedge often refers to a bank planted with shrubs and trees and many of the hedges in our survey fitted that description, but some did not include the bank.

The volunteers managed to survey 83 of the hedges. The diversity of results suggests that this sample gives a representative picture of the current state of the whole valley and is a basis for a list of action points that need to be addressed if future generations are going to enjoy the same level of amenity provided by our wonderful hedgescape.

Summary Data (See Appendix 1 for more details)

83 hedges were surveyed with a total length of 12.69km, 2.5% of the valley's estimated 500km of agricultural hedge.

Hedges ranged from 30-450m in length.

The shrub layer of hedges ranged in height from absent to 5m tall with a mean average of 1.8m and a modal average of 2m.

The shrub layer ranged in depth from absent to some untended hedges spreading to 15m, the mean average is just over 2m and the modal average is 2m.

45 (54%) of the 83 hedges were recently maintained and tidy, the total length of tidy hedges is 7.4Km which is 58% of the sample.

41 of the tidy hedges were maintained by tractor mounted flail, 4 were maintained by recent laying.

21 (25%) of the hedges had been neglected for so long they had lapsed and consisted almost exclusively of trees with varying lengths of space between them and little or no shrub storey, these are termed relict hedges.

31% of the hedges were roadside, 17% were beside a track or unmade road, 52% were solely field boundaries.

69% of the hedges were planted on a bank.

The number of woody species in a single hedge ranged from 2-13 with an average (mean, median and modal) of 8 species, 41 different woody species were recorded (Appendix 2).

A total of 780 standard trees was recorded, this extrapolates to just over 31,000 hedgerow standards across the valley.

The most common species of standard were Ash (158), Oak (142), Beech (145) and Sycamore (69), together comprising 66% of all standards. 87 (60%) of the Beech standards were concentrated in just three relict hedges, and 36 (56%) of the Sycamore were in a single, relict hedge. Appendix 2 includes the woody species that occurred as standard trees.

33 (41%) of the hedges were considered to have a rich diversity of herbaceous species in their ground storey, while 20 (24%) were considered to have poor herbaceous diversity. More than 140 herbaceous species were recorded (Appendix 3).

Woody Species Diversity

The valley's hedgerows play an important part in the biodiversity of the valley. Apart from the diversity of plant species, they are a source of food and shelter to a large number of animal species. As importantly, they act as green corridors to allow the interconnection of animal populations to maintain genetic diversity. The wider the diversity of woody species, the greater contribution a hedge is able to make to the valley's biodiversity.

The principal determinant of how many woody species you find in a hedge is time, the longer a hedge has been in place, the greater the woody species diversity you are likely to find. This idea is based on the work of Max Hooper, there is more on Hooper's Rule in the section on hedgerow age below.

It is known from the evidence of old maps and enclosure records that many of the hedges on the upland plateau around the valley are about 150 years old while those on the valley floor and the lower slopes are more than 240 years old. The plateau hedges are mainly Beech and contain few other species, woody or herbaceous, except where they border an old road or woodland. Nearly all of the ten hedges with the largest number of woody species are in parts of the valley that are believed to have been farmed for more than 600 years.

The fields on the north side of Sid Road from Fortescue to Sidford, although known to be at least two hundred years old, appear to have been replanted more recently and are made up of Elm mainly with very few mature trees.

There is a wide variety in field size across the valley and the survey hedges ranged from 30-450m. It is usual to find that the fields taken into agriculture by early humans as they settled Devon, and hence the sites of the oldest hedges, were small enclosures of about an acre (0.4 ha). Comparatively recent agricultural developments have led to larger fields, mainly by removing hedges to amalgamate small fields, or enclosing open land.

In the survey, the longest hedges, alongside the larger fields, tended to have slightly more woody species than the shortest hedges, but that is not a surprise. However, the data ranges for short, medium, and long hedges overlapped considerably. Some of the longest hedges had below average diversity and some of the shortest hedges had good diversity. If you standardise the comparison by calculating species per 100m of hedge, the smallest fields had much higher diversity. The shortest hedges had a mean of 10.0 woody species per 100m, middle length hedges had a mean of 5.3 woody species per 100m, and the longest hedges had a mean of only 3.4 woody species per 100m.

69% of the hedges are traditional Devon Hedges in that they are planted on a bank, sometimes just earth, others supported by stone cladding. This includes some of the hedges that have clearly been replanted comparatively recently. There is no correlation between number of woody species and whether or not a hedge is banked, there are almost equal numbers of hedges above and below the median of 8 species for banked and unbanked hedges.

45 (54%) of the hedges are maintained regularly, but 21 (25%) of the survey hedges are relict, they have been neglected for decades and have grown into lines of trees rather than a hedge. Some of the relict hedges were once maintained by the traditional practice of hedge laying where upright growth is half cut through, laid down, and branches are woven together to form a stock proof barrier. A small number of the well-maintained hedges show evidence of having been laid comparatively recently, but the majority of the tidy hedges are maintained by tractor mounted flail.

There is a negative correlation between a hedge being left untended and relict and having a wide range of woody species. In the tidy hedges, there is an even spread of woody diversity above and below the mean. In the untidy and relict hedges, there are three times as many below the median for woody diversity as above. Some of the relict hedges are on the upland plateau and so are

species poor because they are comparatively young, but this does not fully explain the wide discrepancy with the managed hedges.

There is a positive correlation between being sited next to a road and the hedge having multiple species of woody plant. Of the roadside hedges, twice as many were above the median of 8 woody species as below. Of the field hedges not beside a road, four times as many were below the median as above. This may be the product of age and maintenance. In areas still being farmed, local roads tended to develop at the same time as the early fields, and modern landowners are obliged to keep roadside hedges under some measure of control.

Apart from the number, the variety of woody species within particular hedges changes across the valley. Many areas have a predominant mix of mainly Hazel, Hawthorn and Blackthorn with other species interspersed. In other areas the hedges are mainly of Elm or of Beech. Some of the longer hedges in the larger fields are in distinct sections, perhaps a stretch of Field Maple and then a stretch of Hawthorn or Blackthorn. In some cases, this is linked to previous field patterns shown on old maps. The distinct stretches used to be the border to separate fields that are now amalgamated. In other cases, a farmer might have revitalised a neglected hedge with a new planting where the old hedge had failed, but they have used a different species.

Standard Trees

One of the main aims of the study was to establish the condition of standard trees, that is trees allowed to grow to maturity spreading their canopies above the hedge. Standard trees are very important in the appearance of the valley and to wildlife. Our standards are part of a group known as Trees Out of Woods (TOWs). According to the Woodland Trust, TOWs *have ecologic impacts far beyond the proportion of land they occupy, by increasing the permeability and habitat value of the whole landscape.*[2]

If you discount the conifer plantations from the 2014 survey of the valley's trees, there are probably about 200,000 broadleaf trees in the valley. The hedgerow survey suggests there are about 38,000 standard trees in our hedgerows, 19% of the total mature trees.

Often, these standards are pollards, trees cut off at the height reached by a man with an axe to keep the new growth out of reach of browsing livestock. This used to be common practice because the wide spreading crowns provided shelter for livestock, and repeated pollarding, like coppicing, provided valuable timber for craft and woodfuel. Pollarded trees tend to shelter more wildlife than unmanaged standards because their crowns have a wider range of environmental niches.

Modern maintenance tends to be by tractor mounted flail and there isn't the labour available to maintain and develop standard trees. There is evidence that, when hedges and standards were maintained by manual labour, there would have been as many as 100,000 standards in the valley's hedges. Now, the majority of the standard trees still standing are the mature trees left by previous generations, and these trees are coming to the end of their lives, particularly the Ashes, but more on that later.

Our valley's hedges still have a rich stock of mature standards, but they are not distributed evenly. Sixty percent of the survey hedge length was tidy, most of it maintained by tractor borne flail, but this length of hedge held only 20% of the standards and 34% of the young trees that could be grown on to new standards. If the management was changed and these young trees were allowed to grow, they still would not fully replace the old standards. Many of the young trees are Hazel and Goat Willow coppice which will not grow into good standard trees. Young Elm and Ash are likely to succumb to disease before they can grow into standards. Of the Oaks, Beeches and other species that could make standards, they are unlikely to be pollarded. The first pollard cut could be managed with a tractor mounted saw or flail, but that would not be possible on subsequent cuts as the more substantial branches developed.

Roadside hedges hold fewer standards per 100m than other, similarly maintained, hedges, but there is no deficit in the number of young trees. Possibly this is down to risk averse councils who do not want large branches hanging over the highway and large roadside trees are more likely to be removed than those away from the roads. The hedges beside tracks and unmetalled roads held more standards and young trees than average.

The presence or absence of a bank does not appear to have an influence on the frequency of standard or young trees. The 68% of hedges planted on a bank held 71% of the standards and 66% of the young trees.

Ash Dieback

At 20% of the total, Ash is the most common standard tree in our hedgerows, they represent 29% if you ignore the relict hedges with their concentrated lines of Beech and Sycamore. The 2014 Tree Survey had Ash as the dominant deciduous tree in the valley. Ash trees are 10.7% of the tree population and provide 18% of the total leaf area. Their importance is even more significant because they support much more of our local biodiversity than the Larch and Douglas Fir which are the most numerous trees. To lose our Ash trees will be as devastating to the landscape and ecology of the valley as Dutch Elm Disease was several decades ago across southern England.

Ash Dieback is a fungal disease that spread from Asia where the native Ash species have evolved resistance to its effects, our trees do not enjoy that resistance. The fungus invades and blocks the water and nutrient transport systems of the tree and eventually the tree dies. As was said, Ash is the dominant broadleaf tree in the valley and, as a native tree, it supports a wide range of other species. The loss of most of our mature Ash trees and the loss of young trees to succeed the old trees will not only affect the landscape, but the valley's invertebrate biodiversity with a knock-on effect on vertebrates, particularly birds.

The stark numbers are that of the 83 sites surveyed, 45 (54%) have Ash trees and a further 25 (30%) have Ash in the shrub layer. Of the 70 sites with Ash present, 57 (69%) have recorded signs of Ash Dieback at the time of survey. Ash Dieback symptoms are not easy to spot until midsummer if the infection is at an early stage. It is likely that some of the hedges that were surveyed early in the project, and not revisited at a later date, also have infected trees that were asymptomatic at the time of survey.

It is not possible to stop Ash Die Back; you cannot inoculate nearly eight thousand trees, forty thousand if you include the trees in woodland, even if there was a tree antibiotic. It is possible that some trees will show resistance and survive to breed new stock, but that will be a long-term process that I will not see. The outlook for the next few years is not promising. There is more information about Ash Dieback in Appendix 4 to this report.

Herbaceous Diversity

The valley's hedgerows have a wide diversity of herbaceous plants growing in their ground storey. Where hedges are associated with a rich variety of herbaceous species this provides a good base for a food chain that will support many types of invertebrates, and small vertebrates, particularly birds and small mammals. More than 140 herbaceous species were recorded during the survey, but this will be an under-reporting. Each hedge was visited only once, this means late species such as Broomrapes (*Orobanche sp.*) will not be showing during an early season visit, and early species such as Coltsfoot (*Tussilago farfara*) have died back by the time of a late visit. Both of these species are present in the valley, but not recorded in this survey. A more comprehensive herbaceous survey will be undertaken as part of the Sid Vale Biodiversity Project.

The collected data shows there is a strong correlation between the diversity of woody and herbaceous species in our hedgerows. Of the 37 hedges above the median of 8 woody species, 25 (68%) of them are rated good for herbaceous diversity, 11 (30%) medium, and only 1 was rated as

poor. Of the 35 hedges below the median of 8 woody species, only 6 (17%) are rated as good for herbaceous diversity, 13 (37%) medium, and 16 (46%) are rated as poor.

This is an association rather than a cause and effect, if you add a variety of woody species to an existing hedge, you will not develop a rich herbaceous understorey immediately. Herbaceous diversity is more likely to be affected by geology, topography, and hedge management.

A future survey will try to establish the links between the range of herbaceous plants and the geology and topography of the valley. The current survey shows there is a positive correlation between tidy hedge management and herbaceous diversity.

Of the 44 hedges rated tidy, 23 (52%) had good herbaceous diversity, 16 (36%) were medium, and 5 (11%) poor. The tidy hedges are 53% of the total but represented 70% of the hedges rated as good for diversity, 53% of the hedges rated medium, but only 25% of the those rated as poor.

11 of the hedges were maintained but untidy, 7 (64%) were good and 4 (36%) were poor for herbaceous diversity. The untidy hedges were 13% of the total but represented 21% of the good hedges and 20% of the poor hedges.

The relict hedges are 25% of the total but represented only 6% of the hedges rated as good for herbaceous diversity and 45% of the hedges rated as poor. These hedges have the poorest diversity of woody species, this is a major factor in the correlation between diversity of woody and herbaceous species.

Roadside hedges tend to have better herbaceous diversity than field hedges. Of the 26 hedges beside a road, 61% had good herbaceous diversity and only 8% poor. The roadside hedges are 31% of the total but represented 48% of the good hedges and only 10% of the hedges with poor diversity.

Of the 43 hedges bounding fields but not a road or track, only 26% had good herbaceous diversity and 30% were poor. The field hedges are 52% of the total but they represented only 33% of the good hedges, and 65% of the hedges with poor diversity.

Perhaps surprisingly, banked hedges are no more likely to have good herbaceous diversity than unbanked hedges, any potential advantage may be overridden by effects of management.

Unlike the association between diversity of woody and herbaceous species, the link with management is more likely to be a case of cause and effect. Several of the field hedges appear to suffer if the field is cultivated right up to the base of the hedge, while field and roadside hedges with a clear verge that is maintained but not cultivated have a rich herbaceous diversity.

Again, the relict hedges skew the data. Most of the relict hedges can be divided into two scenarios. Some have stretches of bare ground between the many standard trees and the lack of light and water makes this a challenging environment for herbaceous species, particularly climbing and scrambling species such as Cleavers and Black Bryony. Other relict hedges have substantial growths of brambles and bracken and this swamps other herbaceous species.

Dating Hedges

According to Sidmouth Arboretum's separate report on the historical changes (Appendix 5), some of our hedges are clearly very old, some have been planted comparatively recently. Evidence from a range of sources indicates that many of the hedge boundaries in the valley floor were established several centuries ago and may date back to prehistoric times, many of the fields on the slopes at the side of the valley were established between the 12th and 15th centuries, and the fields on the upland heath areas were enclosed in the 19th century.

One widely used method of dating hedges is Hooper's Rule. It is true generally that older hedges have a wider range of woody species in their length. In the 1960s, ecologist and historian Max Hooper used a wealth of observations and archive evidence to propose a method of dating hedges which became known as Hooper's Rule. Dating a hedge is not a precise science and, with modern

farming trends, it is becoming less reliable, but Hooper's Rule is still a useful guide. The rule states that the number of woody species in a 30 yards length of hedge multiplied by 110 gives you the age of the hedge site in centuries. The explanation is that, although hedges are usually planted as a single species, a Hawthorn or a Field Maple hedge for example, other species are introduced by natural processes of seed dispersal as time passes.

Saying that a hedge is 500 years old does not mean that is the age of the trees and shrubs currently making up the hedge, although this might be true for the occasional ancient Oak standard. It means there has been a field boundary on this site for that length of time with a succession of trees and shrubs. Hedge 611N in our survey has 13 woody species in its length. If you took any 30 yard section, it contains at least 9 of these and so, x110, the rule suggests there has been a hedge on that site for about 1,000 years, but the oldest tree in the hedge is an Ash that is about 200 years old.

Modern hedge planting often includes multiple species as a deliberate choice. Sidmouth Arboretum has planted three hedges in the last year, each of which was a mixture of five species. If the hedge was surveyed five years from now by someone who did not know the history, and they simply applied Hooper's Rule, they would conclude the hedge had been in place for 550 years. In the case of 611N, there is other evidence that backs up the conclusion about the age of the hedge, but that is covered in the Historical Changes report.

Hooper's Rule may have some problems, but it is certainly true that ancient hedge sites, as with ancient forests, tend to have more woody species than younger hedge sites and this diversity is considered a good thing from an environmental point of view.

Conclusion

The overall picture of the valley's hedgerows is mixed but not very positive. The survey has recorded many examples of well maintained hedges with a diverse range of woody species and space around them managed for herbaceous diversity and these make a huge contribution to the valley's biodiversity as well as its visual appeal. However, the valley has approximately 500km of agricultural hedgerow, but half of them are poorly maintained or relict and only 40% support a good diversity of herbaceous plants.

The hedges have been in decline for many decades. The report on historical changes shows that urban development and changes in farming practice have led to the loss of more than 30% of the hedges recorded on the 1839 Tithe Maps. A quarter of the existing hedges have been neglected for so long that they are now relict and are unlikely to be included as hedges if the survey is repeated in ten years. The loss of standard trees has been even more dramatic. It is likely that the current number of hedgerow standards is only one third of the number you would have seen 200 years ago, and the quality of the remaining trees is also poorer with many in the later stages of their life cycle or threatened by disease.

There are clouds on the future horizon that offer further threats to our trees and hedges. The long-term threat to the hedges themselves from climate change is unquantified, but there are serious concerns about the extra impact of climate change on our already declining standard trees which are a key part of the visual and wildlife value of the hedges. Away from the upland areas, Ash and Oak standards are the two main species. Many of the standards are succumbing to age and there is a potential threat to the Oaks from a disease called Sudden Oak Death, but that threat to our valley's appearance and biodiversity is much lower than Ash Die Back.

Two positive points are that we have major landowners with a stated policy of supporting the biodiversity of the valley, and the formation of an alliance of community groups that will be able to work with those landowners supplying information and a stimulus to improve the situation. Steps are being taken to set up co-ordinated projects aimed at spreading ideas of good practice.

The first possible action point is to work with farmers to promote the idea of leaving more of the young trees in the regularly maintained hedges to grow as standards. This will involve the farmers in extra work and a good cost benefit analysis would have to be made. There will also be the possibility of changing the timing of the whole programme of flailing because there is evidence from the Centre for Ecology and Hydrology[3] that relaxing the cutting regimes increases the value of hedges for wildlife at the same time as saving the farmers money and effort.

References

1 Sidmouth Arboretum Tree Survey 2014
http://sidmoutharboretum.org.uk/documents/tree_survey_report_v6.pdf

2 Trees Outside Woods https://www.woodlandtrust.org.uk/media/1821/trees-outside-woods-ecological-value.pdf

3 Increasing the value of hedges for wildlife, The Centre for Ecology and Hydrology, https://www.ceh.ac.uk/sites/default/files/HedgerowManagementResearchProject_SummaryLeaflet_June15.pdf

Further reading about Hedges and Hedgerows

Hedgelink UK http://www.hedgelink.org.uk/index.php?page=16

Devon Hedge Group http://www.devon.gov.uk/devon_hedges

Blackdown Hills Hedge Association http://bhha.info/

Natural England http://www.cfeonline.org.uk/hedge-trees/

Appendix 1 Data Correlations

1. 83 of the 100 selected hedges have been surveyed to date.
2. Total length surveyed 12.69km, which is 2.5% of the valley's total of approximately 500km.
3. Field sizes vary enormously across the valley and the selected hedges range from 30-450m.
4. The shrub layer of hedges ranged in height from absent to 5m tall with a mean average of 1.8m and a modal average of 2m.
5. The shrub layer ranged in depth from absent to some untended hedges spreading to 15m, the mean average is just over 2m and the modal average is 2m.
6. 45 of the 83 hedges were considered tidy which is 54% of the sample surveyed so far, the total length of tidy hedges is 7.4Km which is 58% of the sample surveyed so far, this is approximated to 60% for analysis below.
7. 41 of the tidy hedges are maintained by tractor mounted flail, 4 maintained by recent laying.
8. 21 (25%) of the hedges had been neglected so long they had lapsed and consisted almost exclusively of trees with varying lengths of empty space between them.
9. 31% of the hedges are roadside, 17% are beside a track or unmade road, 52% are solely field boundaries.
10. 69% of the hedges are planted on a bank.
11. A total of 780 standard trees (5m or taller) was recorded, this extrapolates to just over 31,000 standard trees in the hedges of the valley.
    a. The mean average is 7 standards per 100m of hedge, but that reduces to 4 per 100m if you remove the relict hedges that have grown as lines of mainly Beech trees.
    b. 33 hedges have fewer than 2 standards per 100m.
    c. 19 hedges have no standard trees, they total 2.8Km, 22% of the sample which extrapolates to 112Km of treeless hedge in the valley.
12. The most frequent standards are
    a. Ash 158 specimens (extrapolating to 6,300 across the valley), the tallest 25m, one specimen with a girth of 600cm, a registered ancient tree in Byes Lane estimated to be 450 years old and another nearly 400 years old.
    b. English Oak 142 specimens (extrapolating to 5,700 across the valley), the tallest 30m, two trees had a girth of 470cm equating to an age of 270-300 years.
    c. Beech 145 specimens but nearly 100 of these are concentrated in three relict hedges on the upland plateau, the tallest 25m, maximum girth 250cm equating to an age of 100 years
    d. Sycamore 69 specimens but half of these were in a single relict hedge, the tallest 18m, maximum girth 250cm equating to an age of 70 years, but most were only 30 years old.
13. A total of 393 possible future standard trees (small trees up to 5m that could be left to grow into a standard) was recorded, this extrapolates to a potential 15,700 future standard trees in the hedges of the valley.
    a. Of the species capable of growing to a large tree, the breakdown is: Ash 40, Beech 27, English Oak 29, Field Maple 34, Sycamore 24.

b. The remainder were mainly Hazel and Willow coppice that had been left to grow out.

14. The standard and potential standard trees were not distributed proportionately across different hedge formats.
    a. The 60% of the total hedge length that was rated as tidy, almost exclusively flailed, held just 20% of the standard trees and 34% of the potential standards.
    b. The 31% of hedges beside a road held only 13% of the standards, but 31% of the potential standards.
    c. The 17% of hedges beside a track held 27% and 24% respectively.
    d. The 52% of hedges neither beside a road nor a track held 60% of the standards but 45% of the potential standards.
    e. The 68% of hedges planted on a bank held 71% of the standards and 66% of the potential standards.
15. The average (mean, median and modal) number of woody species is 8 per hedge but the range varies greatly, 611N had 13 different species while 207N is a relict hedge with only 2 species, Ash and Oak trees spaced approximately 10m apart, but no shrub storey between.
16. There is a positive correlation between hedge length and the diversity of woody species, but the ranges of that diversity for short, medium and long hedges overlap considerably, the least diverse hedge is of medium length and the most diverse hedge is one of the short hedges.
    a. The shortest hedges, up to 100m, ranged from 3-18 species with a mean of 7.5 species.
    b. Middle length hedges, 110-200m, ranged from 2-15 species with a mean of 8.3 species.
    c. The longest hedges, greater than 200m, ranged from 6-13 species with a mean of 9.3 species.
17. If you take account of the hedge length and standardise the species count to a number per 100m, the progression is reversed and there is a strong negative correlation between hedge length and diversity of woody species.
    a. The shortest hedges have a mean of 10.0 woody species per 100m.
    b. Middle length hedges have a mean of 5.3 woody species per 100m.
    c. The longest hedges have a mean of 3.4 woody species per 100m.
18. There is a strong positive correlation between diversity of woody species and diversity of herbaceous under storey.
    a. Of the 37 hedges above the median of 8 woody species, 25 are rated good for herbaceous diversity, 11 medium and only 1 poor.
    b. Of the 35 hedges below the median of 8 woody species, only 6 are rated as good for herbaceous diversity, 13 medium and 16 poor.
19. There is a weak positive correlation between banked hedges and a diversity of woody species, and a stronger positive correlation with herbaceous diversity.
    a. 26 of the banked hedges are above the median of 8 woody species, 21 are below.
    b. 10 of the unbanked hedges are above the median of 8 woody species, 11 are below.

c. 26 of the banked hedges are rated good for herbaceous diversity, 17 are medium, and 14 are rated poor.

d. 7 of the unbanked hedges are rated as good for herbaceous diversity, 13 medium, and 6 poor.

20. There is a positive correlation between a hedge being maintained and the number of woody species.

    a. Of the tidy hedges, 18 are above the median of 8 woody species, 15 are below.

    b. Of the untidy, 3 are above the median, 8 are below.

    c. Of the relict hedges, 6 are above the mean of 8 woody species, 21 are below.

21. Roadside hedges tend to have more woody species than field hedges

    a. Of the roadside hedges, 14 are above the median of 8 woody species, 5 are on the median, 7 are below, the mean number of species is 8.4.

    b. Of the trackside hedges, 7 are above the median, 1 is on the median, 6 are below, the mean number of species is 8.0.

    c. Of the field hedges neither beside a road nor a track, 7 are above the median, 6 are on the median, 30 are below, the mean number of species is 6.6.

22. The assessment of the herbaceous diversity was qualitative but equates approximately to hedges associated with more than 10 herbaceous species being good, 5-10 species being medium, and those holding fewer than 5 herbaceous species being poor. There may be some seasonal effect because of the single visit assessment, early or late visits are more likely to under record species than mid-season visits.

23. 33 (41%) of the 83 hedges were rated as good, 30 (36%) medium, and 20 (24%) poor for herbaceous diversity.

24. There is a positive correlation between hedge maintenance and herbaceous diversity.

    a. Of the 44 hedges rated tidy, almost exclusively flailed, 23 (52%) had good herbaceous diversity, 16 (36%) were medium, and 5 (11%) poor.

    b. The tidy hedges are 53% of the total but represented 70% of the hedges rated as good for diversity, 53% of those rated medium, but only 25% of the those rated as poor.

    c. 11 of the hedges were maintained but untidy, 7 (64%) were good and 4 (36%) were poor for herbaceous diversity.

    d. The untidy hedges were 13% of the total but represented 21% of the good hedges and 20% of the poor hedges.

    e. The relict hedges are 25% of the total but represented only 6% of the hedges rated as good for herbaceous diversity and 45% of the hedges rated as poor.

25. Roadside hedges tend to have better herbaceous diversity than field hedges.

    a. Of the 26 hedges beside a road, 61% had good herbaceous diversity and only 8% poor.

    b. The roadside hedges are 31% of the total but represented 48% of the good hedges and only 10% of the hedges with poor diversity.

    c. Of the 14 hedges beside a track, 43% had good herbaceous diversity and 36% were poor.

d. The trackside hedges are 17% of the total, they represented 18% of the good hedges but 25% of the hedges with poor herbaceous diversity.

e. Of the 43 hedges bounding fields but not a road or track, only 26% had good herbaceous diversity and 30% were poor.

f. The field hedges are 52% of the total but they represented only 33% of the good hedges but 65% of the hedges with poor diversity.

26. There was no correlation between the presence of a hedge bank and herbaceous diversity.

    a. Of the 57 hedges planted on a bank, 46% had good diversity and 24% were poor.

    b. Banked hedges are 69% of the total, they represented 65% of the good hedges and 70% of the hedges with poor diversity.

27. 41 woody species were recorded.

Appendix 2 Recorded Woody Species, species including standard trees shown in bold type

ALDER	ELM ENGLISH	LAUREL	ROSE
APPLE	ELM FIELD	LILAC	ROSE OF SHARON
ASH	FIELD MAPLE	LIME COMMON	ROWAN
BEECH	GORSE	LIME SMALL LEAVED	SPINDLE
BIRCH	GUELDER ROSE	OAK ENGLISH	SYCAMORE
BLACKTHORN	HAWTHORN	OAK SESSILE	WAYFARING TREE
BUDDLEIA	HAZEL	OAK TURKEY	WHITEBEAM
CHERRY	HOLLY	PINE MONTEREY	WILLOW GOAT
CHESTNUT	HONEYSUCKLE	PINE SCOTS	
DOGWOOD	HORNBEAM	PRIVET	
ELDER	HORSE CHESTNUT	RHODODENDRON	

Appendix 3 Recorded Herbaceous Species

AGRIMONY	DROPWORT	PARSLEY COW
ALEXANDERS	FAT HEN	PARSLEY HEDGE
ALKANET	FERN, HARD	PENDULOUS SEDGE
ANGELICA	FERN, HARTS TONGUE	PIGNUT
ARUM	FERN, MALE	PLANTAIN RIBWORT
BEDSTRAW, HEDGE	FIGWORT, COMMON	PRICKLY LETTUCE
BEDSTRAW, LADIES	FLEABANE	PRICKLY OXTONGUE
BINDWEED, FIELD	FOX AND CUBS	PRIMROSE
BINDWEED, HEDGE	FOXGLOVE	PULMONARIA
BIRD'S FOOT TREFOIL, LARGE	GARLIC MUSTARD	RAGWORT, COMMON
BIRDSFOOT TREFOIL	GOLDENROD	SANICLE
BITTERSWEET	GOLDENROD, CANADIAN	SCARLET PIMPERNEL
BLUEBELL	GROUND ELDER	SCENTLESS MAYWEED
BRACKEN	GROUND IVY	SHEPHERD'S PURSE
BRYONY, BLACK	HAWKBIT	SILVERWEED
BRYONY, WHITE	HAWKSBEARD, ROUGH	SORREL
BUGLE	HEDGE MUSTARD	SOW-THISTLE, ROUGH
BURDOCK	HERB BENNETT	SOW-THISTLE, SMOOTH
BUTTERBUR	HERB ROBERT	SPEEDWELL
BUTTERCUP, CREEPING	HIMALAYAN BALSAM	SPOTTED LOOSETRIFE
BUTTERCUP, MEADOW	HOGWEED (not Giant)	ST JOHN'S WORT
CAMPION, RED	HOGWEED GIANT	STITCHWORT
CATS EAR	HONESTY	STRAWBERRY WILD
CATSEAR, SMOOTH	HORSETAIL	TANSY
CELANDINE	IRIS, STINKING	TEASLE
CHARLOCK	IRIS, YELLOW	THISTLE, CREEPING
CHICKWEED	KNAPWEED	THISTLE, SOW
CINQUEFOIL	KNOTGRASS	THISTLE, SPEAR
CLEAVERS	LUCERNE	TOADFLAX
CLOVER, RED	MADDER, WILD	TOADFLAX, IVE LEAVED
CLOVER, WHITE	MALLOW, COMMON	TORMENTIL
COMFREY	MALLOW, MUSK	VALERIAN
CRANESBILL, CUT-LEAVED	MEADOW-RUE	VETCH, BUSH
CRANESBILL, DOVE'S FOOT	MEADOWSWEET	VETCH, COMMON
CRANESBILL, LONG STALKED	MEDICK, SICKLE	VIOLET
CRANESBILL, WOOD	MUGWORT	WILD CARROT
CROCOSMIA	NAVELWORT	WILD GARLIC
CUCKOO FLOWER	NETTLE, ANNUAL STINGING	WILD ONION
DANDELION	NETTLE, PERENNIAL STINGING	WILLOWHERB, BROAD LEAF
DEADNETTLE, RED	NETTLE, SMALL	WILLOWHERB, GREATER
DEADNETTLE, WHITE	NIGHTSHADE, BLACK	WILLOWHERB, MARSH
DOCK, BROAD LEAVED	NIGHTSHADE, ENCHANTERS	WILLOWHERB, SQUARE STEM
DOCK, CURLED	NIGHTSHADE, WOODY	WOODSAGE
DOCK, HYBRID	NIPPLEWORT	YARROW
DOG'S MERCURY	OX-EYE DAISY	YELLOW ARCHANGEL

Appendix 4 ASH DIE BACK - SID VALLEY 2020

Hedgerow Ash trees are a major feature of the landscape of the Sid Valley and have an important part to play in the valley's biodiversity. Ash Dieback (ADB) threatens these vital members of the local treescape. This report attempts to quantify the scale of the likely impact.

In 2014 a survey of the tree cover in the Sid Valley was undertaken and reported on (Sidmouth Arboretum 2014). The most significant broadleaf tree species in the valley was Ash, *Fraxinus excelsior*. Ash trees were the most common species with 10.7% of the tree population, indicating more than 40,000 Ash trees across the valley, and they provide 18% of the total leaf area. Their importance is even more significant because Ash trees support much more of our local biodiversity than the most numerous trees which were Larch and Douglas Fir.

Apart from stretches of woodland on the steeper valley sides, the agricultural landscape of East Devon valleys in general, and the Sid Valley in particular, evolved into what is described as a 'wood pasture' from the Medieval Period onwards. This is characterised by a patchwork of small fields enclosed by hedges with many standard trees. The trees played an important part in the local economy, often pollarded (cut off at the height reached by an axe) as a source of timber used for a range of purposes from building houses to cooking food.

As hedgerows play such an important part in the visual amenity of the valley, a follow up survey of the local agricultural hedges was undertaken in 2020. This involved visiting a sample of nearly 100 hedges at randomly selected sites throughout the valley. The main focus of the survey was the condition of the hedges, the range of woody species, the number and maximum size of standard trees within the hedges, and the diversity of herbaceous plants in the ground storey.

The results of the hedgerow survey (Sidmouth Arboretum 2020) show that the three commonest standard trees are Ash, Beech and Oak. Half of the Beech trees in the survey are restricted to the lines of outgrown trees that make up three relict hedges on the heathland plateau and Beech trees only occur in 19% of the hedgerows. Ash and Oak trees are distributed much more evenly, 57% of the hedgerows have at least one standard Oak tree and 54% of the hedgerows have at least one standard Ash tree in them. As with the valley wide tree survey, Ash is the commonest broadleaf tree in the hedgerows.

There are almost 200 mature and young Ash trees in the 13km of hedge surveyed. This extrapolates to approximately 8,000 hedgerow Ash trees across the valley, 17% of the estimated total 47,000 hedgerow trees. This is much higher than the 10.7% of the total trees in the valley because there are very few conifers growing as hedgerow standards. A further 30% of the hedgerows have Ash in the shrub storey, often kept from becoming a tree by tractor borne flails trimming the hedges. Ash trees make an important contribution to the look of local farmland.

Mature Oak trees are well known to support a wide range of wildlife, but Ash trees also play a major part in supporting biodiversity. In a recent detailed study (Mitchell et al.), more than a thousand different species were found to be associated with Ash trees, feeding directly or living on or under them, 44 species were described as 'obligate' or completely dependent on the Ash, 62 species were highly associated and the disappearance of Ash

trees will seriously harm their populations. These include a wide range of invertebrates, lichens, bryophytes, and fungi. The loss of these obligate and highly associated species will have a knock-on effect on bird and mammal populations. Ash leaves break down quickly when they fall in autumn to produce a rich growth medium, and the open canopy of Ash trees allows enough light to reach the ground and a rich herbaceous layer thrives in Ash woods. The implication is that loss of Ash trees to ADB will be a hammer blow to the biodiversity of the valley and the rest of rural England.

It was decided to record the extent of Ash Dieback present in the hedgerows and standard Ash trees throughout the valley. Young Ash trees are more prone to ADB than mature trees. Young trees succumb quite quickly, but mature trees have the resources to resist the disease for many years. In mature trees, leaves at the extremity of the crown die back but the tree develops dense growths of leaves at the heart of the crown to keep going. There can be scarring of the branches in mature trees, but this is difficult to see from the ground and the characteristic wilting and blackening of the leaves is the easiest way to spot infected trees, therefore recording the disease is likely to be under-reported among the mature trees.

Ash Dieback is a disease of Ash trees caused by a fungus called *Hymenoscyphus fraxineus* (Forest Research). The disease spread from Asia where the native Ash species have co-evolved with the disease and have developed some level of resistance to its effects, our trees do not enjoy that resistance. It has been present across Europe for thirty years and was first identified in the UK in 2012, probably introduced through imported Ash tree stock. One might ask why we imported Ash trees when anyone with a vegetable plot within 200m of a female Ash trees knows they seed freely and the seeds germinate successfully, but that question is beyond the scope of this report.

Fig.1 Chalara Ash Dieback

The fungus invades the leaves and blocks the water transport which causes the leaves to wilt and die (Fig.1). When it spreads to the main trunk, eventually it blocks the water transporting xylem and the whole tree dies. It is predicted that 95% of the mature Ash trees in England could succumb to the disease. This will have a bigger impact on the local ecosystem than that caused by Dutch Elm Disease in the nineteen seventies and eighties. Elm has maintained a presence as a hedgerow species since Dutch Elm Disease and continues to support much of its dependent biodiversity. Importantly, hedgerow Elm can grow to seed production before bark beetles infect the young trees and so there is regular stock renewal. Most of the young Ash seedlings will die before they can produce seed and so, as the mature trees die, the species will not be able to regenerate.

Ash was present either as a standard tree or as young growth in the shrub level in 70 of the 83 hedgerow sites surveyed. 35 (50%) of these hedges showed signs of ADB at the time of survey.

The initial figure of 50% is an under-reporting. Nine hedgerows with Ash had already been visited before the decision to record ADB and so it is 35 of 61 hedges, 57%. The incidence is even higher than this. ADB takes time to affect the leaves and the effect does not usually show until the summer. Some of the hedges surveyed after the decision to record ADB in May might have been infected but were asymptomatic at that time, the data contained false negatives.

Some of the sites were revisited in July and a further 13 hedgerows were recorded as having signs of ADB, we now know that at least 69% of the sites with Ash have signs of ADB. Fig.2 shows sites where ADB has been recorded. The absence of records for the eastern half of the valley is because this area was not revisited, it is likely that there are incidents of ADB in this area. We have not surveyed beyond the East Hill Strips into the Otter Valley.

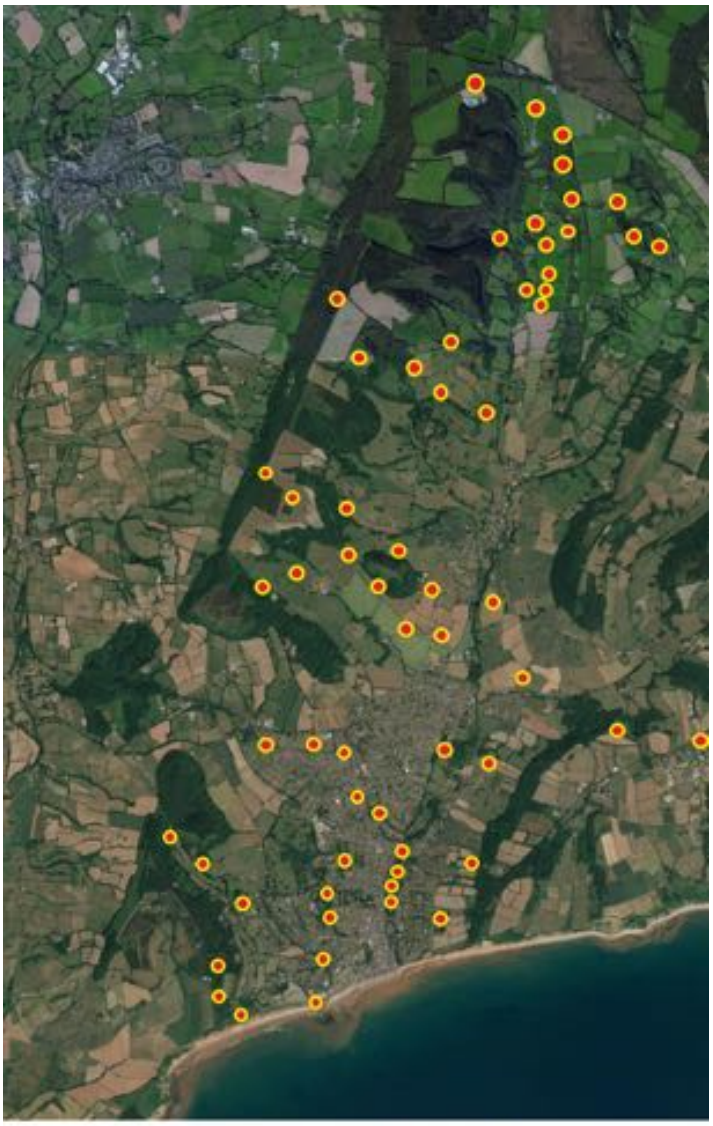

Fig.2 Survey sites with Chalara Ash Dieback

In most of the sites, the infection is not yet so bad that mature trees are at immediate risk, but there are some sites, for example north of Synderborough Farm and The Sid Valley Country House Hotel and on Moor Park Lane near the golf course, where some of the trees have about 20% of the leaf cover that you would expect in a healthy tree. These trees are

Class 4 in the Suffolk Canopy Description used in the Ash Dieback – Action Plan Tool Kit (Tree Council 2019) and are subject to the loss off large limbs and imminent death.

The hedgerow survey only recorded agricultural hedges. It was decided to extend the ADB survey to the urban areas of the valley. This involved a walk around areas of Sidmouth with significant tree cover recording the incidence of ADB where Ash was found. Mature Ash trees are less common in the town than in the countryside of the valley but there are some.

There are several mature trees that still appear to be healthy, several around Gilchrist Field in The Byes, and at Stowford. There are others, such as in the old field hedgerow preserved behind Lindemann Close (Fig.3), and the Cemetery which are clearly infected. Two particularly sad cases are the Claret Ash planted in the garden of the Stowford Medical Centre and the Manna Ashes in the Manor Road car park, it is not just English Ash that is susceptible. Also, there are several areas where Ash is growing as a shrub under some of the mature trees. Sadly, with the exception of Gilchrist Field, all of the areas of young growth seen so far in town show symptoms of ADB and this is bound to infect the mature trees that stand above them eventually. The riverside area of the Byes up to Lymebourne Lane is badly affected, as is the young growth along Station Road.

Fig.3 A badly affected tree near Lindemann Close.

The overall picture is not a happy one. Ash Dieback is now endemic in the valley and the worst-case scenario is that we will be losing up to 40,000 trees, a large part of our broadleaf tree cover, and the flora and fauna dependent on that canopy, in the next few years. Unlike Dutch Elm Disease, this population will not regenerate even as small trees. It is possible that, with such a large population, a small number of the valley's trees will have sufficient resistance and internal resources to survive and go on to repopulate the valley, if climate change hasn't made it too inhospitable to the species. There is a great deal of work going on exploring which trees will be the best species to replace the lost Ash and how to manage that replacement. However, both of these outcomes will be for future generations.

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Appendix 5 Hedges of the Sid Valley 2020 - Historical Context

Introduction

The main hedgerow survey gives a 2020 snapshot of the hedges, but the present situation would benefit from being placed in a historical context, how did we get to where we are now? Historical maps are a valuable source of information and there is a series of maps available online showing field boundaries dating back to the mid-19th century. To go back to the earliest origins of the valley's hedges we need to look to archaeology. The science of palynology, which includes the study of archaeological pollen grain deposits, can help us understand some aspects of the local ecology dating back many centuries. There is good archaeological evidence for the early development of farming practices and hence field patterns in other areas of East Devon but, in the absence of much direct evidence in the Sid Valley, the suggested history in this report has to be taken as speculative extrapolation of that evidence.

There are three distinct areas of hedge and field layout in the valley. The largest area is the valley floor stretching up beyond Sidbury, including the wider, gently sloping area around Woolbrook. Also, there are the steeply sloping valley sides, and the hilltop plateau heathland. The field patterns of the three areas differ significantly now, but, if you go back far enough, there was a time when there were no hedges in the valley.

Prehistory

At the end of the Devensian Ice Age, about 11,500 years ago, the landscape of East Devon would have been tundra, a treeless plain where only simple vegetation could survive because of the short growing season and reduced availability of water. Analysis of pollen deposits shows that, as the climate warmed, Britain was colonised by a succession of plants, climaxing with trees (Mina). Possibly because their seeds are windborne, Willows and Birches arrived first, then Pines. Oaks arrived about 7,000 years ago and Beeches some 2,000 years later, possibly brought in by colonising humans.

Hedgerow species evolved as plants of the woodland edges and in clearings caused by large browsing animals or the fall of large trees, but the hedge is a human invention. Hedges were developed to enclose parcels of land to establish ownership and facilitate agriculture, particularly the keeping of livestock. In Devon, unlike many areas of lowland Britain where hedges were established by just pushing Hawthorn or Blackthorn twigs into the ground and letting them grow, the construction of field boundaries entailed significant effort because they took the form of an earth bank, sometimes reinforced with stone. If a more significant stock proof barrier was required, the shrub storey of the hedge could be planted on top.

We know humans had settled this area in the Bronze Age, 2,000-700 BC, with sites such as the round barrow cemetery at Farway (Historic England), and the circle of Seven Stones on Muttersmoor, removed in Victorian times to be used in a rockery at Bicton unfortunately. Despite these local funerary and worship sites, there is no direct evidence of Bronze Age farming in the Sid Valley. If there is or was any evidence, it is obscured by subsequent farming practices and urban development. Excavations elsewhere have shown that there is archaeological evidence that forest was cleared, and land ploughed for crops in the bottoms of the Axe, Clyst and Exe valleys in the Bronze Age (Hawkins), and it is quite likely that these early farmers enclosed fields in parts of our valley as well. But, as all local evidence of occupation at this time is located on high ground, that is where we will begin.

Encircling Plateau

The hilltop plateau that surrounds most of our secluded valley is made up of a layer of Upper Greensand overlain with what geologists call Clay-with-Flints, the ground conditions make for very

poor soil agriculturally whereas the underlying geology of most of the valley is alluvium and Mercian Mudstone which supports reasonably rich soil.

We have funerary and worship sites on the plateau but, whatever the Bronze Age population was doing on the local hilltops, there is no evidence they were enclosing fields with hedges. In the Clyst valley, there were ancient land features such as field boundaries, but they had been erased from the surface by modern ploughing, only to be revealed by excavations during the construction of the A30 dual carriageway. The difficulties presented by the plateau's flinty soil make it very unlikely that the Bronze Age population would have ploughed the land for crops. If Bronze Age farmers had erected hedges on the plateau for their livestock, with or without banks, these would remain as visible relics because of the land has not been subject to ploughing in historic times right up until late Victorian times.

Although the hilltop plateau is relatively high ground locally, it is described as lowland heath on a national scale. We get a historical glimpse of the upland from Edmund Butcher in his 1820 guidebook Beauties of Sidmouth:

> *Where there are no enclosures, a short, sweet, and darkish grass covers these elevations. Furze (Gorse) and heath (Heather), with their yellow and purple flowers, fill the air with fragrance, and beautifully diversify the scene. Great numbers of sheep brouze (sic.) upon this delicious herbage.*

The plateau at the northern end of the valley was similarly unwooded, Theodore Mogridge writing in 1836 describes the pastoral hills and of having a wide and extensive view of the Otter Valley as he crossed Gittisham Hill towards Honiton.

There is much archaeological evidence for Bronze Age pastoral farming on Dartmoor and Exmoor, but there is none for our heathland. The earliest reliable evidence that we have of land use on the plateau is the Tithe Maps. These were produced in order to assess the tithe payable in cash to the parish church for the support of the church and its clergy. This tithe had been paid in kind, generally a portion of the harvested crops, until The Commutation Act was passed in 1836, when it was agreed that this should be converted to a monetary payment.

A survey of the whole of England and Wales was undertaken in the decade or so after 1836, to establish the boundaries of each parish, and assess the amount of tithe due for each parcel of land within it. This resulted in a record of all fields in each parish with a map, or maps in the case of Salcombe Regis and Sidbury, covering the whole parish and a reference book (the Apportionment of the Rent Charge in lieu of Tithes) cataloguing each plot of land, its owner, tenant, land use, and area. The Tithe Maps for the parishes that make up the Sid Valley can be viewed on the Devon Historic Environment web pages (Devon County Council).

Fig.1 shows part of the 1839 Tithe Map for Salcombe Regis which records most of the heathland on Salcombe Hill as unenclosed. The Apportionment tells us it was Common, a shared space where the local people could graze their animals. Other maps show there were several unenclosed areas of the plateau that rings the valley. Most are marked as Common and recorded as furze, the old name for gorse heathland. This would have been used as rough grazing and as a source of kindling. It is unlikely that Bronze Age farmers would have done anything different.

The change between the 1839 Tithe Map and the 1888 Ordnance Survey Map (Fig.2) is quite dramatic, 210 acres of the open common on Salcombe Hill was enclosed into broadly rectangular fields with straight hedges in 1850. The process began in 1846, and many of the local worthies were angered by the application. This led to a meeting in September 1846 and the Sidmouth Improvement Committee was set up to, among other things, secure the public access to Salcombe Hill. This Committee later became the Sid Vale Association which does so much to protect our local environment to this day.

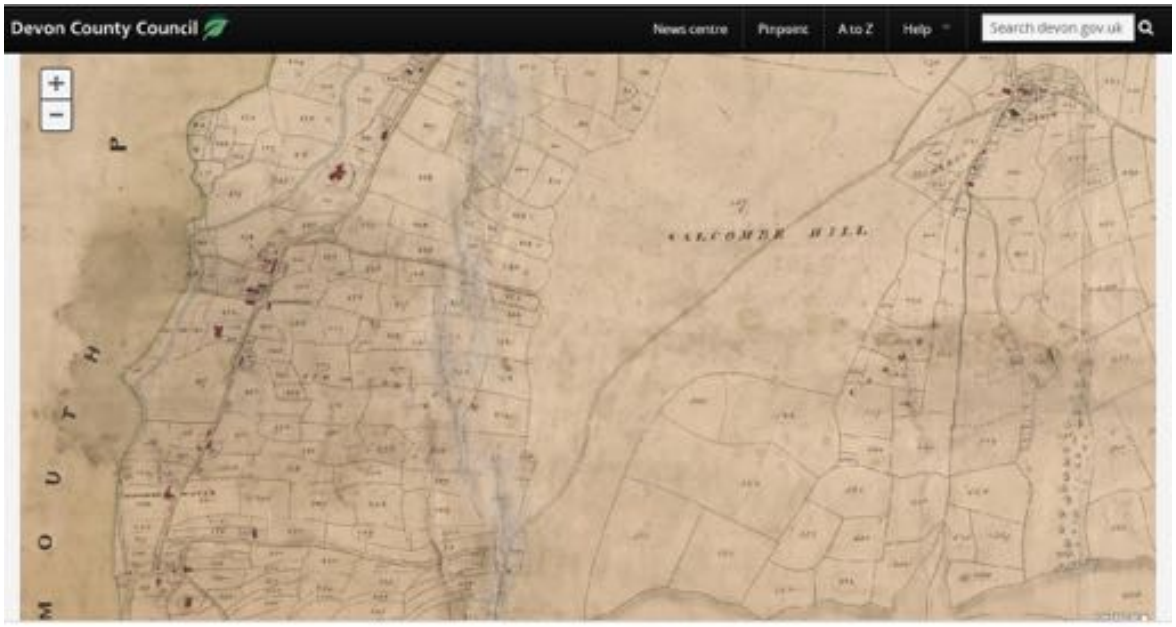

Fig.1 Part of the 1839 Tithe Map for Salcombe Regis

Fig.2 Ordnance Survey 1888 Six-Inch Devonshire XCIV.NE, courtesy of National Library of Scotland

Enclosure is a simple concept but with many complications. When land was enclosed, it was done by building a fence, planting a hedge, digging a trench or building an embankment, or a combination of these. In places such as Sidbury Castle it was done as a defence to keep others out, but mainly it was to establish ownership or to keep livestock from wandering. We have very different regional landscape patterns across the country. The driving forces for enclosure and so the field patterns laid down went through distinct phases across history, and with different chronologies and outcomes across regions of England.

The first people to occupy East Devon enclosed small fields in a piecemeal process around their new home, claiming parcels of the virgin land. Bronze Age people were living in small, scattered farmsteads growing crops in their small fields long before the Romans arrived. By the 11th century, there had been considerable change, probably driven by new methods introduced by the Saxons when they took control of southern England in the 7th and 8th centuries. Many settlements across Devon, but especially in East Devon, had come together to form villages with what are termed 'open' or 'sub-divided' fields, large fields divided into small strips with responsibility for a mix of strips distributed among several families. The local landscape of hills and steep sided valleys restricted the size of some of these fields compared to the huge expanses of the Midlands, but they were still much larger than the Bronze Age fields. The farming economy was very different from now, by the time of the Norman Conquest, 70% of the land was arable (Rippon), 13% pasture and meadow, and 17% 'waste' which is rough land such as the Greensand Plateau, or marshes.

From the 13th century, the local economy began changing. Manorial records show that families were swapping their scattered strips to bring their land together (Fox). The new fields were enclosed by hedges dividing the old 'open' fields into parcels of 2-3 acres. The main drive for this appears to be a change from arable to livestock farming. Records for Axminster show that by the 16th century the land had become mainly pastoral with a thriving local cloth industry being supplied with local wool. The increase in hedges provided another valuable resource, timber. The landscape was now what is called 'wood pasture', small fields with their hedges dominated by standard trees and used as pasture for several years during which soil fertility would build, and then ploughed for a short period before being returned to pasture. In his 1795 diary, the Rev. John Swete talks of the tall, overhanging Elms being so numerous they obscure the view. Edmund Butcher gives more detail:

> *The hedges of Devonshire are proverbially large and rich. Sidmouth is closely surrounded with them like so many green and flowery zones. Elms, ashes, and oaks are interspersed in great numbers in almost every enclosure…*
>
> *In the vernal and autumnal parts of the year, the numerous lanes which intersect and divide this rich valley, are truly delightful. The country then seems a universal garden; the air is full of fragrance… the deep banks are literally covered with vegetable mosaic.*

The small fields allowed the livestock to be rotated so that they had a constant supply of fresh grazing. Much of the typical patchwork East Devon landscape of today is based on these fields, the only major change is loss of the elms that blocked Swete's views. In South Devon, a similar parcelling up of the open fields took another two centuries and was driven by a decline in the rural economy.

The rich arable land of the Midlands with its enormous open fields underwent a different process called 'Parliamentary Enclosure'. The landowning aristocracy, with the backing of Acts of Parliament they sponsored, used it as a way of excluding the local population from common land and the very productive, communally farmed open fields. Unlike the pre-historic enclosure of the virgin land, the 'Parliamentary Enclosures', which began in the 17th century, were part of a planned reorganisation of farmland. As the landscape was planned, the fields tended to be regular, often straight-sided rectangles. Unlike Devon, there was a continued emphasis on arable farming, and this allowed for larger fields. There was no need for the small fields to rotate the grazing and hedges took up valuable crop space.

The uncultivated upland plateau around our valley had escaped the Medieval enclosures of the East Devon arable land described above, but the local manors joined the 'Parliamentary Enclosure' movement eventually, although much later than the landowners of the Midlands.

There was much less impetus to enclose the rough grazing of the plateau, but, at the head of the valley above Sidbury and on Muttersmoor, some areas were already divided into regular fields with straight borders and right-angled corners on the 1839 Tithe Map. The rest of the common land was enclosed soon after the date of the Tithe Map. Salcombe Hill was enclosed in 1846, Stockland Hill in 1864 and Beacon Hill, Upottery in 1874. The latter were among the last 'Parliamentary Enclosures' to be enacted.

According to the commissioners, the Salcombe Hill enclosure was granted because "*We consider this proposed inclosure (sic.) expedient on the grounds that the land is at present in a most neglected and unproductive state, though, for the most part, capable of being made as good as the old inclosures adjoining, and would lead to a very useful application of labour and capital*" (The Legal Observer)

The enclosure of Salcombe Hill was not a great success agriculturally, few of the fields turned out to be "as good as the old inclosures" and did not make worthwhile pasture. Fig. 3 shows that, by the time of the 1944 OS map, the fields are still marked as scrub and heath. Soon afterwards, much of the area was planted as Beechwood with some Douglas Fir. Other areas of the plateau followed a similar course, but they were planted almost exclusively with conifers, mainly Douglas Fir and Larch.

Fig.3 Ordnance Survey 1944 Six-Inch Devonshire XCIV.NE, courtesy of National Library of Scotland.

One effect of the planned layout of the 'Parliamentary Enclosures' was that they included new, straight, or newly straightened roads that were wider than the lanes that developed in pre-medieval periods. In pre-medieval times, the lanes in agricultural areas developed their sinuous courses around the small, irregular fields as they were enclosed progressively (Fig.4). There was no need for the lanes to be like motorways because there was only limited movement of people or goods. As England developed in post-medieval times there was more wheeled traffic and the unmetalled roads needed to be wider to allow wagons and coaches to pick a secure path in wet weather. When these roads were metalled in modern times the extra width allowed for wide verges. The road across Salcombe Hill was probably straight even if it was an ancient track across the heath because there

were no fields to go around. Now, it has been improved and there is a standard width of metalled road leaving the wide verges for wildlife on either side up to the enclosing hedges.

Fig.4 Saxon lanes near Burnham on Crouch, Essex

As the Arboretum hedge survey is showing, a small number of the plateau hedges consist of mixed woody species, but most are almost exclusively a single species. Hedges on the western side of the valley, near the golf course, and those on the west facing side of Salcombe Hill are mainly of Beech. We know these hedges were planted about 160 years ago and the single species ties in with Hooper's Rule.

It is true generally that older hedges have a wider range of woody species in their length. In the 1960s, ecologist and historian Max Hooper used a wealth of observations and archive evidence to propose a method of dating hedges which became known as Hooper's Rule. Dating a hedge is not a precise science and, with modern farming trends of planting wildlife friendly hedges, it is becoming less reliable, but Hooper's Rule is still a useful guide. The rule states that the number of woody species in a 30 yards length of hedge, multiplied by 110, gives you the approximate age of the hedge site. The explanation is that, although hedges were usually planted as a single species, for example a Hawthorn or a Field Maple hedge, other species are introduced by natural processes of seed dispersal as time passes. Saying that a hedge is 500 years old does not mean that is the age of the trees and shrubs currently making up the hedge, although this might be true for the occasional ancient Oak standard. It means there has been a field boundary on this site for that length of time with a succession of trees and shrubs. Some hedges in the valley have an estimated age of at least 1,000 years but the oldest trees presently in them are only 200-250 years old.

The lack of agricultural progress for the new plateau fields meant that the hedges around these fields were not maintained. A hedge is a line of woody shrubs but, if you leave them, the short-lived ones will die, others will grow to become trees. Many of the plateau hedges are what is termed relict or lapsed, either the banks have collapsed and there is a broken line of scrub, or there is now a line of trees growing closely together (Fig.5).

Fig.5 A grown out Beech hedge on Salcombe Hill.

Some of the hedges were maintained in their early years by laying, particularly around the golf course and on Muttersmoor. When laying a hedge, you cut halfway through upright timber and lay it down, weaving branches around stakes to form a stockproof barrier. Now there are some fantastic, twisted growths of Beech alongside some of the tracks as you make you way up Muttersmoor Lane (Fig.5A).

Fig.5A Relict laid hedge

Steep Valley Hillsides

The fields on the steep valley sides exhibit a different pattern to those on the plateau and those of the valley floor, which suggests a different history. We can be certain the hedges around the fields between Milltown Lane and Griggs Lane are older than the hedges around the fields on Salcombe

Hill because they were in existence already on the 1839 Tithe Map. The field pattern of the steep hillsides is different to the higgledy-piggledy patchwork of the very early farmsteads and one developed by the medieval switch from arable 'open' fields to pastoral farming, and possibly developed at a different time.

As stated above, there is good archaeological evidence that Bronze Age settlers were farming the Exe, Clyst and Axe valleys, but we cannot say if there were farmed fields in any of our three distinct areas in the Bronze Age Sid Valley. What we do have is a field pattern on the steep hillsides known as a co-axial landscape where lines of field boundaries run in parallel formation. Co-axial landscapes on Dartmoor have been dated to the Bronze Age and the Bronze Age fields in the Clyst Valley are co-axial, but not all such landscapes are that old and some may have been laid out in the late Medieval period (Williamson).

Evidence from the pollen deposits on the nearby Blackdown Hills, which have a similar geology to our plateau and may have a shared farming history, suggests that the steep, poorly drained valley sides persisted as woodland, possibly under management by coppicing, after the early clearance of the valley floor areas (Brown et al.). Certainly, the very steep south side of the Snod Brook valley at Knowle Barton was still listed as coppice on the Tithe Map for Salcombe Regis. The Sidbury Tithe Apportionment has 201 references to Coppice, as a field name and/or a land use, mainly on the steep valley sides.

The Tithe Map shows the fields in the Milltown Lane area exhibit the co-axial pattern of parallel boundaries running west to east (Fig.6). A possible explanation for this is that, while the rich and comparatively level land in the valley floor was being farmed for arable crops or as high quality pasture from very early times, the steep hillsides were probably still wooded, and animals were being grazed on the heathland on Salcombe Hill in the summer. Milltown Lane and Grigg's Lane would have been tracks through the woodland to drive animals up and down the hill at seasonal changes. These would be mainly sheep if Sidmouth was similar to Ottery St Mary and Salcombe Regis according to their entries in the Domesday Book.

Fig.6 Fields south of Milltown Lane on the 1839 Tithe Map for Salcombe Regis

The tracks run straight up and down the hillside because there were no fields to go round, they are unlikely to have developed for wheeled traffic because the direct route up would be too steep as you passed onto to the Greensand geology. There is now a horizontal track at the top of the lane which was probably the route taken to bring grain from Salcombe Regis down to the eponymous mill of Milltown. This track appears to be a later addition, it is not marked on the Tithe Map and the trackside hedges are typical of the ones installed at the time of enclosure. Further south you have Salcombe Hill Road which is clearly a link between the two settlements of Sidmouth and Salcombe Regis. It begins as a direct ascent but, at the steepest part of the hill, it turns across the hillside which lessens the gradient, presumably to make it easier for wagons.

Although, once again, there is little direct evidence of the early story, the accumulation of various snippets suggest that the co-axial fields were enclosed between the 12th and 15th centuries.

It is not unreasonable to suggest that the Sid Valley was no different to other valleys nearby with arable farming as far back as the Bronze Age, and then a switch to pastoral farming in Medieval times. There is evidence of the early open fields around Sidbury, but there is no evidence of an open field system in the valley bottom below Milltown Lane and Griggs Lane. It is likely to have been pastoral throughout because it would have been too wet for reliable arable cropping. The majority of the fields further up the hillside were cultivated arable fields in 1839.

The histories of Sidbury and Sidmouth parish churches provide some clues to how things might have progressed. At the time of Domesday, the valley had one church, St Giles in Sidbury. By 1200 Sidmouth had expanded and had its own church (Sid Valley Mission). Both parishes expanded their churches and had the money to build fine towers in the Medieval period. The expanding population would create a market for more agricultural produce.

With Milltown Lane and Grigg's Lane established as livestock routes up and down the wooded hillsides, as the population increased and land values increased, the steeper land would have become more attractive and come under progressive colonisation.

The palynology shows that there was a significant loss of woodland in East Devon beginning in the 9th century. The proportion of tree and shrub pollen in deposits in the Blackdown Hills begins a sharp decrease, probably because the valley sides were being cleared for increased agriculture. It is not unreasonable to suggest that this change would have extended to the Sid Valley where the slopes below the Greensand are less steep than the Snod Brook valley which retained its coppice.

Farmers would have cleared the woodland, whether it was managed coppice or not, to create more valuable farmed fields. The whole valley side would not have been cleared in a single event. Families would have gained permission from the Manor to clear successive areas over a considerable period in a piecemeal process similar to the original settlers, in parcels of about an acre (0.4 hectare), the area that could be ploughed in a day. Different families would have their own plots in the valley bottom, and they would work from these progressing up the hillside side by side with neighbouring families. Thus, you would have the strings of fields marching up the hillside in parallel lines, a co-axial arrangement.

As can be seen in Fig. 6, these co-axial fields stop abruptly in a line that, according to Ordnance Survey maps, is more or less parallel to the 120m contour, rising slowly as you progress inland. This coincides with a sharp increase in gradient, and a spring line that provided domestic water supplies in Victorian times. This is associated with the change to the Upper Greensand geological formation that overlays the Mercia Mudstone. The land above this line was too steep and too poor to cultivate and, along with the flinty clays above which would have blunted early ploughs very quickly, the very steep slope was left as open heath for grazing.

Whenever this development occurred, we have to return to the Tithe Maps as the first reliable record of local field patterns. The fields alongside the length of Sid Road are small fields mostly of between one and two acres, as would have been cleared by the first farmers and maintained for

pastoral farming, with some orchards. Some of the field names are purely descriptive but others are indicators of great age.

The fields at the foot of Milltown Lane were part of the extensive estate owned by Mary Pearce Leigh but farmed by Henry Godfrey. The tithe apportionment entry for these fields reads thus:

148 Lower Mead, arable, area 1 acre 2 roods (quarter acres) 22 perches ($^{1}/_{160}$ acre)

149 Bowels (probably after a previous owner rather than intestines), arable, 1.1.4

150 Orchard, orchard,0.1.0

151 Well Close, arable, 2.1.30

152 Barn Hay, orchard, 1.0.15

A Hay is a Saxon term for a field enclosed by hedges, and a Mead is a Saxon term that became meadow in Medieval times. The term Close is later, a Middle English (12-15th century) term for an enclosure.

The fields further up the hillside are nearly all called some variant of Down or Downlands which refers to their uphill location but is considered a much later term (Sandover) which supports the idea that they were enclosed some time after the fields by the road, but still by the end of the Medieval period.

If you check the hedges against Hooper's Rule as you walk up Milltown Lane, there is a definite progression. The hedges on both sides at the bottom of the lane have a count of 8 species, this equates to an age of about 900 years or 12th century. Halfway up the lane, the species count drops to 5 which indicates possible 15th century origin. The boundary hedge between the tops of the fields and the steep Greensand escarpment is 16th century according to Hooper's Rule. A similar pattern presents itself on Griggs Lane, although the hedges in the lowest section have been lost to housing development. As was said before, Hooper's Rule is not definitive, but it does correspond to other evidence that the hillside was enclosed progressively through the Medieval period.

Nearly all the fields on the hillside are listed as arable on the Tithe Map, but this was to change soon afterwards. The diaries of J.G. Cornish in the 1870s (Parishscape) lament how changes from arable to pasture on the hillside area have reduced the number of partridges:

"*Partridges were plentiful then, for nearly all the red marl on the west side of Salcombe Hill was under the plough and much of the poor light land on the hilltop, while further east and north where the hilltop clay is deeper there were few grass fields. So the partridges reared fine broods on the hillsides and the light land …*

And the country was far more interesting, for there was the change of crops, wheat, barley, oats, rye-grass, fallow, mangolds, turnips, where now we find only one or two arable fields to six or eight of grass. It seems strange to me now to look at a steep hillside covered with bracken or even gorse and brambles, and to think how I saw oats being sown by hand on it and the carter standing at a perilous angle to harrow in the grain."

Perhaps this is a precursor to the Silent Spring where post-war agricultural practice is linked to a serious depletion of farmland birds. J.G. Cornish held the principal interest in the common and therefore was one of the main drivers of the enclosure of Salcombe Hill in 1846 which played a part in the changes he is lamenting; the law of unintended consequences is not a new thing.

It is likely that the arable farming of these fields at the time of the Tithe Map was the tail end of a temporary phase brought about by the Napoleonic Wars when much pasture had been ploughed up to increase wheat production (MacDonald). Wheat prices collapsed after the war ended and there was a steady return to pasture in many parts of the country.

Some of the fields to the north of Milltown Lane are considerably larger than most, Tithe plot 116, Great Field is a pasture of just over 8 acres, and 137, Road Close, is over 3½ acres. Looking at the pattern, these are probably cases of field aggregation, where dividing boundaries are removed to create larger fields from adjacent smaller ones. In many cases this is related to the Medieval and Parliamentary Enclosures but a different timescale for these particular fields will be discussed later.

There are similar co-axial field patterns working their way up either side of Core Hill Lane and, although less clear because of field aggregation, alongside Stintway Lane on the hillside going up to Mutters Moor. It can be seen also above the Roncombe Valley, and the eastern side of the main valley as the A375 climbs up from Sidbury towards Putts Corner.

The Valley Floor

In 1839, the land beside the river from the north of Sidbury down to Sidmouth was mainly used as meadow and orchard (Fig.7), possibly it was too poorly drained for arable crops. On the Tithe Maps, there are at least twenty riverside meadows and pastures named Ham running from beside Salcombe House (now Hunter's Moon) up past Sidbury to Barnard's Farm (now the Sid Valley Country House Hotel). Ham is generally taken to be a useable field but one prone to flooding. Perhaps surprisingly, the present-day Ham by the river mouth was not labelled as a Ham in 1839 but a meadow named Marsh.

It is possible that the riverside fields had existed since the first settlement of the valley because there was no agricultural pressure to change. Many fields in the southern valley are now obscured by development but most of the riverside fields from Sidford right up to the head of the valley are unchanged from 1839 to the present day and so may be Saxon enclosures, or even older. Sixty fields in the valley floor have the Old English (Saxon) Mead in their name which is unlikely to have been given to a field after the Norman conquest.

Fig.7 Part of the 1839 Tithe Map showing field names and land use for part of Sidford.

The builders of the Iron Age Sidbury Castle would have needed food supplies. As farming was well established in the area in the Bronze Age, it is very likely that land downhill from the castle on the valley floor around Sidbury was under cultivation before the Romans arrived, but there is no evidence to confirm that the field pattern is that old. There is evidence that both Sidbury (Fig.8) and Sidmouth (Fig.9) had at least one Saxon sub-divided open field with relic strip lynchets that survived up until the 1839 Tithe Maps. They have been almost completely erased by subsequent development, in Sidbury by the Manor Park developed in Victorian times, and in Sidmouth by the Victorian and Edwardian Salcombe Hill and Hillside Road housing. On the 18th century Manorial Map

of Sidmouth, the western area of the town around the Fortfield was divided into even smaller strips but these were too small to be ploughed and were vegetable allotments. In 1839, there were some long thin fields on the western side of Sidmouth, but they tend to be isolated and do not create enough of the pattern you would need to say that they were relics of a sub-divided open field.

Fig. 8 Part of the 1839 Tithe Map for Sidbury showing relic strip lynchets in what is now the Manor Park.

Fig.9 Part of the 1839 Tithe Map showing relic strip lynchets to the south of Salcombe Hill.

Thanks to Kate Tobin's research of the National Archives, we know that some of the fields on the western side of the valley around Boughmore date from the 13th century or earlier.

> "*Abbot Nicholas grants to Robert Bogmore and his lawful offspring a virgate of land (30 acres) in Sidmue called Bogmore by the yearly rent of 16s. Date July 1267.*"

The land already has a separate name which means it had been enclosed before the grant. Given the name of the tenant, this implies that he already lived on the land and he or his ancestors enclosed it originally and the Abbot was regulating the arrangement. The use of the term *virgate* is linked to ploughing land, the amount a team of oxen could plough in a season, and so hints that the fields might have been cultivated, although the name Bogmore suggests wet ground only fit for rough pasture.

The rest of the remaining farming land on the more level parts of the valley has a wide range of field types and it is difficult to assign the fields and hedges any particular age until we reach the certainty of the Tithe Maps. But, as was shown by the enclosure of the common on Salcombe Hill, the fields and their hedges have continued to undergo changes since then.

One of the biggest changes has been housing development, mainly in Sidmouth itself. Since the time of the Tithe Map, the town has spread from being a small fishing village and seaside resort with clusters of marine villas, to a town that occupies about one quarter of the valley floor. Large areas around Woolbrook and Stowford that were farmland and orchards 150 years ago are now housing estates.

However, some of the old field hedges still survive in this area. Mainly, they run alongside old countryside footpaths that connected the settlements of Woolbrook and Manstone. Manstone Old House dates back to at least the 15th century, and the settlement name is possibly pre-Saxon. The hedges still show up on aerial photographs (Fig.10) and they can be matched with the 1839 field boundaries. If you take a walk and examine the hedges, you will find that some still show the characteristics of ancient hedges, i.e. many woody species and a rich herbaceous diversity. Sadly, the one between Lindemann Close and Woolbrook Rise is seriously neglected (Fig.11).

Fig.10 Old field hedges retained in Woolbrook and Stowford.

Fig.11 Relict Hedge bethind Lindemann Close

The large-scale expansion of housing is a relatively recent part of the valley's history, but changes in farming practice have caused a series of major alterations to the field and hedge pattern. The Saxon and Medieval changes noted above were more or less fossilised into the fabric of the valley by the 15th century in the form of wood pasture with small fields bounded by hedges with many standard trees. Kate Tobin's searches of the National Archive show that the standard trees were sufficiently important to be included as conditions in the terms of land leases. There are many records in Devon from the 18th and 19th centuries of leases with conditions to plant fruit trees and trees for timber, a practice that has provided many of the finest standard trees that we enjoy today. Here is just one example:

123M/L914 1705

29 October 1705
Counterpart lease for 99 years or 1 life in reversion
Lessee: Susanna Turner of Hitway, Sidbury, widow.
Fine: £25.
Premises: reversion, on deaths of lessee and son John, of ½ tenement called Leigh to which belongs 20½ acres and common of pasture for 37 sheep, in the tenure of Susanna Turner.
Life: Susanna lessee's daughter.
Rent 15s., to plant 3 oak, ash or elm trees annually or forfeit 3s. 4d. for each tree.

Recent history

After the enclosure of the upland plateau in late Victorian times, successive Ordnance Survey maps show some limited change in the field patterns up until 1944. Apart from the spread of housing development, there were some pockets of the aggregation of small fields to form larger ones mentioned above. The area from Griggs Lane to Sidford demonstrates this (Fig.12), although there was very little change in the hillside area south of Griggs Lane.

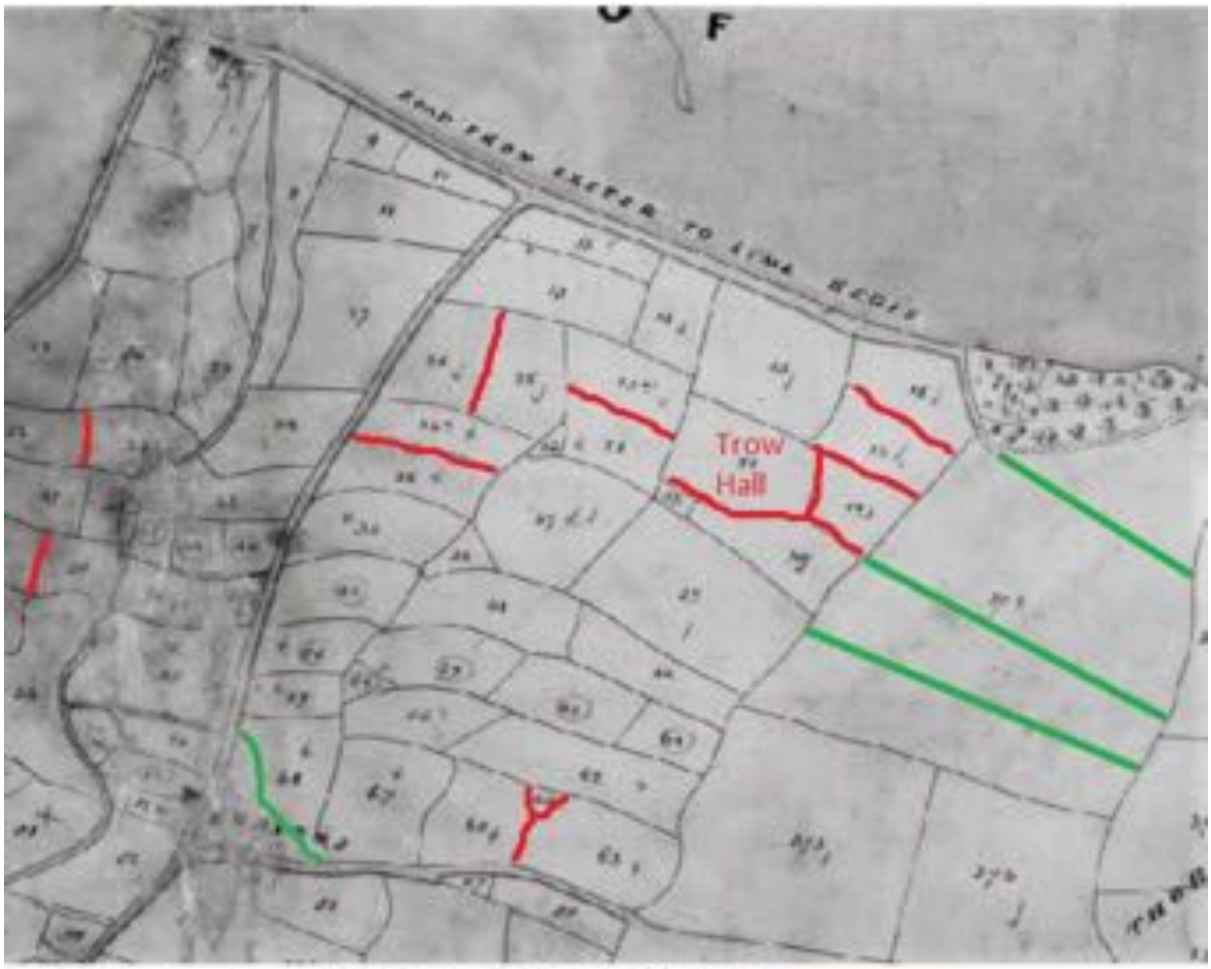

Fig.12 Hedgerow changes 1839-1944

After the Second World War, there was a drive for the country to be self-sufficient in food supply. Across the country, many hedges were removed to increase the land area available for planting, there was also the need to accommodate larger farm machinery. This process was encouraged by government grants.

Analysis of changes to the hedges recorded by post-war aerial photographs showed that the country lost an estimated 3,000 miles of hedgerow **per year** between 1946 and 1963 (Hooper). This single figure disguises a complex pattern of change, some hedges were grubbed out, others declined or became relict because they were neglected, and many miles were lost to rapid post-war housing and industrial development.

The loss of hedgerows continued into the 1990s. A survey by the Institute of Terrestrial Ecology (Barr) showed that there was a net loss of 19,000 km by various processes between 1978 and 1991. Finally, the government responded to a wave of public concern and introduced the 1997 Hedgerow Regulations Act which required landowners to seek permission before removing a hedge. This slowed the loss, but hedgerows are still being lost, grubbed out as towns expand, and by slow neglect if landowners stop maintaining them.

The Sid Valley has fared better than areas of intensive arable farming such as East Anglia, but there have been losses. If you compare the Griggs Lane area with a modern OS map, there have been further losses since 1944 (Fig.13).

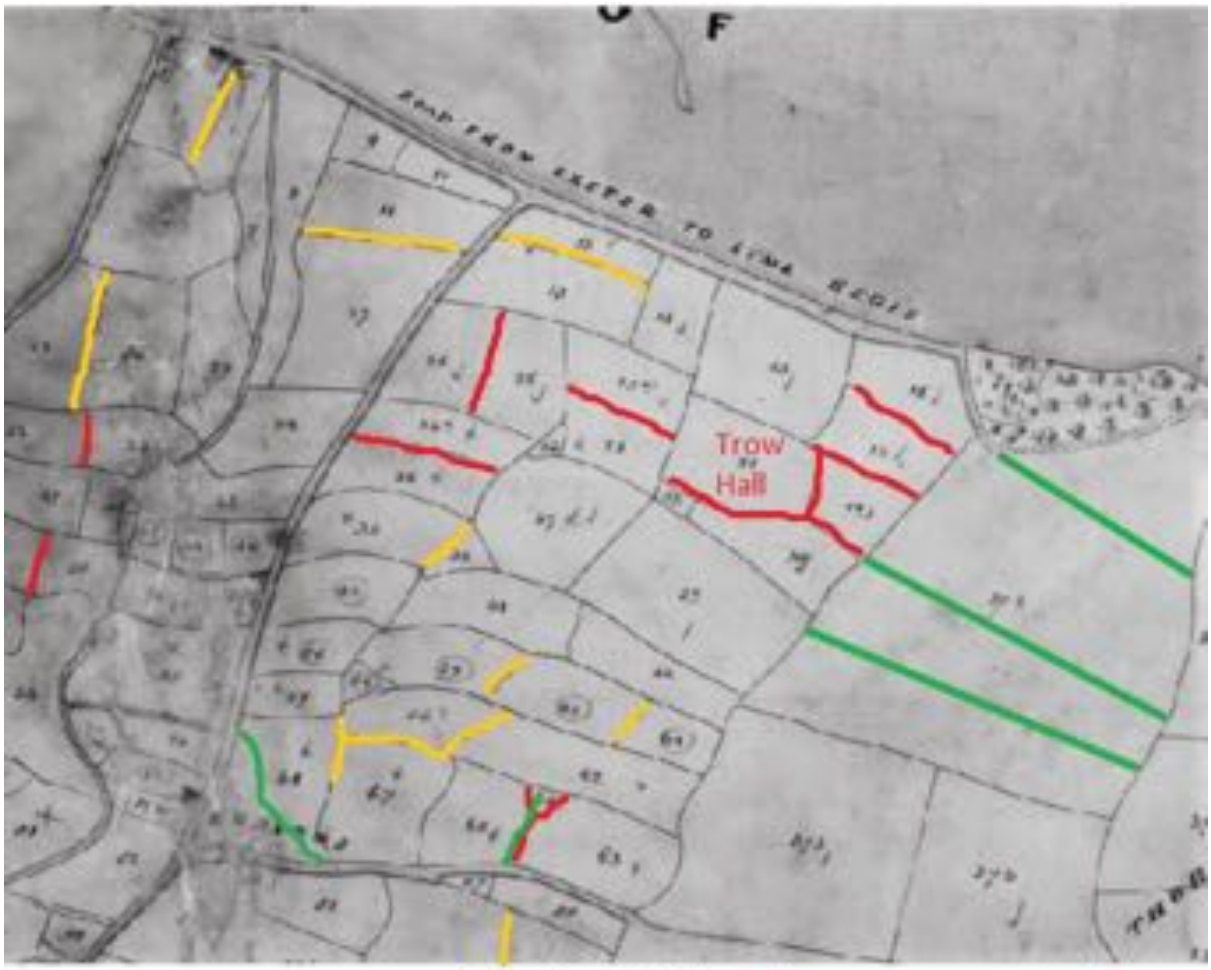

Fig. 13 Changes 1839-1944-2020

The Griggs Lane area is not unique, apart from the loss because of housing development to the south of the A3025, the area north of Waitrose, around Core Hill Lane is still farmland but it has also lost sections of the old hedgerows.

Again, comparing the layout on the Tithe Map with a modern Ordnance Survey map, it is clear that the field pattern has changed (Fig.14). There are now fewer but larger fields.

This is not a simple case of hedge removal; this section of the OS map records some 400 m of hedges in this area that did not exist on the Tithe Map, new hedge to excise building plots from fields, and new hedge to regularise the new field pattern. Fig.13 shows that one of the hedges in fields adjacent to Griggs Lane that was removed by 1944 was reinstated by 2020.

If we move further up the valley towards Sidbury, the picture is even clearer (Fig. 15). Looking at the Tithe Map between Sidbury Castle and the Cemetery, the hedgerow loss has been just as dramatic. This is not surprising because many of these fields are arable and subject to the pressures mentioned above.

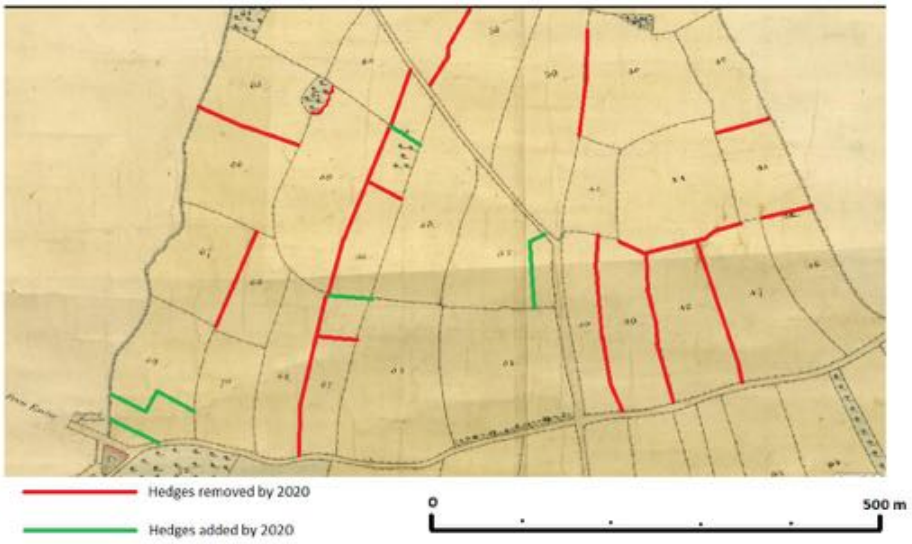

Fig. 14 Core Hill Lane, hedgerow changes 1839-2020

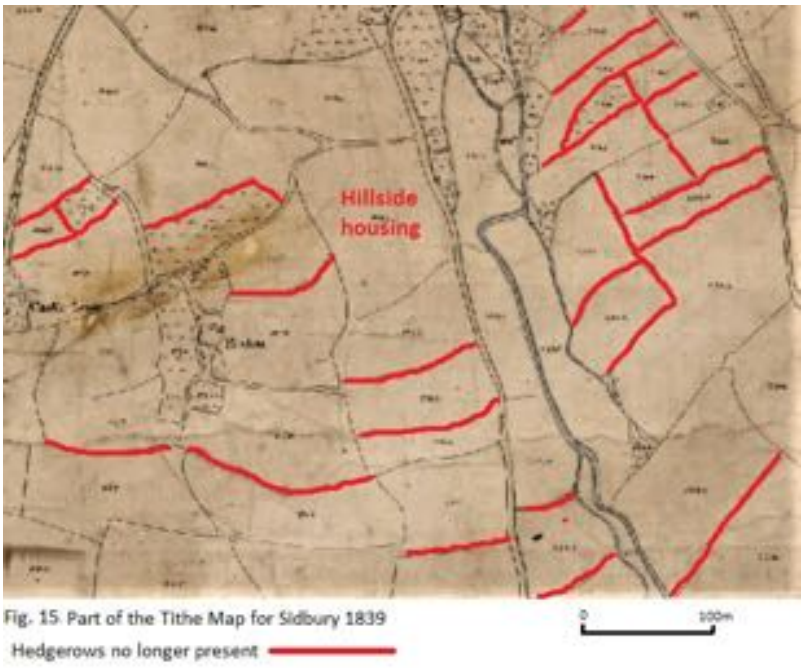

Fig. 15 Part of the Tithe Map for Sidbury 1839

To give an idea of the extent of the loss, the hedges were measured on a scaled map. In the Tithe Map of Fig. 12, the area bounded by Griggs Lane, Sid Road, the A3052 and the spring line at the top of the fields has about 8,700m of hedgerow. Surveying the same area now, 1,500m (17%) of that hedgerow has been removed or lost through neglect in the last 160 years, much of that in the last 50 years.

In the Core Hill Lane section (Fig. 14), the Tithe Map records some 5,800 m of hedgerow, but the modern OS map records only 4,000m in the same field space, a 31% loss in an area of less than ½ km^2. This would be a 38% loss if it wasn't for 400m of new lengths of hedgerow planted around building plots excised from the fields.

If we are considering the value of hedgerows as havens of biodiversity rather than just their aesthetic impact, the results of the Arboretum 2020 survey show that the new hedging will not mitigate the loss of an equivalent length of old hedge. As Max Hooper found out, the longer a hedge

is in place and maintained, the more species will take up residence, this is true for woody species, but also herbaceous plants and a wide range of animals, invertebrate and vertebrate.

The loss of hedges in the valley floor below Sidbury Castle will represent an even greater loss of biodiversity because these fields and their hedges are likely to have been under cultivation since before the Romans passed through. The rectangle of Fig. 15 is just over ¼ km^2 and had 7,000m of hedgerow in 1839, now it has 4,800m, again a loss of 31%.

These calculations only count the length of the hedgerows lost but, as the valley has developed as wood pasture, the standard trees in the old hedges had a significant impact on the look of the valley and its wildlife. The Arboretum survey is counting the number and size of the standards that we still have today. Currently, we have approximately 500km of hedgerow with 31,000 standard trees, which sounds a large number, but it is a significant reduction on the former population.

We know from Swete's Diaries that we have lost many Elms. Also, the remaining hedgerows have far fewer mature standards than they would have had before modern hedge management which is largely carried out with tractor borne flails. It is known that post-medieval hedgerows in areas of wood pasture had standard trees, mainly pollards, every 6-10m (Barnes, et al.) The, 1789 Sidmouth Manor Map, 1839 Tithe Maps and the 1888 Ordnance Survey 26-inch Maps all show trees at an approximate spacing of 7m in most of the hedgerows. This equates to one every 16m, which indicates that we have lost half the standard trees that would have been seen in most hedgerows 160 years ago. Today's 500km of rural hedges represents a loss of approximately 30% of the hedges from the same area in 1839, add to this the hedges lost to urban development and there was probably close to 1,000km of hedge. If they were planted every 7-8m, that gives a population of between 125-142,000 standards trees. No wonder Butcher's view was obscured.

Ash trees make up 20% of the standards, that is over 6,000 mature trees. As Ash Dieback spreads across the valley, the loss of the environmentally valuable standard trees will accelerate over the next few years.

Conclusion

The Sid valley has three distinct underlying topographies, the hilltop plateau, the steep valley sides and the comparatively level valley floor, this area being subdivided into that part close to the river and the rest. Where the land is still fields bordered by hedges, these topographies and their impact on the population have led to different histories of land use and we can make speculative estimates of their age.

The valley floor close to the river is poorly drained and has probably remained unchanged since Saxon times except for the part affected by the modern expansion of urban Sidmouth. The other level land has a field pattern that went through different phases until it became more or less fixed in the late Medieval period but has been subject to field aggregation in the last century. The hedges that have not been removed probably date from the 15th century.

The co-axial fields that climb the steep valley sides progress in age from about the 12th century at the foot up to the 15th century for those at the top of the slope below the geology change from Mudstone to Greensand. These fields have been subject to less aggregation than the level areas.

The hilltop plateau fields are the only fields whose establishment we can date securely, they were enclosed in the late 19th century.

It has been a long story so far, but the hedgerows of the Sid Valley make a significant contribution to the aesthetic appearance and biodiversity of where we live. If we want future generations to inherit this valuable resource, then we need to work together to protect what we have. Sidmouth Arboretum, in conjunction with the newly formed Sid Valley Biodiversity Group, hope to play their part.

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