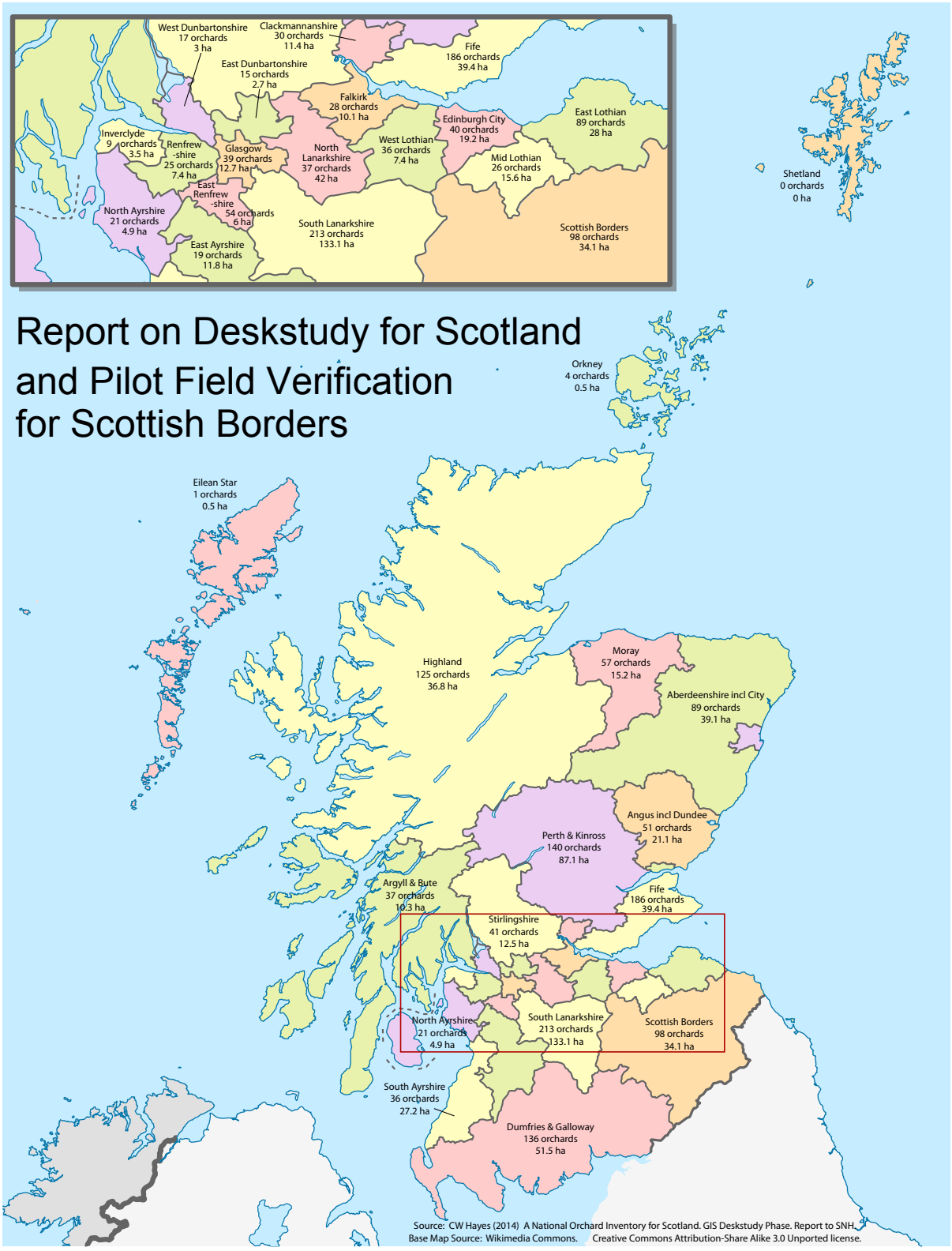
A National Orchard Inventory for Scotland



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Thanks for all your contributions

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1 Report Summary

Orchards represent much more than just fruit, though their fruit would be reason enough for their survival. They also hold an important place in the cultural heritage of many areas of Scotland; in names, personal memories, history, and commerce. The wider vision of this project is that they continue to do so.

The orchards of Scotland have been in demise for many decades, mainly due to economic factors. Many of our large traditional orchards have been lost. However, over the last decade or so there has been renewed interest in ensuring they survive.

This project will create a firm foundation for their survival over generations to come. They are part of our living history, particularly when one considers that some of our oldest pear trees could have been planted before the Act of Union.

The completion of the first of two major steps in the creation of a National Orchard Inventory for Scotland is reported here. It has been over a century since the last comprehensive national orchard survey was carried out.

This first step is a detailed deskstudy using a geographical information system together with diverse other sources of data. Also reported is the pilot carried out in the Scottish Borders for the second step which is Field Verification by volunteer survey.

The Deskstudy found:

- 1859 sites considered
- 1728 proposed as candidate orchards to go forward to field survey
- Orchards found in 31 out of 32 Unitary Authority areas.
- South Lanarkshire, followed by Fife have the largest number of candidate orchards, at 213 and 186 respectively
- Dumfries & Galloway, Highland, Perth & Kinross and Scottish Borders all have over 100 candidate orchards.
- The total area of candidate orchards is 714 hectares. This includes mixed habitats such as garden areas or walled gardens that contain an orchard.
- South Lanarkshire has the largest area with 133 hectares, much of which is found in the Clyde Valley.
- Perth & Kinross follows up with 87 hectares, including the Carse of Gowrie.
- Aberdeenshire, Dumfries & Galloway, Fife, Highland, North Lanarkshire, and the Scottish Borders all have more than 30 hectares each.

The pilot on field verification by survey in the Scottish Borders showed:

- 98 orchards are confirmed to exist in the Scottish Borders
- 42 sites were confirmed not to be orchards or contained less than 5 fruit trees
- most orchards were found in private gardens but estate orchards and walled gardens also made up significant numbers
- eating apples predominated, while half the orchards contained cooking apples, pears and plums.
- walnut and cobnut are grown in small numbers
- over 2000 fruit trees were individually recorded across the Scottish Borders
- significant quantities of veteran tree features were recorded indicating high biodiversity in many orchards
- Size: most orchards have up to 30 trees. Three orchards recorded more than 100 trees.
- Age: Many orchards are mixed age, but most also contain old trees.
- Management: the majority of orchards have at least some management but a fifth are abandoned or have no management.
- Use of fruit: for most orchards fruit is used within the family or given away to friends. Many orchards also have fruit left on the ground. Very little selling of fruit is done.

2 Introduction

There has been growing interest in traditional orchards in Scotland for nearly a decade. This interest has a great breadth; from cultural heritage and horticultural practice, to historic varieties and the gradual disappearance of this unusual Scottish habitat.

The document reports on a further stage in creating a National Orchard Inventory for Scotland. It describes work carried between 10th October 2013 and 31st March 2014.

2.1 Aims of Project

The aim of the project is to create a comprehensive orchard inventory for Scotland. This has probably not been attempted for over a century.

The rationale that underpins this aim is that an Orchard Inventory will form the basis for addressing a number of issues linked to the decline of orchards over the last four decades and create a strong foundation for their revival.

Raising awareness of the value of Scotland's orchards will be a key 'soft' outcome.

The 'hard' outcome will be a publically available GIS dataset.

3 Deskstudy

3.1 Methodology of Deskstudy

The project was designed to be implemented in a two-stage process. Firstly a Deskstudy creates a list of candidate orchard sites, and then in a second stage, a visit is made to each site to verify it is an orchard and to collect other useful data. Data from the Deskstudy and the Field Verification visit are then merged into a record of the site.

A Geographical Information System (GIS) is used to identify sites and manage data.

The Deskstudy used Ordnance Survey mapping, historical mapping, aerial images, existing surveys, other existing datasets, and information from local orchard projects to identify, assess, and record 1859 sites across Scotland.

The methodology of the Deskstudy is reported in detail in Annex 1, Section 6.

The Deskstudy has been implemented across Scotland in all 32 Unitary Authority areas.

3.2 Deskstudy Results for All Unitary Authority Areas in Scotland

3.2.1 Number of Sites Considered

During planning, the Deskstudy anticipated that a little over 1000 sites would be considered. The implementation of the Deskstudy showed that many more sites needed to be considered. The summary results are shown in the table below.

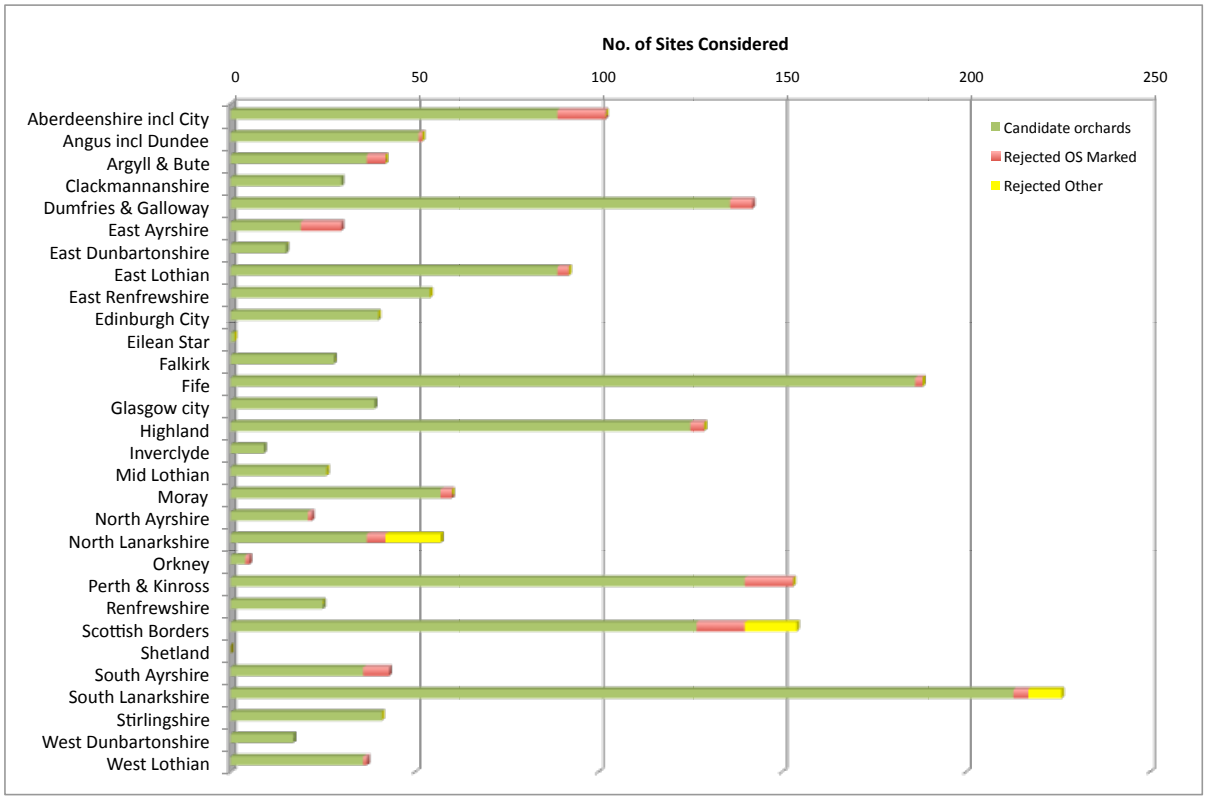
Table 1: Summary of Number of Sites Considered

Total Sites Considered	Candidate Orchards Sites	Site considered but rejected	
		OSMM marked	Other
1859	1728	93	38

While 1859 no. sites were considered, only 1728 no. are proposed as 'candidates' to be taken forward to the Field Verification stage. Of those sites that were rejected, a total of 93 were given the 'Orchard' attribute in OS MasterMap. The Deskstudy indicates that these sites were incorrectly attributed or the land use has changed since the last update of this attribute by OS. A further 38 sites that were considered from other sources of information were also rejected.

The detail of numbers of sites by Unitary Authority Area is given in the graph below.

Figure 1: Number of Sites Considered, by Unitary Authority Area



In terms of Candidate Sites (green bar) it shows that South Lanarkshire and Fife have the largest number of orchard candidate sites. While this may be expected for the former, given the inclusion of the Clyde Valley orchards, the high number of sites in Fife is a welcome surprise. Below this, in a bracket of 75 to 150 candidate orchards, are Aberdeenshire, Dumfries and Galloway, East Lothian, Highland, Perth & Kinross, and the Scottish Borders.

The data is given as a table in Annex 1, Section 6.3.3 below.

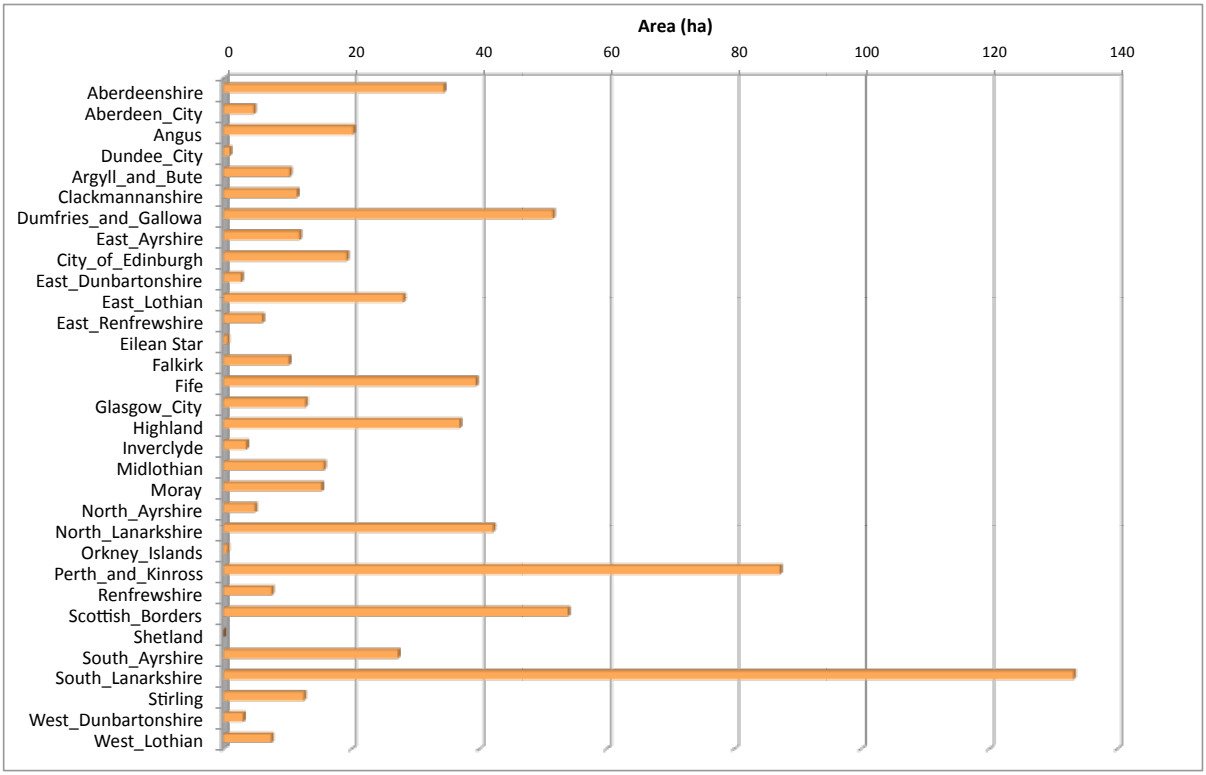
3.2.2 Area of Candidate Orchards

The total area of candidate orchards across Scotland is 714 hectares.

The total areas by Unitary Authority are shown in the figure below.

A data table is given in Annex 1, Section 6.3.3 below.

Figure 2: Total Area of Candidate Orchards, by Unitary Authority

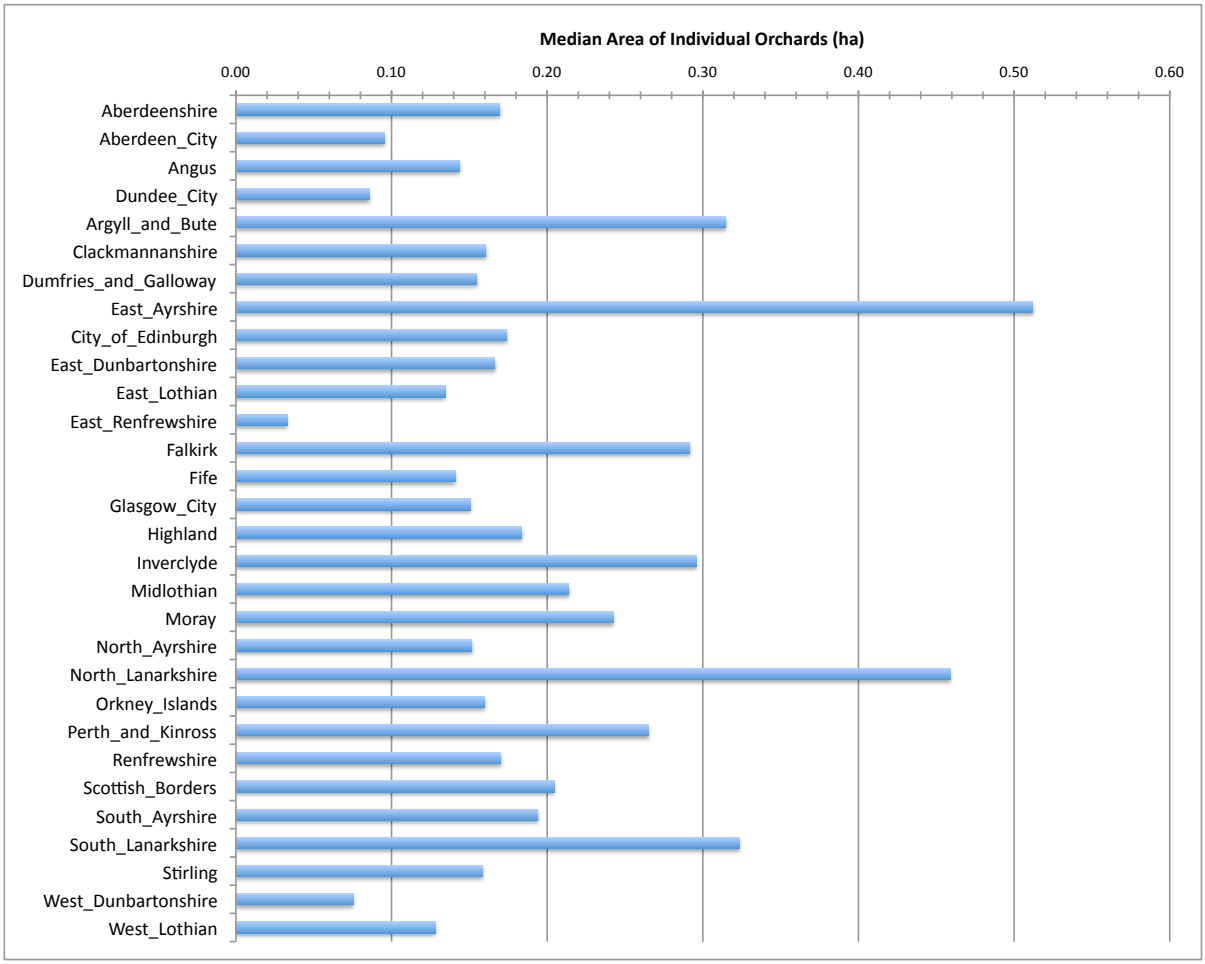


The graph shows that South Lanarkshire and Perth & Kinross have the largest total areas of candidate orchard, reflecting the presence of the Clyde Valley and the Carse of Gowrie, the two most renowned orchard areas of Scotland.

With more than 40 hectares, Dumfries & Galloway, North Lanarkshire, and the Scottish Borders are strong runners up.

With more than 20 hectares, Aberdeenshire, East Lothian, Fife, Highland, and South Ayrshire make their presence felt.

Figure 3: Typical Size of Orchards; Median Area



The median area is the area which 50% of the orchards are larger and 50% smaller.

For many Unitary Authority Areas, the median area of an orchard is around 0.15 ha, though for several other locations, the median area is between 0.25 – 0.35 ha. Only East Ayrshire and North Lanarkshire are larger at a median of around 0.5 ha. Looking at the base data shows that East Ayrshire has a small number of candidate orchards identified, but that they are mainly of a larger size, and the same is true for North Lanarkshire.

3.2.3 Contemporary Presence on Historic Orchard Sites

The contemporary presence of an orchard on a historic orchard site could indicate that there is some likelihood that the orchard was in continuous existence for at least 150 years.

Table 2: Orchards Sites; Comparison of Contemporary & 1860s Map.

Sites Marked as Orchard on OS1st Edn	Total Sites Considered	Candidate Orchard Sites		Site considered but rejected	
		OSMM marked	Other	OSMM marked	Other
Yes	598	117	452	4	25
No	1147	445	611	85	6
Undetermined	114				
	1859				

In the first row of data, a total of 598 no. sites were found to be marked as Orchard on the OS 1st Edition maps, created in approximately 1860[1]. The sites that are also marked on the contemporary OS MasterMap (OSMM) number 117 candidate orchards plus 4 rejected sites. The majority of candidate orchards that were on the OS historic map are not on today's OS MasterMap; some 452 orchards across Scotland.

In the second row of data, a total of 1147 no. sites that were **not** marked on the OS 1st Edition are dealt with. Most of these are candidate orchards, comprising 445 no. that are on the contemporary OSMM plus 611 no. not on the contemporary map.

In the third row, the number of undetermined sites is given for completeness. This figure comprises sites for which the historic mapping either not available or its quality was too poor or unclear to make a confident determination.

To summarise;

- three quarters of sites that are both candidate and marked on the historic map, are not included in the contemporary OS MasterMap.
- 569 no. sites are candidate and marked on the historic map; this is evidence that this large number of sites could have been orchard habitat for more than 150 years.

3.2.4 Habitat Classification by EUNIS

An assessment of EUNIS habitat classification was made for each site according to an agreed framework. It should be noted that this is a preliminary assessment that will be updated during Field Verification.

Table 3: Summary of Habitat Classification of All Sites Considered

EUNIS classification	No. of Sites	EUNIS classification	No. of Sites
E7	5	I2.21	4
FA	3	I2.22	11
FB.3	1	I2.3	2
FB.31	162	X11	1
G	15	X22	2
G1	22	X24	185
G1.D4	747	X25	448
G1.D5	18	Misinterpreted	122
G2.D4	1	Various non standard	32
I1.21	6	Lost	38
I1.22	34	Total	1859

Aerial interpretation to determine height of tree is difficult and seldom accurate. Therefore, all G categories that require the 'tree' to be at least 5m high should be treated with caution.

The table shows that orchards are to be found in various habitats, including gardens and mixed habitats.

[1] Survey and publication dates vary across Scotland, but most OS 1st Edition maps here were surveyed from 1855 and published by 1865.

4 Field Verification

Field Verification is the act of visiting each and every candidate orchard site that the Deskstudy has proposed. It is the second of two stages in creating a National Orchard Inventory for Scotland.

The purpose is to verify the existence of the orchard, in the location and boundaries shown in the Deskstudy, and then to collect further information about the orchard.

This report covers a pilot of the field verification process that was conducted for the Scottish Borders. The lessons learnt will be applied to the forthcoming Field Verification for the rest of Scotland

4.1 Methodology for Field Verification Pilot

A coherent methodology was utilised that built on the practices of the Contractor's previous regional orchard survey work.

The detail of the methodology is given in Annex 1, Section 6.4.1

A key aspect of the method is that volunteer surveyors carry out the field verification.

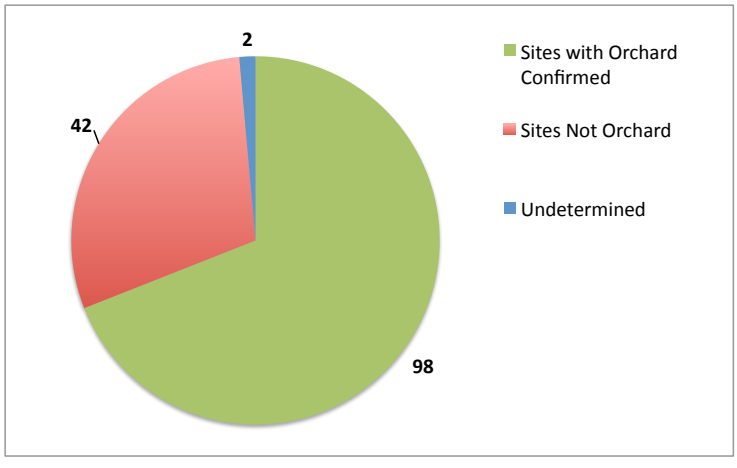
To summarise, survey resources and instructions were created at a national level, and then implemented at a local level by a local partner organisation. A Local Facilitator was employed to recruit volunteers, manage the fieldwork they carried, and handle incoming data.

The main data collection tool was e-form that was filled in by volunteers. Volunteers also submitted photos of each site.

4.2 Results for Field Verification Pilot in Scottish Borders

A large quantity of data was collected during Field Verification. 142 no. sites were considered as candidate orchards, and were therefore visited by the survey volunteers. The extensive results are reported below.

Figure 4: Outcome of Candidate Sites Considered in Field Verification in Borders



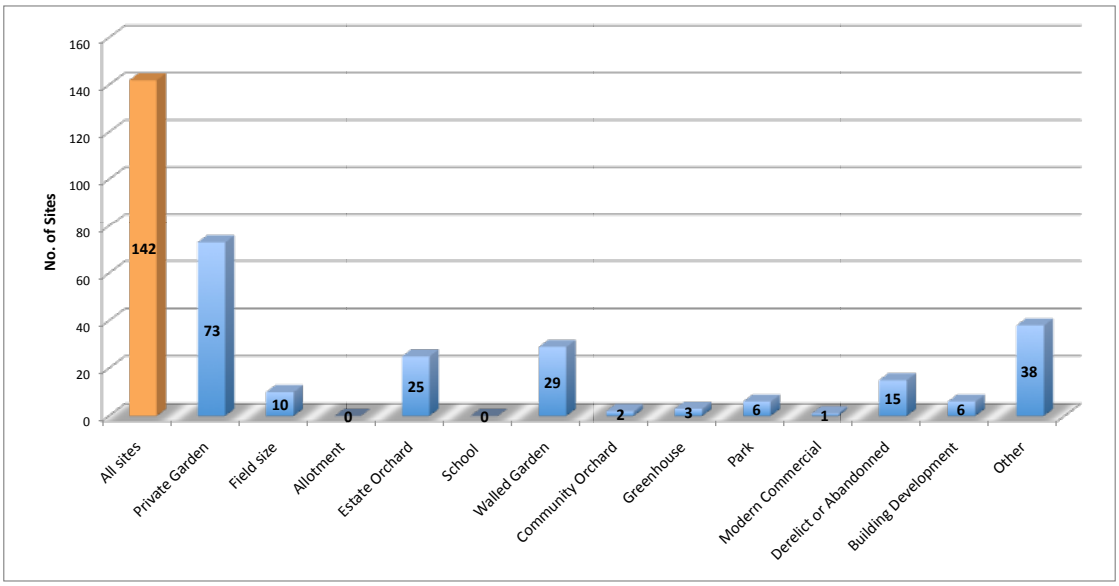
The chart shows that 98 no. of sites were confirmed as orchard, and had other details collected. Some 42 no. sites were shown not to be orchard; that is less than 5 fruit trees or entirely devoid of fruit trees.

Two sites were Undetermined because it was not possible to make contact with the owner, and not possible to determine the site without visiting.

4.2.1 Type of Site

The type of site was recorded as a simple metric that can give a powerful insight into the type of orchard being considered, as well as assisting in the habitat classification.

Figure 5: Type of Site

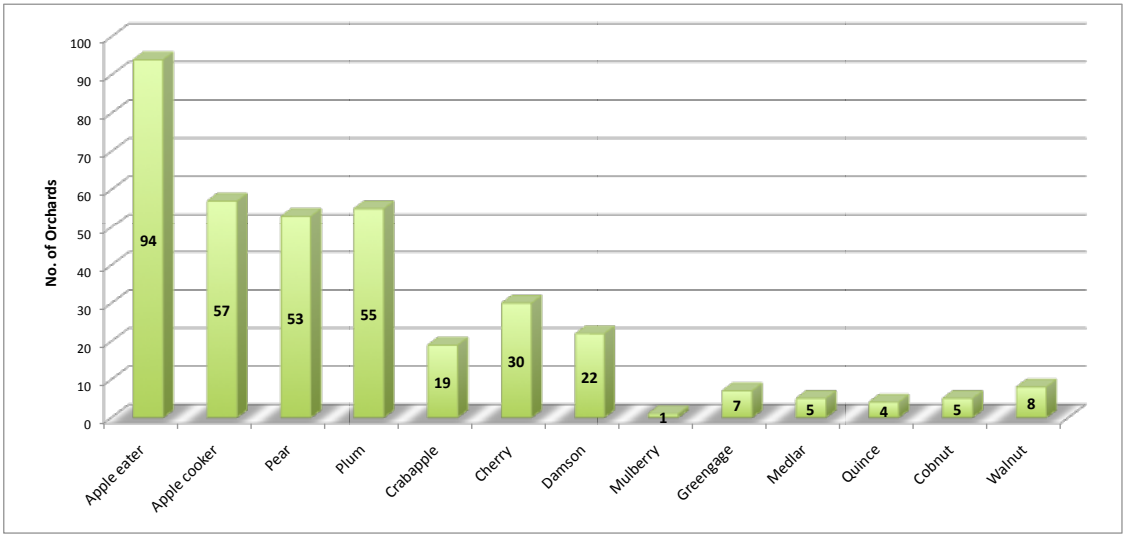


The graph shows that around half of the sites considered are private garden, while estate orchards and walled gardens make up more than a third of sites. Field size orchards only number 10 of the sites considered. The sites found not to be an orchard are amongst the final three categories to the right hand side of the graph.

4.2.2 Fruit Tree Species Recorded

A broad range of top fruit species were recorded in order to have a full picture of the fruit produced.

Figure 6: Fruit Species Recorded in Scottish Borders Orchards



Unsurprisingly most orchards contained eating apples and a little over half also had cooking apples.

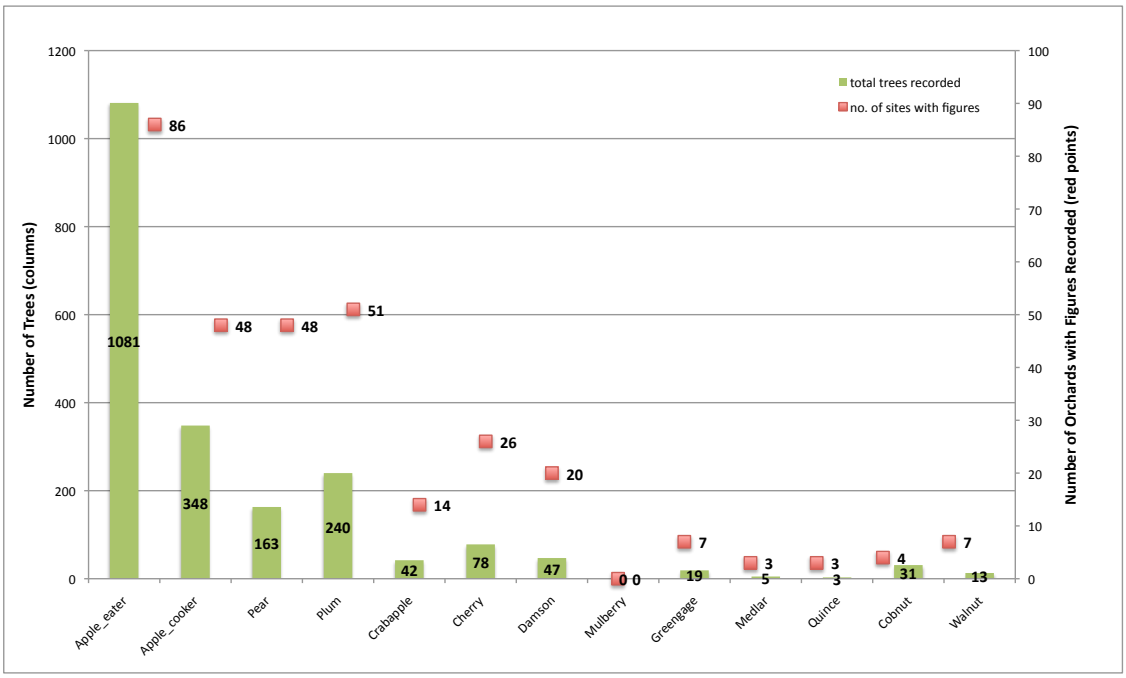
Again, a little over half of the orchards had pear and plum trees.

Just under a third had cherry, and around a fifth had crabapple and damson.

Other top fruit and nut species were found in 5 –10 % of orchards.

In some but not all orchards, the specific number of fruit trees of different species was recorded.

Figure 7: Number of Different Fruit Trees Species Recorded



The red points (right hand scale) show the number of orchards that have figures for the species recorded. The green column (left hand scale) shows the total number of trees of that species recorded in those orchards.

While the trends are similar to the previous chart, the detail of numbers reveals the stock of trees in the orchards of the Scottish Borders.

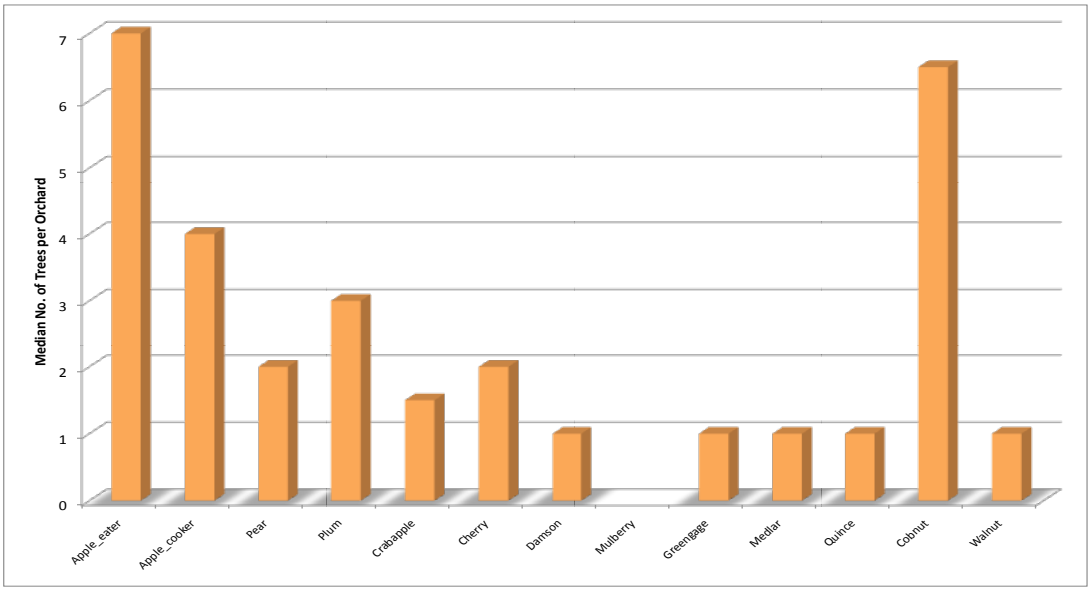
For example, 1081 eating apple trees were recorded in 86 orchards, and a further 348 cooking apple trees in 48 orchards.

Also recorded were 163 pear in 48 orchards, and 240 plum in 51 orchards. Smaller number of trees were recorded for other species.

Typical stocking of an orchard: The graph below shows the median number of each species of fruit tree in orchards where they have been recorded. The median value is the number of trees that half orchards (with figures recorded) will have greater than, and half will have less than.

For the common species such as apple, where most orchards have figures recorded, the median is a good indication of what is typical in the Scottish Borders. So half of the orchards in the Borders have more than 7 eating apples, and half have less than 7 eating apples. The median is also likely to represent the typical situation for cooking apples, pears and plums.

Figure 8: Typical Stocking of Each Species in Scottish Borders Orchards



However, for species where low numbers of orchards are recorded (to the right hand side of the chart), the median only represents the situation for those orchards that figures are recorded. For example in the 4 cobnut orchards recorded, the median represents just those orchards not the typical Scottish Borders orchard.

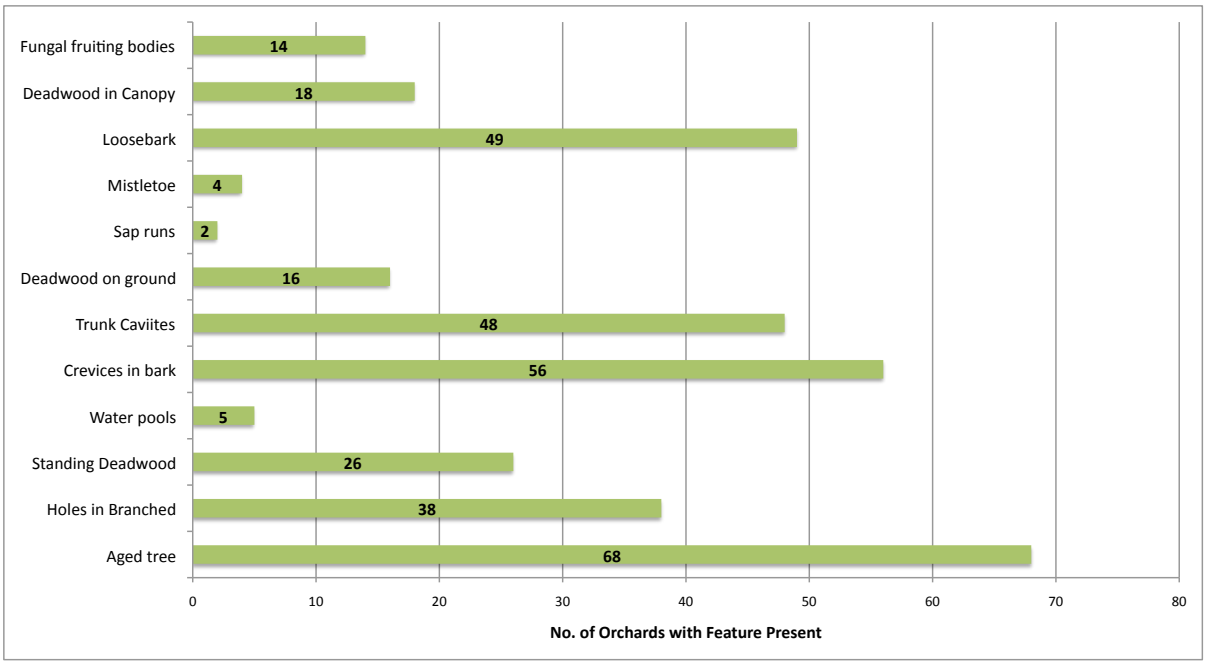
Information on varieties recorded is given in Annex 1, Section 6.4.3.

4.2.3 Veteran Trees Features

The features recorded in this section provide information on two important aspects:

- Tree health
- Indication of biodiversity

Figure 9: Orchards Found with Veteran Trees Features



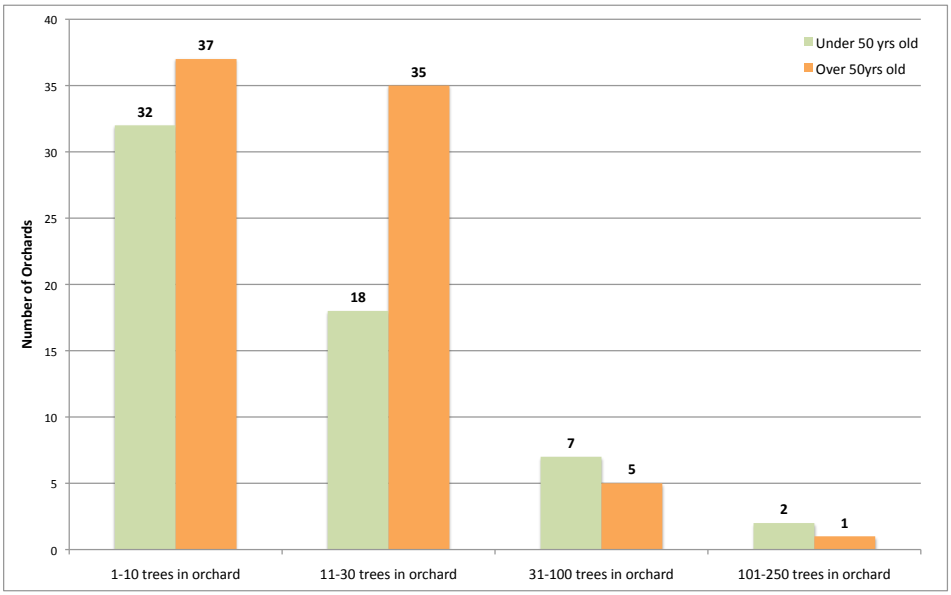
Half or more of orchards were found to include aged trees, crevices in bark, trunk cavities, and loose bark. Though positive indicators of biodiversity, these features do not indicate imminent health problems.

A relatively small number of orchards contain features indicating poor tree health, such as sap runs (which can indicate viral infection) and fungal fruiting bodies (indicating long-lived chronic decay).

Mistletoe reported in 4 orchards is unexpected but welcome, generally considered to be quite rare in Scotland.

4.2.4 Size of Orchards by Tree Numbers

Figure 10: Classifying Size of Orchards in terms of Numbers of Younger & Old Trees



The size of orchards has been assessed in 2 ways. The Deskstudy has already considered the area of each orchard using the GIS system. Those results are given earlier in this report. The other way to consider size of orchard is by number of trees in the orchard. That information is collected in this survey work. To provide an even fuller picture, we have split numbers of trees into numbers of younger trees and into numbers of older trees.

For the purposes of the field verification survey work, and in the context of this survey question, trees more than 50 yrs of age are considered 'Old'.

The graph shows the numbers of 'younger' trees and the number of 'old' trees found in orchards. This data is grouped into size groups: 1 – 10 trees in the orchard, 11-30 trees, 31-100 trees and so on.

The left hand pair of columns shows that 32 orchards had 1-10 younger trees and 37 orchards had 1-10 old trees.

Moving across the next pair of columns, 18 orchards had 11-30 younger trees and 35 orchards had 11-30 old trees.

Significantly fewer orchards had more than 30 trees, and only a handful more than 100 trees.

The graph shows that trends of younger and old tree populations are different. For younger trees, there is a clear linear relationship. Smaller orchards are more frequent.

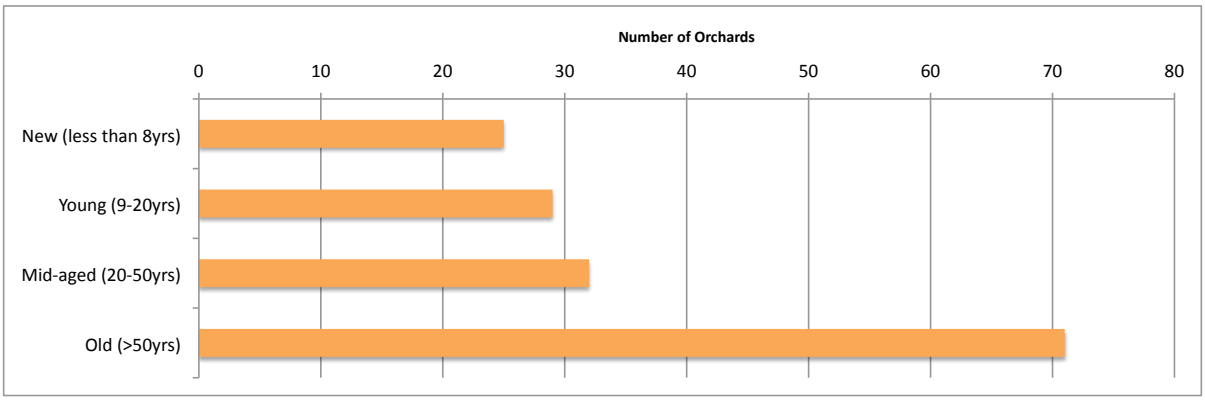
For old trees, this is not the case. There are similar numbers of older tree orchards in both the 1-10 trees and 11-30 tree size groups.

The difference may reflect new planting of smaller orchards in recent years, compared to relatively larger orchards planted more than 50 years ago.

4.2.5 Age of Trees in Orchards

The age of trees contained in an orchard was recorded. Ages were grouped into 4 categories to simplify the assessment in the field.

Figure 11: Number of Orchards with Trees of Various Age Groups



Note: An individual orchard can contain trees in any or all these age groups.

The graph shows that most orchards contain trees older than 50 yrs of age. Around a third of orchards in the Scottish Borders contain trees in the 20-50yrs age bracket, while around a quarter of orchards have New and Young stock.

This shows that the majority of the orchards recorded in the Scottish Borders are well established, but that planting of new trees (in existing and new orchards) has continued over the last five decades.

4.2.6 Remarkable Trees

The survey considered the presence of remarkable trees. The question was intended to be open to allow reporting of various unusual specimens. The response was:

- 28 orchards contain remarkable trees.
- 40 orchards do not contain remarkable trees.

Without further information, it is assumed that sites with no response to this question do not contain remarkable trees.

The following are comments from survey forms give a flavour of the trees encountered:

- Amazing fan trained apple and some other large veteran trees
- Majority of trees have fallen and are still productive - loads of veteran features
- Two fallen trees - still clinging to life.
- Great fan plum and fan pear
- The older trees are great! 1 x crab apple and 2 x eating apple have a girth of approx. 1.3m
- have photos, two old pear trees, 100cm to 110cm
- "both pear trees and one apple are veteran trees the pears should have some type of protection order if possible. "
- Approx. 65% of all trees have girth over 1m; there is a pleached(?) aged apple and a large fallen (yet productive) pear. 90% of trees are gnarly and have cavities and crevices.

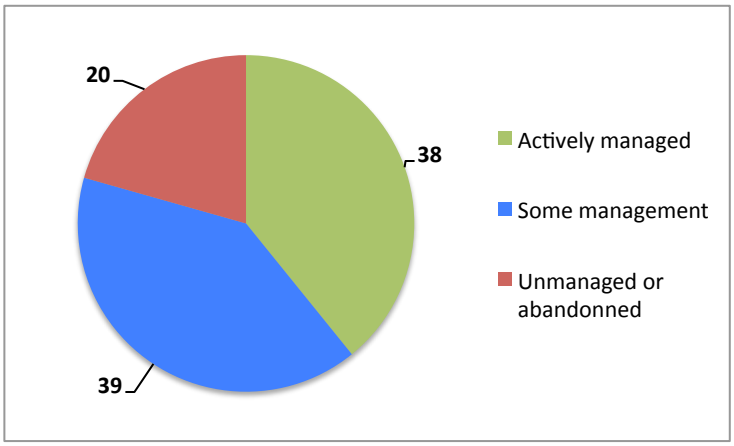
- girth approx 200cm (estimated - no tape)
- 2 x cooking apples with girth of over 1.2m
- 100cm (widest tree)
- double stemmed large apple tree - girth approx. 1m at branching point
- White Melrose tree - amazing. Huge girth (1.4m) and veteran features. The owner took an apple to the Harestanes Apple Day for I.D. and Alec west said that it was a pure version than in the National Collection. Another couple of apple trees are notable.
- Old Pear has nice veteran features - girth of approx. 90cm
- Trees were over 5m but have been pruned back hard within last ten years. One tree has a substantial trunk which measures well over 2 metres in circumference before spliting into two huge bows. A photo is enclosed.
- Many gnarly old trees, with loads of veteran features. Many are multi-stemmed and some (4 or 5) have a girth of approx 1.2m
- Some of the fan trees had base girth of >1m
- Stunning collection. At least 4 apple trees were remarkable - girth over 1.2m
- There is a fantastic very old fan pear tree - see photos
- Trained in vase shape from young – four leaders
- Amazing walnut tree - approx 3m girth
- Huge apple trees - girth of over 1.3m
- Worchester Pearmain - girth over 1.3m; Blenheim orange - many veteran features (hollow trunk); Bramley's Seedling - huge girth, multi-stemmed; Victoria Plum - twisted trunk. Beauty of Bath - large and gnarly.
- pear tree ~150 years old.
- old free standing trees and espalier on outer wall.
- One very old tree - split in two, new shoots coming from the middle. Photo taken.
- Very old trees with girths between 80cm - 1.3m. Loads of veteran features. Still very productive. One has a woodpecker nest in it.
- 2 old medlar trees, no girth as split from stump near ground level.
- trees were originally planted along a wall as espaliers (?) now growing vertically from years of pruning neglect

The comments provide a colourful illustration of what was may be encountered and form the basis for further investigation.

4.2.7 Orchard Management

The extent of orchard management is given in the figure below.

Figure 12: To What Extent Are Orchards Managed



The chart shows that over a third of orchards are actively managed, and that over a further third have some management.

A fifth of orchards in the Scottish Borders are unmanaged or abandoned.

4.2.8 Orchard Floor vegetation

The orchard floor is an important part of the orchard habitat, both for biodiversity but also as a further element of the growing space.

The generic term used across various habitats, is the 'field layer'.

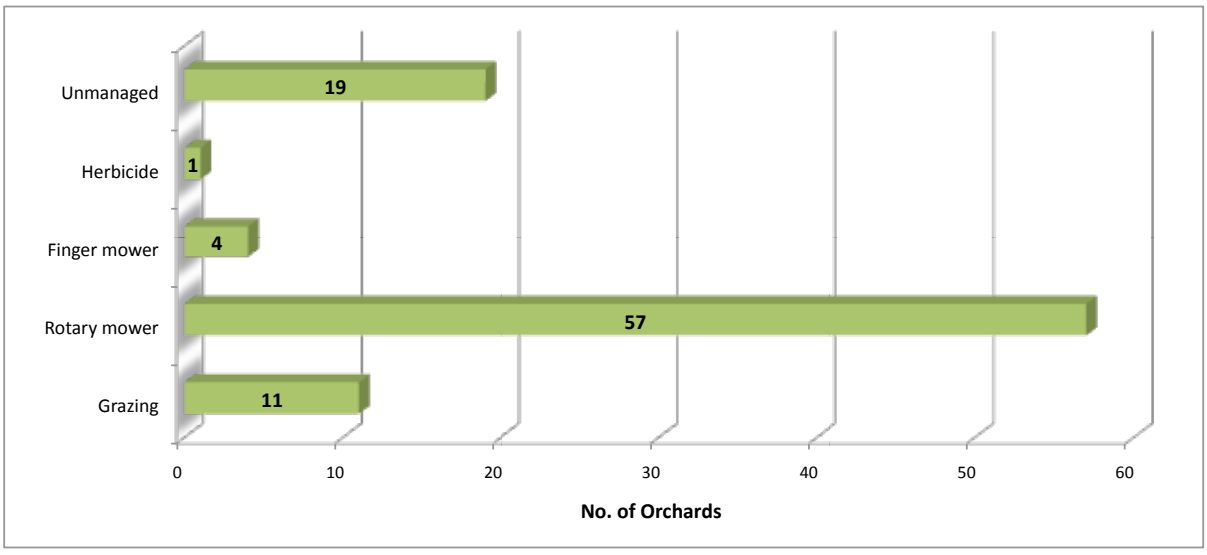
Figure 13: Field Layer; Constituents of the Orchard Floor

The graph shows that the majority of orchards have some sort of grass cover at the field layer. Just under a third are recorded as lawn, that is closely & regularly mown.

In other orchards, the presence of various types of tall weed through to scrub is recorded.

Around a tenth of orchards have cultivated land on the orchard floor.

Figure 14: Management of Orchard Floor



Note: Each orchard can contain multiple constituents

Methods of managing the orchard floor vegetation are shown above. The majority of orchards are cut using a rotary mower. Only 4 orchards use a finger mower. This sort of mower is less destructive to invertebrate life in the sward. Only one orchard is recorded as being managed with the help of herbicide. Around a fifth of orchard have an unmanaged field layer, which corresponds to the figure for unmanaged orchards in Figure 14 above.

A tenth of orchards are grazed. The type of grazing animal is given in the table below.

Table 4: Animals Grazing Orchards

Sheep	Cattle	Horses	Pigs	Fowl
3	3	1	1	6

In orchards where horses and pigs graze, the trees need to be substantially protected if severe damage is not to result. Both sheep and cattle present less of a problem. Fowl of various sort are traditionally found in orchards.

Data collected on damage by herbivores to orchards is given in Annex 1, Section 6.4.3, as is information on habitat elements that neighbour the orchard.

4.2.9 Undercrops

The growing of other crops within an orchard – known as undercrops - was formerly a much more common practice than it is today.

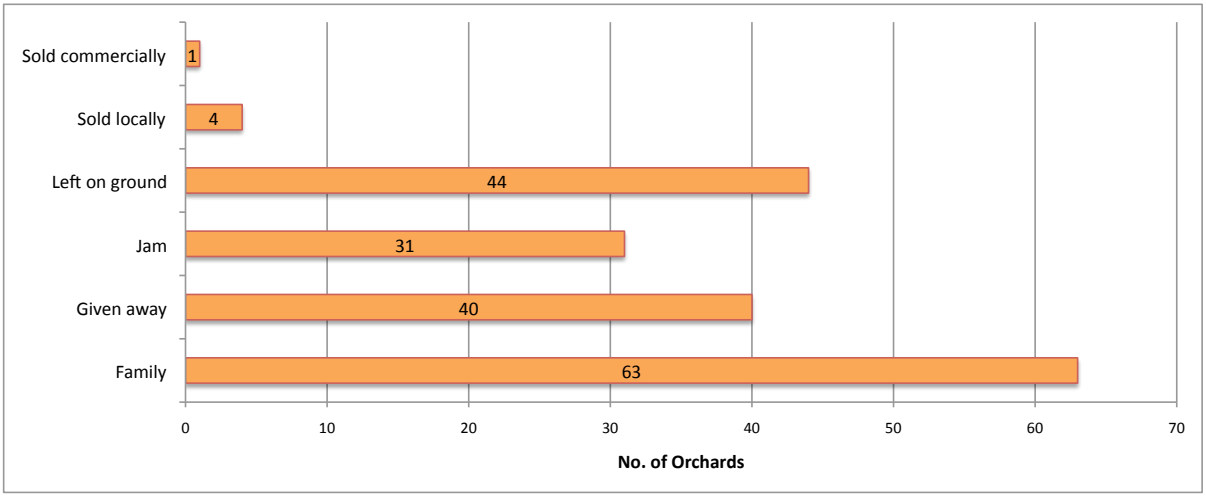
Table 5: Undercrops Recorded in Scottish Borders Orchards

Gooseberries	Currants	Raspberries	Other soft fruit	Vegetables
4	6	7	5	3

4.2.10 Use of Fruit

In response to the question regarding use of fruit from the orchard 'Yes' was reported 67 times and 'No' 17 times. Thus more than two thirds of orchards have fruit used to some extent.

Figure 15: How Fruit is Used



Note: Each orchard can select multiple outcomes.

The chart shows how fruit was reported to be used. For the majority of orchards, fruit was used within the family, while nearly half the orchards had fruit given away. Making jam was the outcome for fruit in almost half the orchards.

In terms of economic use, only one orchard sold fruit commercially while a few others sold fruit locally. However for around half the orchards fruit was left on the ground. While this may create benefit to local biota, in terms of the local economy it represents both a significant waste of resource and a latent opportunity.

4.3 Learning from the Pilot

The pilot clearly demonstrated that the methodology for Field Verification worked.

Knowledge

A great deal of detailed data was collected, and this has created a significant amount of knowledge about orchards in the Scottish Borders. This creates a great foundation for further work that will be better tailored the existing orchards.

In terms of the detail of the data collected, some minor improvements are indicated in what is asked; for example the question on 'Size of Orchard' is complicated by splitting the response into trees younger than 50 yrs and older than 50 yrs. It also makes presenting readily understandable results more difficult. A similar issue arises with data from the proportion of trees above and below 5m. These can be addressed is a revised form design.

Process

The feedback from both volunteers and the Local Facilitator (see Section 6.4.4 and 6.4.5) indicates that:

- Employing a Local Facilitator is an essential link in the data collection chain
- A timely approach to fieldwork, starting in late summer would help considerably
- Survey resources and instruction are fit for purpose. Only minor improvements are indicated.
- Some volunteer training would be desirable for specific aspects; initial person-to-person engagement with owner, some guidance on orchard assessment to improve quality, some guidance on photography and how to label and submit photos.

Reviewing the experience of data collection, receiving forms and processing the data (see Section 6.4.6) we can conclude that:

- The e-form methodology works well most of the time, but there have been file corruption issues 'out in the wild'.
- Numbering of all files with Unique ID needs to be further emphasised.
- The use of Adobe Reader as the only e-form filling tool needs to be further emphasised.
- An alternative channel of submitting information, such as web form should be developed so that sole reliance on pdf form is alleviated.

4.3.1 Implications for Ongoing Field Verification

The implications are that:

- Only minor revisions to the methodology are required before ongoing field verification

- Local Facilitators and local partner organisations are essential partners in the process.
- Local Facilitator is a demanding task and must be a paid role.
- Identifying and engaging with local partner organisations for all parts of Scotland is necessary in order to have Local Facilitators in place before Field Verification is carried out.
- Measures have been identified to built further resilience into e-data collection and these should be implemented.

5 Conclusions & Recommendations

5.1 Conclusions from Deskstudy

The Deskstudy for Scotland was successfully completed.

Almost double the number of sites that were originally anticipated have been considered. Projected outcomes have been surpassed by quite a margin.

Results

Data collected in the Deskstudy show:

- 1859 sites considered
- 1728 proposed as candidate orchards to go forward to Field Verification
- Orchards found in 31 out of 32 Unitary Authority areas.
- South Lanarkshire, followed by Fife have the largest number of candidate orchards, at 213 and 186 respectively
- Dumfries & Galloway, Highland, Perth & Kinross and Scottish Borders all have over 100 candidate orchards.
- The total area of candidate orchards is 714 hectares. This includes mixed habitats such as garden areas or walled gardens that contain an orchard.
- South Lanarkshire has the largest area with 133 hectares, much of which is found in the Clyde Valley.
- Perth & Kinross follows up with 87 hectares, including the Carse of Gowrie.
- Aberdeenshire, Dumfries & Galloway, Fife, Highland, North Lanarkshire, and the Scottish Borders all have more than 30 hectares each.

Resources

The Deskstudy analysis indicates that the contemporary OS MasterMap is far from definitive in terms of the accuracy of the ‘Orchard’ attribute. It has however been a good place to begin looking for orchards.

To summarise what was found, three quarters of sites that are both candidate and marked on the historic map, are not included in the contemporary OS MasterMap. These are preliminary results which need to be confirmed by Field Verification.

The Deskstudy has created a strong set of base information for further stages of fieldwork.

5.2 Conclusions from Field Verification Pilot

The Field Verification pilot was successfully completed.

Results

The results from the data collected in the Scottish Borders show:

- 98 orchards are confirmed to exist
- 42 sites were confirmed not to be orchards or contained less than 5 fruit trees
- most orchards were found in private gardens but estate orchards and walled gardens also made up significant numbers
- eating apples predominated, while half the orchards contained cooking apples, pears and plums.
- walnut and cobnut are grown in small numbers
- over 2000 fruit trees were individually recorded across the Scottish Borders
- significant quantities of veteran tree features were recorded indicating high biodiversity in many orchards
- Size: most orchards have up to 30 trees. Three orchards recorded more than 100 trees.
- Age: Many orchards are mixed age, but most also contain old trees.
- Management: the majority of orchards have at least some management but a fifth are abandoned or have no management.
- Use of fruit: for most orchards fruit is used within the family or given away to friends. Many orchards also have fruit left on the ground. Very little selling of fruit is done.

Comparison of Field Verification with Deskstudy Dataset

The key metric for comparison is number of candidate sites vs. number of proven sites. In the case of our pilot in the Scottish Borders, the Deskstudy proposed 142 candidates while the Field Verification showed 98 proven (+2 undetermined). 42 sites were shown not to be orchards or contain less than 5 fruit trees.

This shows that 30% of the candidates were shown not to be orchards. Loss of candidate orchards is expected; all sites that may have an orchard are proposed as candidates by the Deskstudy because we do not want to miss any. Perhaps the actual issue is that the Field Verification only revealed a further dozen or so orchards that were not proposed as candidates. Implementing the Field Verification late in the year is a factor in this poor orchard recruitment.

Methodology

The experience of implementing the Field Verification work, together with feedback from volunteers and the Local Facilitator lead to the conclusion that the structure and design of the project is appropriate:

- Volunteers valued their experience, and achieved a good standard of data collection
- Managing the project through a satellite organisation and Local Facilitator worked well for volunteers.
- Some minor improvements are indicated in survey resources
- The single most important improvement that could be made is to start Field Verification early in the fruiting season in late July.

Annex 1

6 Study Methodology, Process Description & Additional Results

6.1 Data Architecture

The base unit for mapping is the local government Unitary Authority Area. All sites are considered within their respective Unitary Authority Area, and indeed site reference numbers are identified by these areas. The reason for subdividing the dataset is partly technical (the GIS computer has less data to deal with at one time) but also that action and organisation can be focussed at the appropriate local government level.

A specification of the data structure for the GIS dataset is given in Section 7.1 below.

6.2 Partners

Collaborative working has been a design feature of this project since its inception. The following organisations are project partners:

Borders Forest Trust; local organisation partnering for Field Verification work.

People Trust for Endangered Species; provided and customised specialist GIS tools for data acquisition.

National Trust for Scotland; providing access to the database of their own plant holdings and when necessary engaging with their membership.

Orchard Research & Enterprise CIC; own and have provided domain www.scotlandthefruit.org.uk and have hosted the project website at this url, as part of their wider site www.orchardrevival.org.uk

6.3 GIS Deskstudy

6.3.1 Mapping Resources

The client provided mapping resources via Contractor Licence under the One Scotland Mapping Agreement. The following resources covering the whole of Scotland were provided:

- Ordnance Survey MasterMap
- Ordnance Survey 1st Edition historic maps (as 2-bit images on 5km tiles)
- Ordnance Survey 10k VectorMap Local Raster (on 5km tiles) for site location maps
- Aerial images from Getmapping via a real time Web Map Service link.

Other mapping resources available under OS OpenData were also used, such as the RAS 250k for small scale mapping overlay.

Aerial images and street views freely available on the web were also found to be useful for comparison.

6.3.2 Methodology for GIS Deskstudy

The following methodology was implemented for the Deskstudy.

GIS system: MapInfo Professional v11.5 software with Data Capture Tool[2].

[2] A bespoke tool created and supported by People's Trust for Endangered Species

Identifying locations: Various sources of data to determine orchard locations:

- The OS MasterMap 'Orchard' attribute. The Data Capture tool displays these sites as a green polygon.
- Existing survey data. Sites listed in existing surveys are reassessed and included in the study as appropriate.
- Visual search of aerial and historic mapping.
- Additional existing datasets
- RCAHMS - Historic Land-use Assessment database
- Orchards and Wild Harvest Project for Dumfries and Galloway
- Fife Rangers
- Forth Valley Orchards
- Highland Orchard Project
- National Trust for Scotland Demeter Plants Database
- Agricultural Census, historic data (not site specific)
- Dunn 1885 Apple Congress report[3] (time constraints meant that only a few sites from this marvellous tome were considered)
- and other publically available datasets, such as community orchard listings.
- In-house background knowledge. As part of the 'orchard community' and having carried out orchard survey work throughout Scotland, the Contractor is able to draw on a significant of background knowledge regarding orchard locations.

Creating or amending polygons: Several passes over each location were carried out, once for each data source as described in the Identifying Locations section above, followed by a final pass to review each site for quality & consistency purposes.

In the case of the visual search, the historical mapping was very useful to locate likely orchards – which were generally more numerous at that time – and then the contemporary aerial can be assessed for evidence of an extant orchard. This sort of time-intensive search can only be carried out in settlements or known orchard hot-spots.

Assessing criteria: When an orchard is located, a record and associated polygon is created by the operator.

For OS marked sites, the customised software identifies orchard shapes, and a new polygon can be created from this, or can be modified as required. New polygons for non-OS marked sites can be created to define the current shape of an orchard, though these are usually based on existing demarcations of the site in question.

Polygon areas are calculated by the Data Capture tool and added to the record.

EUNIS: A assessment for the EUNIS classification[4] of each site will be made according to guidance[5] agreed with the Client.

Historical mapping: An assessment is made for every site identified as to whether it is present on the OS 1st Edition historical map. The dates for the 1st Edition vary, but are mainly 1860s. Thus if they are present, this represents the potential for unbroken orchard heritage on the site for at least 150 years.

[3] Dunn, M. 1887. *Apples and Pears 1885: Report of the Apple and Pear Congress Held by the Royal Caledonian Horticultural Society, Edinburgh, from 25th to 28th November 1885.* Maclachlan and Stewart.

[4] European Nature Information System. http://eunis.eea.europa.eu

[5] Hayes, Crispin W. (2013) *The Application of EUNIS Classification to Orchards in Scotland. Report to Scottish Natural Heritage*. (unpublished).

Quality Assurance, Revision & Checking: To ensure consistent interpretation, a sample of sites are checked (and revised as necessary) regularly throughout the process by Principal Consultant.

6.3.3 Deskstudy – Additional Results

An analysis of data collected has been carried out and results are given in the main body of the text in Section 3.2 above. Additional data are given here for completeness.

The data table for Figure 1: Number of Sites Considered, by Unitary Authority Area in the main body of the report is given below.

Table 6: Data Table of Number of Sites Considered in Deskstudy

Unitary Authority Administrative Area	Total Sites Considered	Candidate Orchard Sites	Site considered but rejected	
			OSMM marked	Other
Aberdeenshire incl City	102	89	13	-
Angus incl Dundee	52	51	1	-
Argyll & Bute	42	37	5	-
Clackmannanshire	30	30	-	-
Dumfries & Galloway	142	136	6	-
East Ayrshire	30	19	11	-
East Dunbartonshire	15	15	-	-
East Lothian	92	89	3	-
East Renfrewshire	54	54	-	-
Edinburgh City	40	40	-	-
Eilean Star	1	1	-	-
Falkirk	28	28	-	-
Fife	188	186	2	-
Glasgow city	39	39	-	-
Highland	129	125	4	-
Inverclyde	9	9	-	-
Mid Lothian	26	26	-	-
Moray	60	57	3	-
North Ayrshire	22	21	1	-
North Lanarkshire	57	37	5	15
Orkney	5	4	1	-
Perth & Kinross	153	140	13	-
Renfrewshire	25	25	-	-
Scottish Borders	154	127	13	14
Shetland	-	-	-	-
South Ayrshire	43	36	7	-
South Lanarkshire	226	213	4	9
Stirlingshire	41	41	-	-
West Dunbartonshire	17	17	-	-
West Lothian	37	36	1	-
All Areas	1859	1728	93	38

Table 7: Data Table for Statistical Analysis of Candidate Orchard Areas

	Total area of Candidate Orchard	Average area	Standard deviation (P)	Median
	ha	ha	ha	ha
Aberdeenshire	34.41	0.44	0.84	0.17
Aberdeen_City	4.72	0.47	0.78	0.10
Angus	20.26	0.42	1.14	0.14
Dundee_City	0.94	0.31	0.33	0.09
Argyll_and_Bute	10.32	0.28	0.19	0.31
Clackmannanshire	11.43	0.38	0.84	0.16
Dumfries_and_Galloway	51.60	0.38	0.67	0.15
East_Ayrshire	11.80	0.62	0.49	0.51
City_of_Edinburgh	19.23	0.48	0.66	0.17
East_Dunbartonshire	2.73	0.18	0.12	0.17
East_Lothian	28.09	0.32	0.57	0.13
East_Renfrewshire	6.03	0.11	0.28	0.03
Eilean Star	0.58	-	-	-
Falkirk	10.19	0.36	0.24	0.29
Fife	39.42	0.21	0.23	0.14
Glasgow_City	12.78	0.33	0.42	0.15
Highland	36.86	0.29	0.41	0.18
Inverclyde	3.54	0.39	0.41	0.30
Midlothian	15.64	0.60	1.11	0.21
Moray	15.29	0.27	0.24	0.24
North_Ayrshire	4.90	0.23	0.28	0.15
North_Lanarkshire	42.10	1.14	2.31	0.46
Orkney_Islands	0.58	0.14	0.07	0.16
Perth_and_Kinross	87.13	0.62	0.97	0.26
Renfrewshire	7.47	0.30	0.42	0.17
Scottish_Borders	54.00	0.41	0.89	0.20
Shetland	-	-	-	-
South_Ayrshire	27.26	0.76	1.94	0.19
South_Lanarkshire	133.17	0.63	0.87	0.32
Stirling	12.55	0.31	0.38	0.16
West_Dunbartonshire	3.04	0.18	0.17	0.08
West_Lothian	7.43	0.21	0.16	0.13

The difference between the average and the median demonstrates the skewed distribution for the area of individual orchards. The relatively high figure for standard deviation compared to the average shows that the size of the orchards is highly variable for many Unitary Authority Areas.

6.4 Field Verification Pilot

A pilot for Field Verification was designed and implemented in the Scottish Borders.

6.4.1 Methodology of Field Verification Pilot

The implementation of field verification is structured as follows:

- Field work is devolved to a local partner organisation. A local partner organisation is identified; ideally this is a competent local not-for-profit organisation with a track record demonstrating ability to organise and deliver locally. In the case of the pilot, Borders Forest Trust fulfilled these criteria well and became the local partner.
- Local Facilitator. The local partner organisation employs or contract a person – the Local Facilitator - to be the local interface and organiser of volunteer surveyors. This is a paid role.
- Recruitment of surveyors. The local organisation uses various channels to recruit volunteer surveyors. The channels include local press, presence at events, membership lists, other organisations, and formal & informal networks
- Resources are provided by the National Coordinator (in this case CW Hayes Associates). Site specific resources such as site location maps and candidate site lists are sent directly to the Local Facilitator. Other generic material is distributed via www.scotlandthefruit.org.uk which is used as the project website. This includes the e-forms used to record survey data.
- Allocation. The Local Facilitator allocates sites to volunteers, and manages their progress, ensures instructions including the risk assessment are understood.
- Mentoring. Some volunteer surveyors are very competent at all aspects. Others require a little mentoring. The Local Facilitator carries out this role, if necessary taking the volunteer on a training site visit.
- Survey Data. The Local Facilitator ensures that survey data is returned together with photos, and that all files are identified with the site unique identification. Quality checks are also carried out, and queries referred to volunteers.
- Upload. The Local Facilitator will have collected a lot of data mainly comprising completed e-forms, and site photos. This is uploaded via a file transfer mechanism to the National Coordinator.
- Data processing. The forms are processed in batches by software that collects form data and produces a database output. Quality checks are carried out on the data, and corrections made, if necessary with reference to the Local Facilitator and the volunteer surveyor
- Merging. The field verification data is added to the Deskstudy data for each site.
- Amendments and snagging. Revision of site boundary and other Deskstudy details are carried out on a site by site basis. Snagging is carried out as required.
- Output. Further work may be required for example to redact personal data fields or extract subsets, before the finalised dataset is output.

Discussion on this Field Verification Structure

The structure described above has a number of wider advantages, and in particular the aspect of engaging a local organisation to deliver locally:

- Devolves power and responsibility
- Helps build capacity in local organisations

- Knowledge about local resources is held locally, not expropriated by national bodies
- Engagement with local person in Local Facilitator role creates greater local ownership of project
- Seedcorn action = all this contributes to a sound foundation for further orchard projects that spring from local organisations with initiatives that fit circumstances in their area
-

In this way, it is intended that the outcomes of the project will be broader than merely the dataset created.

6.4.2 Cost and Size of Task for Local Facilitator

In the pilot, the Local Facilitator was a paid role. It was subcontracted via the local partner organisation, Borders Forest Trust.

The budget allocated to the Scottish Borders was £2400. The budget included:

- Fees to Local Facilitator
- Travel costs for Local Facilitator
- Travel costs for volunteers
- Publicity
- Administration charge to local partner organisation

A budget of 12 days work was allocated to the Local Facilitator. For the pilot this proved insufficient, and a further 7 days work were carried out. In large part this was due to the late start of the project. Whilst volunteers were enthusiastic in early November, by the time December arrived that enthusiasm had dwindled. The Local Facilitator was left to fill in the survey gaps. The role of Local Facilitator was not designed or resourced to do significant amounts of fieldwork, but we are grateful to Anna for making sure the survey was completed in the run-up to Christmas.

6.4.3 Additional Results from Field Verification in the Scottish Borders

In addition to those given in Section 4.2 above, the following results were recorded.

Known Varieties

Varieties were recorded where information was available. In some cases a full list of varieties was provided, but this was unusual. In others just anecdotal snippets were available. The following is a verbatim record from survey forms:

- Egremont Russet and Morrelo cherry
- Morrelo cherry, Czar plum? Victoria plum, Stella cherry, Regia walnut
- Victoria
- Within the last 5 years: 2 x Victoria plum; 2 x James Greave; 2 x Discovery and a Lord Derby have been planted.
- Bramley
- Tsar Plum and Victoria Plum
- Old Melrose Apple
- Worcester, Discovery, Bramley, Cox, Darcy Spice, Crawley Beauty, Reverend Wilkes, Elstar, Russet
- Worcester, Discovery, White Melrose, Victoria

- 2 x opals; Rivers early; Lady Sedgeley; 2 x Fondante d'automme; Geoge Cave; Orleans Reniette; Rosemary russet; Lousie Bonne of Jersey; Ingrid Marie; Black Worcester; Ribstone Pippin and St. Edmond's Pippin.
- Very small perfumed pear
- Cookers - Bramley. Others unknown
- Unknown except for 1 Russet, 2 Bramley's Seedling and 1 White Melrose (probably)
- See list
- Bramley's Seedling (2 trees)
- There were old metal tags on some of the trees, but they were all eligible
- >200 apple trees (eating/ cooking and crab) - over 175 varieties (of these 163 were taken to apple day). A variety list was considered 'a weeks work' by the owner, so no further details were given!
- Conference type
- Victoria Plum
- Bramley's Seedling
- List of apples in appendices. Old fan trained pear - Louise Bonne de Jersey
- Chivers delight, James green, laxtons fortune, sunset, bramley, 2 pears, 5 plums (4 victoria)
- Bramley, Worcester Pearman, Discovery, Cox Orange Pippin, Cox Pimona, Laxons, Grenadier, + others
- See list
- American Discovery, Cox Orange Pippin, James Greive, Bramley Seedling, & 3 others (3 of each variety)
- Cookers - one Bramley - others unknown. Eating: Cox's orange Pippin, an other pippin and Russet.
- Victoria
- Bloody Ploughman, Galloway Pippin, Scotch Dumpling. Pruned and trained as pyramids and goblets.
- 5 catillac pears

The verbatim record not only records variety data but also gives an indication of the scale of information available from owners and what is possible to record with volunteer surveyors.

Herbivore Damage

Damage by various herbivores was stated as ‘Yes’ in 16 orchards, and ‘No’ in 74 orchards. Therefore there appears to be a relatively low level of this sort of damage in Scottish Borders orchards.

The type of damage is described in the verbatim record of comments for this question:

- Mainly during the difficult winters when hare and deer damage as noted. Voles haven't been a problem so far and we haven't noticed rabbits.
- Rabbits mesh has been added to prevent further damage.
- Well rubbed
- A small amount of deer damage
- Owner mentions Deer grazing.
- Bark damaged by pigs (and goats in the past)
- Rabbits eat fallen fruit but no tree damage seen
- The home owner said there was damage, but didn't want me to go into the area - as she wasn't happy that it was known/ we knew that she had a new orchard! She doesn't like bureacracy!
- Stripped bark at the base of some trees. Injuries look old.
- Tree are all protected with 0.6m tubes

- Yes, quite large areas of stripped bark - larger than rabbit damage
- Rabbit
- Owner mentions deer grazing.
- No damage evident, but signs that cattle have rubbed against trees
- Roe Deer
- damage not recent
- Rabbit

Deer and rabbits are reported as the main species causing damage in the orchards.

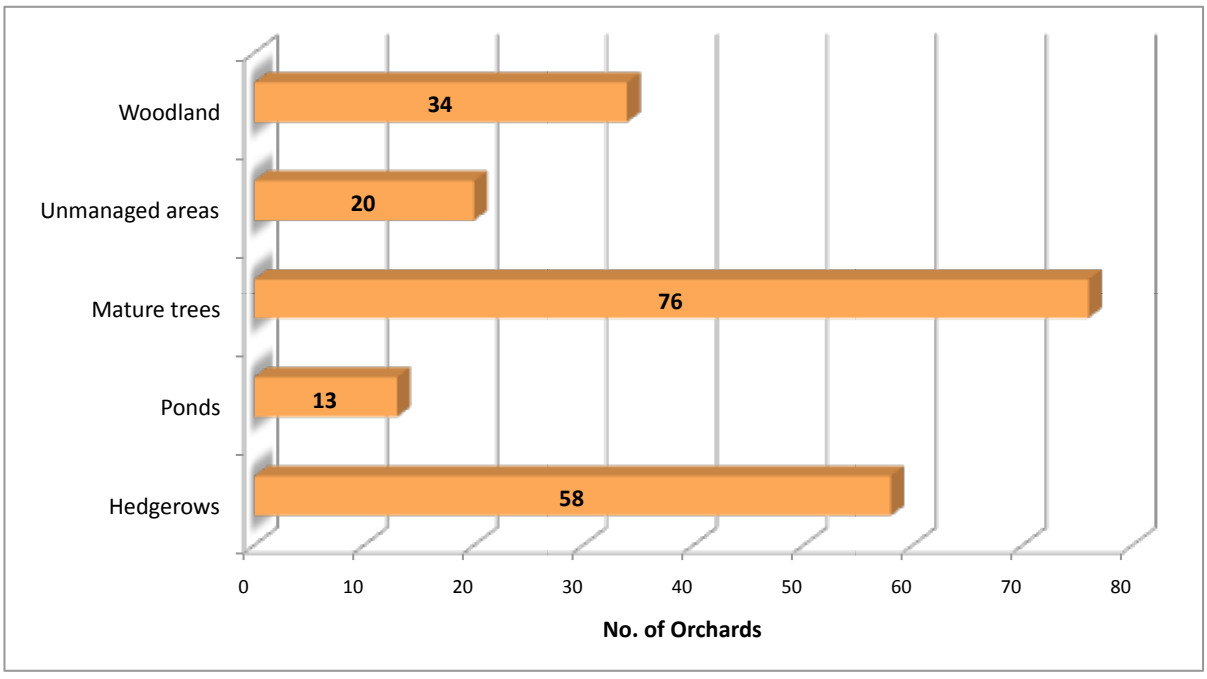
Neighbouring Habitats

The type of habitat that neighbours the orchard will influence the orchard itself and the other species that are found there.

The chart shows that mature trees and hedgerows are found to neighbour the majority of orchards, and that around a third of orchards are beside woodland. Unmanaged areas adjoin around a fifth of orchards and a pond is found to be in or near an eighth of orchards.

All these feature are likely to increase biodiversity in the orchard itself.

Figure 16: Indicators for Habitats Neighbouring the Orchard



Support Payments

The use and potential use of support payments was assessed. For the question, is the orchard part of a Stewardship now, in the past or applying to be in the future, 79 responses were 'No' and no other responses were given.

For the question as to whether the orchard was IACS registered, one response was 'Yes' and 77 'No'.

These figures show that orchards in the Scottish Borders have no support – in terms of land-based payments now, in the past or in the near future.

Photographs

Photos were taken for 104 orchards, and reported as not taken in 25 orchards. There are various reasons that photos were not taken such as; non-consent of orchard, equipment problems, and for many poor lighting conditions, because of the time of the year in which the survey was conducted.

Duration of Survey Visit

The duration of the fieldwork by volunteer surveyors was recorded for each site. This does not include travel time.

Table 8: Duration of Fieldwork at Each Site

Average time	Max time	Min time
24 min	120 min	5 min

The typical time of 24 minutes is in line with what may be expected, but it is clear that this varies according to the site and the nature of the owner.

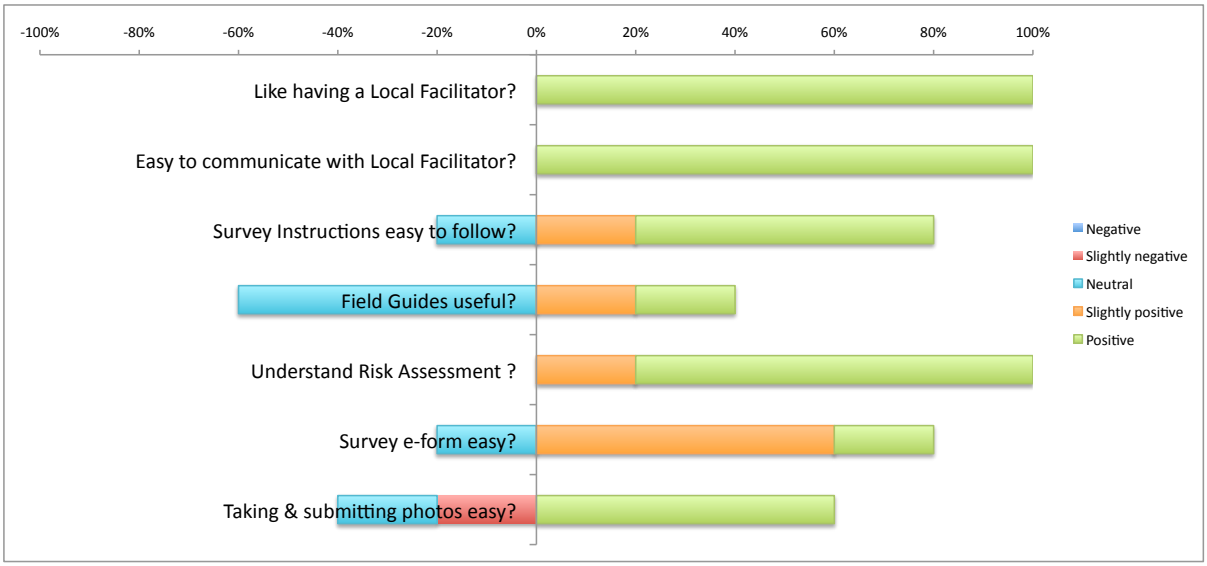
6.4.4 Volunteer Surveyors and their Experience

A total of 26 volunteers took part in the field verification in the Scottish Borders. Some only undertook one orchard, others took on many.

The experience of volunteers was recorded in a feedback form. Five completed feedback forms were received. The feedback was both qualitative and quantitative.

Firstly, questions regarding Organisation Aspects, Methods and Instructions.

Figure 17: Likert Scale Responses to Organisation, Methods & Instructions



The graph is discussed question by question below along with comments.

Q. Did you like having a local person to run the survey in the Borders, rather than it being run nationally?

The graph shows that all respondents were entirely positive on this question. The following comment was made: 'Good to have a local person with local knowledge and easily contacted.'

Q. How easy was it to communicate with your Local Facilitator ?

Again the graph shows that all respondents were entirely positive on this question.

Q. Were the survey instructions easy to follow ?

The graph shows that most people were positive in response.

The following comment was made: 'Survey was a little too late in year to be sure of some identifications, esp younger trees.'

Q. Were the Guides (eg. Tree Identification) useful & adequate ?

The graph shows a more mixed response with most people neither positive or negative. Comments: 'Would have been useful to have a laminate to take to site with images to aid identification.' 'Usefulness varied with season. Hard/ impossible to distinguish between eaters & cookers without fruit. Pity fruit variety identification was not available.'

Q. Did you understand the Risk Assessment ?

All respondents were positive or slightly positive.

Q. How did you find filling in an electronic form to record survey data ?

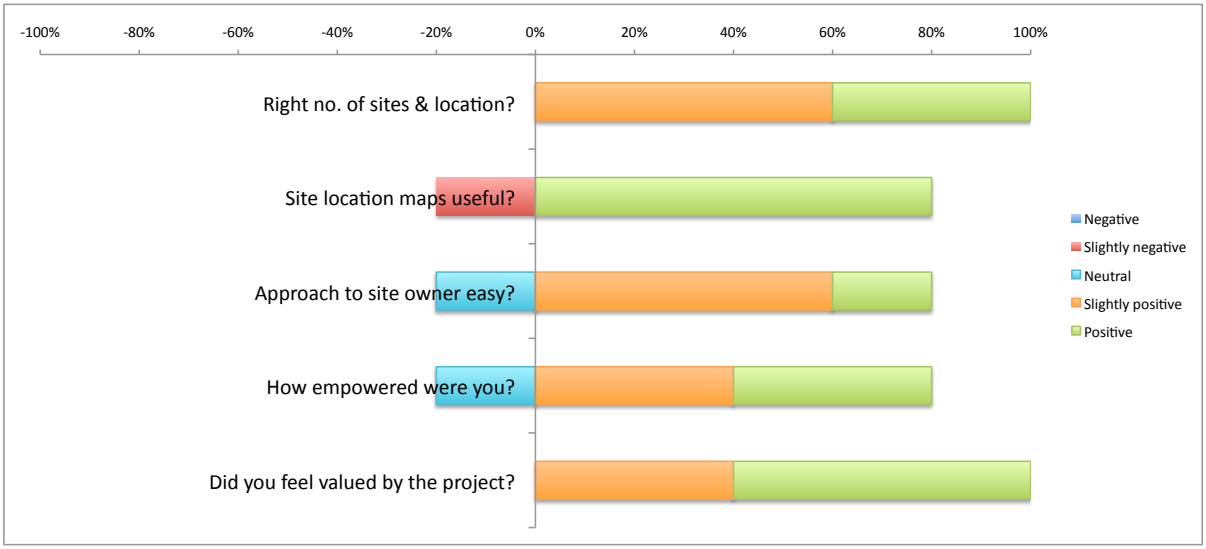
Most respondents were positive or slightly positive, with one being neutral. Comments: 'The first time it took a while, but after that it was fine.'

Q. How did you find taking photos & submitting them via the internet ?

Most respondents were positive but some were neutral or slightly negative.

Secondly questions regarding the site visits and the overall volunteer experience.

Figure 18: Likert Scale Responses to Site Visits and Volunteer Experience



The graph is discussed question by question below along with comments.

Q. Did you feel the list of sites to visit was the right number and location for you ?

All respondents were slightly positive or positive. Comments: 'Only managed 2 of the 3.' ' I did what was possible for me.'

Q. How good/useful were the site location maps provided ?

Most respondents were positive, but a small minority were slightly negative. Comments: ' Would be useful to know the source and date of the maps, as in one site there was no trace of an orchard.'

Q. How did you feel about approaching the site owner on your own ?

Most respondents were positive, but a small minority were neutral. Comments: 'Varied between sites - in one case I had to visit 3 times to get access.' 'We only visited 2 orchards owned by the same estate and it turned out that they were very welcoming and helpful'

Q. Did you feel sufficiently empowered to make this approach ? Is training on this necessary?

Most respondents were positive, but a small minority were neutral. Comments: 'In the Borders most orchard owners pretty friendly.'

Q. Did you find site owners generally helpful ?

Comments: 'yes. Generally they were happy to help.' 'Very helpful.'

Q. As a volunteer, did you feel valued in this project ?

All respondents were slightly positive or positive.

Q. What was the best thing about being a volunteer surveyor?

Comments: 'Getting to look a nice fruit trees and finding remnant orchards. Also talking to the owners and finding out what they do with the fruit was interesting.'

'Nice to do something useful environmentally, fun to do with the kids.'

'I learned a lot about local orchards.'

'Finding out about the orchards in our area'

Q. What was the hardest thing about being a volunteer surveyor?

'It was frustrating when no-one was in (even after a number of visits)'

'Knocking on doors takes a bit of getting used to, introduction letter helped.'

'Quite time consuming finding the right premasis of owners.'

'Actually doing the survey and trying to identify fruit trees.'

'We were too late in the season - Identification of types was very difficult.'

Q. Any other recommendations, comments, other things that we should know about

'I think it is a really worthwhile project and I enjoyed being involved.'

'Would be great to have some experts to send fruit pictures to (or even fruit).'

'Start earlier in the season.'

To summarise, the feedback was overall positive, but a few issues have been highlighted for improvement.

6.4.5 Feedback from Local Facilitator

Organisational Aspect

Q. How important do you think it is to have a local person as the point of contact rather than a remote National Coordinator ?

Really important! Local Co-ordinators are far more likely to have access to a variety of relevant local networks/ contacts (key factor in promoting orchard volunteer opportunity and getting knowledgeable/ interested local people on board) and will also be far more

knowledgeable about the local geography (makes the matching of orchard sites to appropriate local volunteers far easier).

Q. How easy was it to communicate with the National Coordinator (that's Crispin!) ? Any suggestions for improvements ?

Sometimes responses to queries were a little slow and I felt a little on my own, but otherwise, I was happy with everything - I knew what I had to do and I just got on with it. Improvements wise – the only thing I can think of is a slightly quicker response time to random (trickier) questions/ queries that crop up in the early stages of volunteer recruitment/ project delivery…. But, following on from our project feedback meeting - I think we covered all of the wee niggles and discussed ways that these can be strengthened/ made clear at the outset of future project roll out.

Q. How easy was it to recruit sufficient numbers of competent volunteers ?

It was fairly easy to find and recruit enthusiastic volunteers (particularly when you already know local outdoorsy/ woodland/ orchard fans and people who work for local partner environmental organisations). The tricky part is gauging the competency/ skills levels of members of the public who sign up for volunteering after reading/ hearing about the project – the quality of returned survey forms was very variable!

Q. What were the best channels for recruitment ? (eg. newspaper, word of mouth, informal networks?)

Promotion of project and opportunities at local environmental themed events – having a stand at a local Apple Day event was an excellent means of publicising the project and recruiting volunteers.

Newspaper Articles – the piece in the Peeblesshire attracted a lot of prospective volunteers NB: focussing on localised weekly newspapers in areas where there a large number of orchard sites would help in getting a balanced no. of volunteers : no. of sites coverage.

Local informal networks – excellent means of getting information out to a wide audience.

Methods and Instructions

Q. Were the Instructions for you as Local Facilitator and for volunteers easy to follow ? How could they be improved ?

As discussed at our meeting – I think that they are lengthy, but great! I don't think that there is a way that the information can be reduced. A pre-survey volunteer training/ networking session would definitely be a useful tool for clarifying all expectations and aspects of the surveying process.

An additional form for volunteers to post through the door of orchard owners that are not in would be very useful. I hand wrote little notes asking for them to get in touch and more often than not they did!

Q. Did you understand the Risk Assessment, and other Health & Safety instructions ? Were you confident in conveying their importance and content to volunteers?

Yes, I'm well practiced in the world of Risk Assessment and think that I managed to highlight the importance etc. to volunteers. I know that many of the volunteers read the document, because they came back with queries about Hi-vis jackets.

Q. Were the Guides (eg. Tree Identification) useful & adequate ? What you like to see improved ?

The guides were great, in the early days of my surveying I relied on them heavily. Surveying whilst there are leaves on trees will make them even more user friendly :o) The image of a plum tree shape could be better. Are there any more notable differences between Plum/ Damson/ Greengage (I found winter I.D. of these very difficult)? If possible some additional information could be added to cover the differences between types of cherry tree and the subtleties between cooking/ eating apple recognition.

Q. What was your experience of using an electronic form to record survey data ?

Good, nice and straight forward. Although, I think that some of the volunteers didn't use Adobe which meant that I had to redo the form.

Q. How could it be improved ?

Reformatting the form so that all of the questions that the orchard owners need to be asked are on the first page – would make the process a little easier.

More options for the Neighbouring habitats section – river/ arable field/ livestock pasture.

Plus, adding a third option in the questions where once the buttons have been clicked they cannot be unselected, despite not being relevant/ accurate.

Q. How was it collating and managing photos that were submitted via the internet ?

Quite honestly this was the worst bit of the project for me! I found that many people didn't use/ were intimidated by Dropbox and sent me the photographs as (often) unlabelled email attachments. I then had to chase information about them/ download the image/ re-label them and then add/ move them to the appropriate Dropbox site folder. Lots of data shifting. Also, some of the star volunteers took >60 beautiful top quality photos of each site and labelled them in a way that they described what/ where they were, but they didn't have the required BORD0*** labelling – this meant that each one had to be amended individually.

Many photos were totally random and seemingly irrelevant, e.g. a tuft of grass; some blurred bark; a neighbouring arable field etc.

Managing Volunteers

Q. How easy was it to manage the allocation of sites to volunteers ?

Fairly easy. The tricky part was that there was a lot of interest in volunteering in the Peeblesshire area, but not a lot of sites. There were also some more remote areas of the Borders where there were no volunteers and a fair few sites. I had to find volunteers who were happy to travel, or (due to limited timescale) I had to do them.

Q. How good/useful were the site location maps provided ?

They were good. It was really helpful for me to have area maps that showed multiple sites – this made the allocation of sites for volunteers easier and more efficient.

In the future I recommend that the Local Co-ordinator is provided with a larger Regional Map of sites to enable an overall view of the site locations/ dispersal. NB: this would have been really useful for me.

Q. What were the key issues that volunteers came back to you with queries about ?

Hi-vis jackets?

Data Protection – request to add more information about how the survey information will be used.

Access – what if the orchard owner isn't in? Access has been refused? How many times should I re-visit a site (if the owner is never in)?

How can you tell the difference between different cherry trees; eating and cooking apples etc.

Q. What did you have to chase up volunteers about ?

Whether or not they had done the survey/ or were still planning to do the survey! Information about missed elements in the survey form. Photographs/ photograph information (which site was it etc?).

Q. Would volunteer training address these points? How ?

Volunteers would get a clear picture of project expectations. You could cover all of the basics – Risk assessment/ using Dropbox; the importance of relevant, good quality, labelled photographs; basic fruit tree identification; how to approach orchard owners; and also it

would be a fantastic opportunity to assign appropriate sites to volunteers. It could also possibly promote volunteer peer support/ partnership working and the establishment of a local orchard network/ group.

NB: Equipment could be handed out, e.g. hi-vis vests

Additional online resources, I.D keys could be shared

Your Experience

Q. As Local Facilitator, did you feel valued in this project ?

Yes

Q. What was the best thing about being a Local Facilitator ?

Working with/ meeting new people; discovering new sites and seeing amazing trees.

Q. What was the hardest thing about being a Local Facilitator ?

Time/ seasonal constraints. Volunteers signing up enthusiastically, promising that the surveys will be done on set day, and then not doing the surveys and telling me really late on in the project. Chasing up site photographs from volunteers. Organising/ data handling of unlabelled photographs from volunteers. Not knowing competency/ skills/ capabilities of new contacts (volunteers).

Summary

To summarise, our Local Facilitator in the Scottish Borders had a positive experience and has provided really useful feedback on the process. Triangulating this with the volunteer feedback means that we can identify methodological improvements that need to be implemented.

6.4.6 e-Form Data Collection Mechanism

An anonymised example of a filled survey e-form is given in Section 8.1

e-Data Collection

The use of fillable e-forms streamlines the process of data collection and vastly reduces the costs compared to older paper-based systems, such as those used for the Inventory in England and in Wales. It also eliminates transcription errors. This project has built on those experiences together with this Contractor's use of e-forms in regional orchard survey and consultation work.

The use of fillable pdf forms is recognised as one of the most reliable methods of e-data collection, though online form/survey websites are also much used.

Throughout several years of the Contractor's previous experience, data corruption has not been a problem. A minor issue that has been encountered previously is that new users need to remember to save each filling of the form as a new file before submitting. A further minor issue is that if Abode Reader is not used, then the data in the form fields is not saved at all. Both these issues are readily observed and corrected.

Data Corruption

A new issue emerged in returned e-forms for the Scottish Borders verification. This was corruption of checkbox data fields for some returned forms. The corruption manifested itself as checkboxes ticked but did not export the corresponding field value (ie. a 'Yes') to the database.

All forms were checked against the export database. Some 34 out of 142 forms were affected by this corruption. The Contractor has been in discussion with the software

manufacturer, and the cause of corruption appears to be the use of Microsoft Reader rather than Adobe Reader in filling the form; it is still far from certain if and how this created a corruption of this nature.

At the time of writing we are still investigating the cause and having done so, will implement measures to mitigate against recurrence.

Limits on No. of Respondents

The existing e-form software has an arbitrary and absolute limit of 500 responses per form. This potentially creates a problem for a national role-out of the field verification in which we could expect around 2000 responses. The proposed work around is to create a number of versions of the same form and allocate a subsection of Scotland to each. For example. one version to the south west of the country, and so on. This is a workable solution.

A further measure would be to implement an identical e-form on a web service, thus giving a further channel to submit data.

This has the added advantage of providing resilience through a diversity of collection conduits.

7 GIS Data

GIS data is provided as computer files. The data is organised by Unitary Authority Areas, with each area having a separate set of files. The data is in MapInfo .tab file format.

Deskstudy data are also collated into a single database of 1859 records. This is provided in both spreadsheet format (MS Excel .xlsx) and in proprietary database format (FileMaker .fp7). Both of these file formats have identical data, but the latter additionally has a form interface built.

7.1 Dataset Description

The GIS dataset is described in the following table. Some minor modifications to reduce ambiguity and improve knowledge have been agreed from that proposed in the Contract, but essentially the data specification remains as is.

Table 9: Data Field Specification for GIS Dataset

Field name	Description	Data format or data entry choices	Length/ format	Deskstudy Included ?
OriginalID	Site identifier unique within traditional orchard habitat inventory	Alpha-numeric code, *county*/*number*	8	YES
UniqueID	Site identifier unique within all Scottish habitat inventories	Alpha-numeric code, TO/*county*/*number*	11	YES
EUNIS	European standard habitat code	EUNIS code or Other descriptive text for non-EUNIS habitat Lost Misidentified (during aerial interpretation)	5	YES
Pridet	Priority determiner – degree of confidence in presence of habitat	Definitely is traditional orchard priority habitat	115	YES

	based on all available sources of data	OR Probably traditional orchard priority habitat but some uncertainty OR Priority traditional orchard habitat may be present but evidence is insufficient to determine presence confidently OR Site does not meet priority habitat criteria OR Not a T.O. site		
Condition	Assessment of condition of orchard based on presence or absence of a number of criteria	Excellent Good Poor	10	
NonTOcode	Marginal site that does not fully meet one or some of the criteria described in the priority habitat definition, but retained in the inventory due to potential habitat or heritage value or potential for restoration	Relict Long abandoned traditional orchard Intensively managed traditional orchard trees Abandoned or organic bush orchard	40	YES
Orch_owner_quest	Owner survey received	DD/MM/YYYY	Date	
Permission_to_visit	Permission granted by the owner for further contact	Y or blank	1	
Ground_truthed	Volunteer surveyor visited site	DD/MM/YYYY	1	
Surveyor_name	Names of surveyors/organisations	[name]	45	
Aerial_image_date	Date of latest photograph used to make interpretation	DD/MM/YYYY	Date	YES
External_source	Survey conducted by another organisation	[name or organisation]	40	If applic.
External_source_date	Date of dataset	DD/MM/YYYY	Date	If applic.
Grazed	Managed by grazing	Y or blank	1	YES
Grazing_damage	Damage to trees caused by grazing animals	Y or blank	1	
Mown	Managed by mowing or hay-cutting	Y or blank	1	If applic.
Fruit_used	Evidence or knowledge of fruit harvesting activity	Y, N or Partial	7	
Herbicides	Evidence or knowledge of chemical use	Y or blank	1	YES
Neglected	Evidence of general neglect	Y or blank	1	YES
Scrub_present	Evidence of scrub on the site	Y or blank	1	YES
Stewardship	Environmental Stewardship agreement (agreement number recorded in additional polygon notes)	RDC	10	
Digitised_By	Name of polygon creator	[name]	25	YES
Created _on	Date polygon created	DD/MM/YYYY	Date	YES
Edit_By	Name of last editor	[name]	25	YES
Last_edit	Date of last edit	DD/MM/YYYY	Date	YES
Additional_polygon_notes	Special notes derived from Aerial Photographic Interpretation, and field and owner surveys, e.g. API difficult to	Free text	254	YES

	interpret, specialist interest, condition of trees, stewardship agreement number, etc.			
OS_First_Edition	Presence on historical map	Y or blank	1	YES
Historical_notes	Comments on history	Free text	254	YES
Crop (11 fields)	Apple, Pear, Plum, Cherry, Damson, Gage, Mulberry, Medlar, Quince, Walnut, Cobnut	Y or blank	1	
Varieties	Fruit varieties known present	Free text	254	
Livestock (5 fields)	Sheep, Cattle, Equine, Pigs, Fowl	Y or blank	1	
Old_fruit_trees~ (4 fields)	Bands recording number of old fruit trees – 0-10, 11-30, 31-100, 101+	Y or blank	1	
Younger_fruit_trees~ (4 fields)	Bands recording number of younger fruit trees (those lacking veteran characteristics) – 0-10, 11-30, 31-100, 101+	Y or blank	1	
Veteran features (9 fields)	Trunk_cavities, Holes_in_branches, Deadwood_canopy, Deadwood_floor, Deadwood_standing, Fungal_fruits, Sap_runs, Loose_bark, Water_pools	Y or blank	1	
Mistletoe	Presence of mistletoe recorded in orchard	Y or blank	1	
Orchard floor condition features (7 fields)	Tall_perennial_weeds, Nettles, Aged_pasture, Improved_pasture, Undercropped, Poaching, Lawn	Y or blank	1	
Species_of_interest	Other significant species found in the orchard	Free text	254	
Surrounding habitats (5 fields)	Hedgerows, Ponds, Veteran trees, Unmanaged_areas, Woodland	Y or blank	1	
Personal details (4 fields)	Owner name, Site name, Address, Telephone number	Free text	Var.	
Unitary_Authority	Unitary Authority of location	Free text	17	YES
Basemap	Maps referenced for polygon creation	Free text	60	YES
BNG	British National Grid Coordinate	LLnnnnnnnnn	12	YES
Easting	BNG easting (x co-ordinate)	Exact centre of polygon	Numeric	YES
Northing	BNG northing (y co-ordinate)	Exact centre of polygon	Numeric	YES
Area_Hectares	Land parcel area in hectares	Exact area of polygon	Numeric	YES

Annex 2

8 Field Verification Data for Scottish Borders Pilot

Field Verification data are provided as computer files.

Field Verification data are collated into a single database of 142 records. This is provided in both spreadsheet format (MS Excel .xlsx) and in proprietary database format (FileMaker .fp7). Both of these file formats have identical data, but the latter additionally has a form interface built.

8.1 Example Form Used in Field Verification

Use abode reader to fill in, then save the form to your desktop, and email

Working towards a Revival of Traditional Orchards in Scotland

Orchard Survey Form v2

Please help us to secure our orchard heritage

1. Identification

Orchard ID: BORD0130 Date of Survey: 11/16/13 Surveyor(s): xxxxxxx

Name of Orchard Keeper: xxxxxxxxxxx

Name of Orchard(s) if different from below:

2. Location Details

	For Orchard Location		For Keeper (if different)
House name	xxxxxxxxxxx		xxxxxxxxxxx
Street	xxxxxxxxxxx		xxxxxxxxxxx
Town/Village	jedburgh		xxxxxxxxxxx
County	roxburghshire		xxxxxxxxxxx
Postcode	xxxxxxxxxxx		xxxxxxxxxxx
Email	xxxxxxxxxxx	Tel:	xxxxxxxxxxx

Grid reference (at base of location map):

Keeper permission to enter site ? (leave blank if undetermined) Given ◉ Refused ◯

3. Type of orchard site ?: (tick any that apply)

Private garden (by house)	✓	Field size orchard	
Allotment		Estate orchard	
School orchard		Walled garden	✓
Community orchard		Greenhouse	
Public Park		Modern commercial orchard	
Derelict or abandoned orchard		Other (please specify)	
Orchard lost to building development			

4. What kind of fruit trees ?: (tick all that apply, and give numbers in 2nd box if known)

Apple (eating)	✓	no. 10	Apple (cooking)		no.
Pear	✓	no. 4	Plum	✓	no. 4
Crab-apple		no.	Cherry	✓	no. 1
Damson		no.	Mulberry		no.
Greengage		no.	Medlar		no.
Quince		no.	Other (please state)		
Cobnut		no.			no.
Walnut		no.			no.

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5. Known Varieties (please list if known. If a large number submit separate Word or Excel file)
none

6. Are Veteran Fruit Trees Present ?
Veteran Tree Features (tick any that apply for any fruit trees)

Clearly aged trees	✓	Crevices in bark	✓	Mistletoe	
Holes in branches	✓	Trunk cavities	✓	Loose bark	✓
Standing deadwood in tree	✓	Deadwood on ground		Deadwood in canopy	
Water pools on tree		Sap runs		Fungal fruiting bodies	

7. Number of Fruit Trees
Firstly OLD fruit trees (those over about 50 yrs or showing veteran features)
Approximately how many trees? 1-10 ○ 11-30 ● 31-100 ○ 101 - 249 ○ 250+ ○
Total number OLD trees (if known)

Secondly YOUNGER fruit trees
Approximately how many trees? 1-10 ● 11-30 ○ 31-100 ○ 101 - 249 ○ 250+ ○
Total number YOUNG trees (if known)

8. Age of Fruit Trees
Approximate age of fruit trees? (please tick any that apply)
New (less than 8yrs) ☐ Young (9-20yrs) ☐ Mid (21-50yrs) ☐ Old(older than 50yrs) ✓
Known ages:

9. Size of Trees
Height: Proportion of fruit trees less than 5m high: 70 % Proportion higher than 5m: 30 %

Remarkable or unusual trees. Are there any in this orchard ? yes ● no ○
Note their girth (circumference at breast height in cm) and any comments below. Take a photo.
Details: old free standing trees and espalier on outer wall.

10. Orchard Management (ie. pruning, general care. please tick most appropriate)
Actively managed ○ Some management ○ Unmanaged ○ Abandoned ●

Chemical sprays; any use of herbicides, pesticides, fungicides etc? yes ○ no ●
Details if available:

11. Orchard Floor
What is main vegetation on orchards floor? (tick any that have significant presence)
Grass ✓ Brambles ✓ Nettles ✓ Thistles ✓ Other tall weeds ✓
Lawn ☐ Aged_pasture ☐ Improved_pasture ☐ Scrub ☐
Cultivated ☐ Other species present:

How is the orchard floor managed ? (please tick any that apply)
Grazing ☐ Rotary mower ☐ Fingerbar mower ☐ Herbicide ☐ Unmanaged ✓
Details if available: appears to be abanadoned for some time. locked walled garden.

If grazed, what animals ? (please tick any that apply)

Sheep ☐ Cattle ☐ Horses ☐ Pigs ☐ Fowl ☐

Other animals & comments:

Is there any evidence of herbivore damage to the fruit trees, such as stripped bark or damaged roots?

yes ○ no ● Comments

Are undercrops grown? (please tick any that apply)

Gooseberries ☐ Currants ☐ Raspberries ☑ Other soft fruit ☐ Vegetables ☐

Details if available:

What other neighbouring habitats are there?

Hedgerows ☑ Ponds ☐ Mature trees ☑ Unmanaged_areas ☑ Woodland ☑

12. Use of fruit

Is the fruit used ? yes, a lot ○ yes, a bit ○ none ●

How is the fruit used ? (tick all that apply)

Family use ☐	Given away to friends ☐
Jams/preserves/ fruit products made ☐	Fruit ignored and left on ground ☐
Sold locally ☐	Sold commercially ☐
If sold/other please give details:	

13. Misc Details

Stewardship; Is the orchard:

a) part of a stewardship scheme? yes ○ no ● was in past ○ applying to be ○

b) registered under the IACS system yes ○ no ● was in past ○ applying to be ○

Details incl numbers if yes:

Any other comments, anecdotes & notes

the estate is currently un occupied and falling into ruin. We are attempting to find the owner and will propose taking on the walled garden as a renovation project.

Data Protection

We take Data Protection seriously. Survey information will be shared solely with project partners. Only anonymised data will be placed in the public domain, along with existing publicly available data relating to the orchard site. Survey information will be stored and processed on computer.

Registered with Information Commissioner's Office as a *Data Controller*.

Photos Have you taken photos of the site ? yes ○ no ●

Does the Location map show the orchard boundary fairly accurately (shown as red bounded polygon)?

yes ● no ○ If no, please draw actual boundary on map and return for amendment.

How long has it taken for this site visit (to nearest 10 minutes) 90 minutes

Thank you and please thank the orchard keeper

Please remember to include the 8 digit Orchard ID no. in filenames, otherwise we'll get in a big mess at our end. Thanks