Woodland Impact Survey

Introduction

Impact surveys can be used to measure current levels of impact on a site and to monitor how impacts are changing with time. Intensive, quantitative surveys have a place in some situations but can be expensive and time consuming. This guide describes a technique, based originally on the work of Dr A. Cooke, that is simple to apply but is also sensitive enough to give a broad description of deer impact, together with an indication of deer activity. It is usually used for general woodland assessment rather than for forestry crops, for which a "nearest neighbour" damage assessment might be more appropriate.
This document links to the Deer Initiative Wild Deer Best Practice Guides "Habitat Impact" and "Deer Signs", which should be read as an introduction. A recording form for this method can be found in the Associated Information section as an Excel file.
It is strongly suggested that training or some form of practice with experienced surveyors is undertaken before attempting large scale, formal surveys.

Preparation

Signs
You will need to be familiar with signs of deer and be able to tell the difference between deer signs and those of rabbits, hares, squirrels and so on (see the Deer Signs guide). This is easier where signs are fresh, but older signs are not so useful. Both rabbits and hares will stand on their hind legs to feed so browsing height can overlap significantly with that of deer.
A little experience is required to judge the scale of activity and impact for scoring purposes and it is useful to walk as many different woodland habitats with as many different deer species and levels of impact as possible, before attempting definitive surveys. This helps to "key in" on the relevant detail.
The signs that you score each year must be recent, that is belonging to the past year only. However, significant changes that may have taken place over a number of years should be noted in your comments, for example previously heavily browsed hardwoods may now be producing new shoots, possibly indicating a reduction of browsing pressure.

Timing
Surveys can be carried out at any time of year, but spring is preferred, with early autumn as a second choice. In the spring, signs such as slots and paths are especially evident and signs of feeding on new growth as well as on that from the previous year may be apparent. In autumn before leaf-fall there is abundant vegetation to observe, although the ground may be hard after a dry summer, so slots and paths are less visible. In the months immediately after leaf fall a lot of sign may be hidden.
If individual plant species or plants at particular stages of growth will form an important part of the impact data, then it may be necessary to complete parts of the survey at a different times of year when those plants are particularly conspicuous.

Annual monitoring in the spring should be undertaken at the same point of emergence of vegetation each year to provide the most consistency between surveys.

Scope of survey

It is important at the outset to decide on the key objectives for the woodland and therefore the key elements that need to be recorded in the survey. If you are not familiar with the wood use as many indicators as you can until it becomes obvious which are the most useful.

The method is applicable to both small and large woodlands although larger blocks of woodland may need to be split up into separate surveys, perhaps relating to compartments, species type, or terrain. If you are unsure whether to include the whole wood in one survey or to split it into habitat types or compartments, then you should follow the same route in either case but simply start a new survey record sheet at each change in habitat. This may highlight which habitats yield the most information in which case you might decide to concentrate on those in the future or you might decide to amalgamate all of the surveys into 1 and do repeat survey for the whole wood.

Typically a wood is visited for a few hours, walking at least a kilometre, this is dependent upon terrain and woodland size. A 16ha wood may take a couple of hours, whereas a much larger wood or woodland compartment may take ½ a day or more.

For whole estate surveys it is usual to survey a sample of woodlands, focussing upon the areas that are key to the overall objectives of the estate. For example if the main objective is for coppice re-growth and natural regeneration then the surveys ought to focus on these areas; if newly planted areas are the key interest then these are the areas to focus the survey on although, because such sites change very rapidly from year to year it might be best to concentrate on a particular growth stage for each new site as it appears in the wood. In both examples if the deer are controlled across the estate then these survey sites can be used as key indicators for impacts at a wider level. If targets are met on the key sites then chances are that the overall impacts across the wider estate are acceptable.

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A typical recording form is provided, this can be changed according to local requirements but it is strongly recommended that the core elements are kept the same.

For consistency it is preferable that the same person, or someone who has surveyed with them, undertakes repeat surveys, and that relevant notes are kept to help successors carry out surveys in a similar manner.

Route

For consistency over time follow roughly the same route, or at least a route taking in the same woodland features, on consecutive surveys. If there has been a significant change in the woodland such as a clear fell or fencing, you may have to decide whether to continue to include that area in your route.

It is useful to record roughly where you went. This can be approximated on a paper map, or by using a GPS unit that works well under a tree canopy (there is no need to follow the precise GPS route on repeat surveys). Using GPS is the easiest way to record the distance walked if you plan to use distance in calculations later.

In larger woodland blocks it may be more difficult to guess at a route which ensures that a representative proportion of all habitat types is assessed. In these cases a map showing habitat types is an essential aid, a pre planned approximate route can be drawn up in advance of the survey to ensure that the woodland is thoroughly assessed but this might be modified if an initial inspection walk reveals areas of particular interest .

Ensure that you have the landowners consent before carrying out the survey

Equipment

There is very little equipment required but this is a suggested list:

sensible clothing (dress to prevent ticks), and insect repellent
binoculars (optional)
waterproof folder
score sheets/pencil (pens might not work in the wet!)
means of keeping time
means of measuring undergrowth heights (knee height is approx 50cm!)
means of communication (in case of accident)
map
hand held GPS (optional) capable of holding a signal in woodland, to prevent getting lost, record route and positions, and distance walked

History

If there is a previous history of impact survey work using another method there may be no need to change methods, providing you are happy with the type of survey and the way the results are recorded. There is not necessarily a right or wrong method to use, and the method described here is an adaptation of a number of different techniques developed over the past 20 years. If you feel that this method may be more appropriate then it is advised that both survey methods are used in parallel for a couple of seasons to assess differences and allow a comparison to take place. Adequate notes must be taken to ensure consistency and background information for the survey over a number of years, particularly where deer impact change is desired or expected. A site map that shows changes in woodland composition is also useful, particularly on larger sites.

The management history of the area surveyed must be taken into consideration. Be sure that apparent deer impacts or lack of them are not in fact due to some aspect of the past management of the wood e.g. areas that have had a fence removed in the past may be showing growth which is not typical of the rest of the wood.

Indicators

Please refer to the recording form as you read this section.

The survey uses a number of **indicators** to produce an **index score** (None/Minimal, Low, Moderate, High) for both the level of deer activity, and for deer impacts.

Most of the indicators on the form are likely to be common to all sites. There is space on the form, for instance in the Tree seedlings and Plant species sections to include indicators which are more site specific. If you are initially unfamiliar with the site start by looking for as many indicators as you can, then, in future, discount those that seem to be of little value, being sure to compare results from year to year using only the 'useful' group of indicators.

It is very important that any changes made to the recording form are "future proofed", for instance, there may be little or no bramble in a wood but if you suspect that it might be present if impacts are reduced in future then you should keep bramble as an indicator on the form.

Deer activity scores usually correlate with the impact scores, and also allow inferences to be drawn about the relative importance of each of the deer species with regard to impacts. There are seven activity indicators.

Impact scores are usually collated regardless of the deer species responsible since overall impact to the wood is the key interest. Deer impact scoring is based on four main elements, each of which is sub divided into a number of more specific elements. Others can be added if this helps you at a site level.

The scoring system uses simple tally marks to record deer activity and impacts (see Scoring and Recording results, below)
Initially it can be difficult to give an idea of how to transform a certain number of sign tallies into an index score of None/Minimal, Low, Moderate or High but a general indication has been given in each of the relevant sections below. As your experience of activity assessment on a site increases you may wish to adjust the measures.

Recording Form

Activity indicators

The deer activity scores are not a means of estimating deer numbers but useful comparisons can be made from year to year, perhaps indicating trends in deer numbers. Depending on the site and deer species involved some or most of these indicators may not be seen frequently. The two most important activity indicators are Dung, and Racks (in wood). If there are signs of other grazing mammals, record the fact in the comments section.

Deer seen
The purpose of recording deer seen is not to estimate how many deer there may be present but to add to information about which species may be present and to give some indication over years as to trends in populations. Bear in mind that sometimes you will see no deer, even where they are present in high numbers, or you might double count them as you conduct the survey. This tends to be more useful in woods with good visibility and with the non-herding deer species.
Repeatedly visiting the site using a consistent counting method may give a more reliable measure, or you may wish to incorporate formal census results (see the Best Practice Census guides).

Record the number of deer seen (and heard for those species that have distinctive alarm or rutting sounds).
You should keep a note of sightings or signs of other species such as rabbits, hares and wild boar, as these species are also likely to cause impacts to woodlands. Other domestic livestock may also be present.
Record how many of each deer species are seen. Seeing just 1 deer during the whole survey scores Low, more than 10 per km (all species combined) scores High.

Dung
Tally up all pellet groups found (a pellet group is 6 or more pellets which were produced at the same time), record the species if you can. Muntjac often deposit in a latrine and a number of pellet groups of varying ages may be found. Record each different group found in the latrine.

You will need to look hard for dung; it is easily missed whilst you are looking at everything else. If you are using the dung count in an attempt to estimate deer density (see the Best Practice Dung Counts guide) you should conduct it separately.

In spring, in a deciduous woodland in the South of England finding only 1 pellet group during the whole survey scores Low, 30 or more groups per km scores High. In colder parts of the country dung can persist for longer therefore pellet counts may be higher for the same score. As your experience of activity assessment on a site increases you may wish to adjust the score.

If you come across an area where large numbers of pellets are found; in a particular habitat type for instance, mark this on a map. It could be useful in monitoring for future visits and for indentifying areas of particularly high deer activity.
The presence of droppings from other herbivores should also be noted.

Couches
Couches are places where deer have lain down, leaving flattened or scraped away areas of vegetation, often oval shaped. They will often be found in groups, particularly with herding species or family groups of roe. It may be possible to determine the deer species if hair is present.
Mark areas with many couches on a map, as deer will often use these areas on a regular basis.
1 couch in the whole survey scores Low, 10 or more per km scores High.

Scrapes
Scrapes are often seasonal in nature and can be very localised. It is usually possible to determine the deer species. If a number of fresh scrapes of the territorial species are found in one small area they should be recorded using only one tally mark as they are probably the work of a single animal.
1 scrape in the whole survey scores Low, 10 or more per km scores High.

Wallows
Wallows are often seasonal in nature and can be very localised. It is usually possible to determine the deer species, only Red, Fallow and Sika regularly wallow.
1 wallow in the whole survey scores low, 4 or more per km scores high.

Racks (deer paths) and slots (individual foot marks)
Individual slots can be useful to identify the species present and may be the only hoof marks where deer are at very low densities.
Usually however, racks are one of the most useful signs of deer activity because although dry or hard ground does not show slots well, deer racks are more obvious, longer lasting and give some indication of pressure of use. The species responsible for the racks might be determined from slots, droppings, height of adjacent browsed vegetation, and size of tunnels (particularly common with Muntjac) in dense bramble or other vegetation.

Count the racks throughout the woodland as you cross them. Racks can be very long, avoid counting the same rack more than once.

Because racks are often better defined where they cross especially heavily used sections of some rides and boundaries, there is some value in putting a special effort into counting them there. You may want to make a separate count in these areas in addition to counting racks throughout the wood, record the results in the Racks (edge) row.

Because decreasing deer density may be associated with a reduction in use rather than a reduction in number of paths it is important to record both number of paths and apparent frequency of use.
A “rarely” used rack will be only vaguely defined with very few or no new slots. A “lightly used” rack is better defined and will have a few newer slot marks. A “frequently used” rack will have more numerous and recent slot marks, and a “heavily” used rack will have many recent slot marks and may be wider than usual.
Occasionally (especially with Muntjac and sometimes other species) you will find a loose network or “maze” of racks. This is often associated with high deer densities and should be noted and scored as such.
On wet ground racks can appear to be more heavily used than they would otherwise.
Take care not to confuse badger paths (often wide and well worn) with deer racks (although both will use the other’s paths).
The distribution of tally marks across the grades will influence the index score, the more tallies to the right side, the higher the score. 1 rack in the whole survey gives a score of Low, 20 or more racks per km with at least some in the “frequently used” grade or above, scores High.

A high rack score should lead to the interpretation of the overall score for activity as being High, despite the other indicators in the Activity section giving low scores. This is because the other indicators may be harder to see/find and are not so reliably correlated with deer density.

Impact indicators

These are grouped into four main categories which should be retained if you modify the score sheets. The indicators within the categories can be used as they are, or changed according to the specific site, for instance, if there is no coppice present there is no point in including it as an indicator. Throughout the survey make notes of other mammal impacts e.g. rabbits, hares, and in some cases domestic livestock. Table 2. lists some commonly grazed/browsed as well as some that are generally avoided.

Fraying
Fraying is often seasonal in nature and can be localised. With the larger deer species fraying may become “thrashing” where branches and stems are broken in addition to bark removal. Take care not to confuse deer fraying by the smaller deer species with rabbit and squirrel damage.
Signs of fraying can be persistent so you must only tally for the fraying that occurred up to 1 year ago. If a number of nearby fresh frayed stems could possibly be attributed to one animal (most likely with the territorial species), they should be recorded using only one tally mark. 1 fraying site in the whole survey scores Low, 20 or more per km scores High.
Sika deer will also bole score with their antlers, this can look a little like fraying and should be scored as such.

Bark stripping
Bark stripping is often seasonal in nature and can be localised. It is normally associated with fallow, sika and red deer. Where damage is fresh, the width of the tooth marks can help to differentiate deer from rabbits or squirrels. Count individual stems or, if stripping is clustered count each cluster as one occurrence. 1 bark stripped stem (cluster) in the whole survey scores Low, 5 or more per km scores High

Broken stems
These occur when deer break stems in order to browse shoots higher than they could normally reach. The height at which the stem is broken may help to identify which species was responsible. 1 broken stem in the whole survey scores Low, 10 or more per km scores High. Stems broken by rabbits and hares usually have a clean, scissor-like cut.

Browse line
A browse line may be clearest when there are leaves on the trees, but even in winter it can be obvious.
At moderate deer densities expect the browse line to be visible when looking through the wood at 50 – 180cm height (depending on deer species). Most favoured plants will be grazed up to the browse line but non-favoured species will often be ignored.
A "hard, most /all species" browse line is one that is sharply defined for some distance through the wood and where even plant species that are not normally favoured, are eaten. Grasses may be grazed but tend to persist even under high grazing pressure.
Climbing ivy will often show a clear browse line but ivy is a particularly favoured plant so such lines are probably not that significant, except to say that if there is no deer browse line on climbing ivy then there are probably very few deer around. Ivy has been used as an indicator of deer presence in other ways[3].
Browse lines of smaller deer may not be obvious if larger deer are present.
A list of plant species that are usually favoured or avoided by deer can be found at the end of this note.

Browsing
Because deer are selective when browsing, it is important to concentrate on plants that are significant, for instance in most woods Bracken or Wood Spurge are rarely browsed, whereas climbing ivy and bramble are invariably browsed if deer are present in any numbers. Hardwood tree seedlings are frequently browsed and there is no harm at all in concentrating seedling counts in areas where there are lots of seedlings, it is here that browsing effects will be most obvious. For instance Ash trees shed a lot of seed and growing ash seedlings attract the attention of deer.
A total lack of tree seedlings may be due to many factors other than deer. It may well be that on any one site, indicators such as coppice or bramble are almost entirely absent, but if you suspect that this is due largely to deer impacts, you should consider keeping them on the recording form.

Coppice <2metres high(<1 metre high where only Muntjac are present)
These are recently coppiced stools with all new growth or older growth approximately at or below 2 metres Usually 1-2 growing seasons). They may be individual trees/stools or coppice coups. In a coppice coup examine at least 20 representative stools spread throughout the site, estimating the percentage of stems with damaged shoots. Note the tree species involved. Each tree/stool gets a tally mark in one of the percentage ranges. Part of the scoring involves a consideration as to whether the coppice stems are reaching the height that would normally be expected for their age. The more tally marks there are towards the right hand side of the sheet, the more intense is the impact.

Live basal shoots on older coppice or tree boles
Old coppice stools and some mature trees continue to produce new shoots from the base, the tops of which are within reach of deer. Look at least 20 representative

stools/trees spread throughout the site estimating the percentage of new (live) shoots that are damaged. Each stool gets a tally mark in one of the percentage ranges.

Seedlings/saplings

In a wood where browsing is light, fewer seedlings will be damaged and provided the young trees have had a few years to grow there is likely to be a range of saplings heights up to the heights you would expect . Count damage to tree seedlings, try to sample no less than 20 at a time wherever you stop. Each group of 20 gets a tally mark. In some woodland the amount of regeneration you find will be less than 20 seedlings in one area; just count what you find. Where browsing ahs been severe over a long period of time, very few or no new seedlings will have been able to grow above deer browsing height and all or most will be damaged.

Where seedlings appear to all be much the same height it is worth checking how old they are, they may have been held (by browsing) at that height for years.

Take into account the height of surrounding ground flora and make a note if it appears to be "nursing" tree seedlings to their current height, ignore isolated examples of this, e.g. a single Ash sapling protected by a fallen tree.

Smaller shrubs may be dwarfed and shaped by deer browse if pressure is high. In areas of lesser deer density you may find heavy low browse but the leader eventually gets away.

Note that depending on deer species location, some vigorous, less preferred trees such as Birch might get away despite heavy browsing on other tree species.

Bear in mind that light levels under a tree canopy will also affect the growth rate of tree seedlings. Try to differentiate between deer damage and that of other animals.

Bramble

Most common species of bramble are very palatable to deer so are a good indicator of impacts. Under little or no browsing pressure bramble tends to form large clumps, or a continuous cover. At high densities larger deer begin to break up large clumps of bramble and rapidly reduce the height to below 1 metre. Sustained pressure pushes it down further, hence the height measure on the recording form.

Bramble that is being reduced in height may eventually become "over topped" by browsing, in other words the leaves right across the tops of clumps will be browsed as well as those on the edges.

If only Muntjac are present, large clumps may persist for longer but will have a distinct browse line with "tunnels" following the racks. In the spring and summer of good growing years bramble may appear to be escaping serious browsing therefore the best time to use it as an indicator is in late winter/early spring when other food sources are not so abundant. Bramble is evergreen to some degree so leaves will be present all year in the absence of browsing, this can be confusing in late spring when previously heavily browsed bramble may have lots of fresh leaves but no darker "winter" leaves. Remember that bramble under a dense canopy is likely to be less vigorous than that found under a canopy cover of less than 50%, impact under dense canopy may appear high, but may in fact be moderate to low depending upon shade levels.

Grazing

Deer of all species will selectively graze ground flora. Space has been left in the grazing section for a number of indicator species which will vary from site to site and between deer species. Commonly Honeysuckle, Sedges and some clump forming grasses are useful indicators. Each plant species will have its own response to

grazing and may therefore have to have its own impact criteria and index score. Either use the grading on the recording sheet or construct your own.
You may, for example, prefer to measure impacts more precisely using a system similar to the example given in Table 1 below.

Table 1. Example of customised grading for grazing (may differ from site to site)

index score	None/ minimal	Low	Moderate	High
Oxlip	Up to 10% loss of flower heads	11- to 25% loss of flower heads	26 to 50% loss of flower heads; up to 20% loss of leaf – loss of plants	more than 50% loss of flower heads; more than 21% loss of leaf – loss of plants
Bluebell	No loss of flowers; up to 5% loss of leaves	Up to 5% loss of flowers; 5-10% loss of leaves	6- 15% loss of flowers; 11-20% loss of leaves	more than15% loss of flowers; more than 21% loss of leaves
Dogs Mercury	up to 5% bitten	6 to 10% bitten	11-15% bitten	more than 15% bitten

Sometimes the size and orientation of tooth marks can help to identify the deer species or differentiate deer damage from other animals. For example hares will often take just a section of stalk and, if the damage is fresh, the cut will be diagonal, resembling a clean cut made by scissors, the remaining stalk and leaves or flowering head may be found at the base of the plant. Deer tend to take the whole shoot, sometimes leaving a ragged cut.
On taller plants it may be apparent which species was responsible for any grazing from the height of the bitten ends.
If only the flowering heads are being taken it may be necessary to look quite hard to see the remaining flower stalks.
Grazing on long-lived perennials can reduce their size and affect their distribution, whereas other species may spread at their expense e.g. grasses, sedges and ground ivy. Make a note of plant species that appear to be un-grazed, if subsequently deer start taking these it may be because there is less, more palatable food about. Record any changes in plant distribution, and consider asking local naturalists for additional information.

Carrying out the survey

Walk slowly; there is a lot to take in. Sometimes there is a danger of missing certain signs (e.g. deer dung can be hard to see amongst ground vegetation) If a particular sign is really important to the survey it might be sensible to do a separate walk looking specifically for it.
There are potentially 4 elements (below) to the survey, which of these you chose to do will depend on what you are most interested in. Element 1 should <u>always</u> be done unless the woodland type makes it very difficult. Element 2 is normally done during element 1. If you decide to include the other elements, your normal route might allow you to do that as you go, or they could be done separately:

1. Walk off of the rides, through woodland blocks, glades, coppice areas etc. The precise route followed is not important but unless rides are the only way of moving about the wood it is important not to simply follow them. This is because the sides of rides may not be good indicators of the true deer activity

or impact, either because of human activity or the fact that there is more light on rides or both.
Where you cross rides any results recorded there can be included in this part of the survey. At this stage avoid following rides and the edges, unless you plan to carry out 3. and 4. below, at the same time.

The route should be representative of the wood/compartment as a whole. The whole wood/section could be covered by following a more or less regular zig zag path through it from one end to the other, or via a roughly circular route.
It is perfectly legitimate to seek out areas where impact is likely to be more obvious as long as the overall impact score is taken in the context of the whole surveyed area not just these "special" areas.
If you are unsure in the initial survey as to whether to include the whole wood in a single survey or to do separate surveys in each habitat or crop type as you follow the same route, it would be best to do separate surveys (you then have the option of combining them as a single survey at a later date) If you find early on that the whole area appears to be the same you should still complete the whole walk as planned, sometime small areas that you might otherwise have missed can throw up a very different picture to the rest of the wood.

2. Look at specific plants of interest. This can usually be done during element 1 above and involves scoring impact on plant species that are good indicators of impact on that specific site. These are recorded in the Grazing section of the record form.

3. Optional. Check woodland/field edges for deer racks coming in and out. This can be done while you are doing 1. but consider recording results separately. You might walk the whole boundary or a representative part of it. Record results in Racks (edge)

4. Optional. Walk a representative ride or rides through the wood, either simply checking for racks as part of 1. above, or to carry out a separate survey. Unless it is unavoidable, or your interest is in purely in ride side impacts, you should not conduct your survey solely on rides. Results can be combined with 1. above but it is sometimes useful to record them separately.

Recording and scoring results
Please refer to the recording form as you read this section.

Survey results should be recorded on a standard recording form, this reduces the risk of forgetting things and should help to ensure consistency over time. Feel free to modify the form supplied but try to "future proof" changes as you need to be consistent if you are intending to monitor over the years. You should also try to keep the 4 main categories in the impact section, just changing the sub-categories

The example recording form is split into two sections, one for Deer Activity and another for Deer Impact.
As the survey proceeds, each time an example of each element is found it is given a tally mark using the "5 bar gate" (𝍸) tally system.

Some boxes have no scoring criteria above the tally boxes (i.e. most of the rows in the "Activity" section apart from the "racks" rows, plus the "bark removal or breakage" rows). In these the more tally marks there are, the higher the score on the right hand side. In these same boxes it is useful to group the tallies according to deer species (because it may help to indicate which species is prevalent) and, if you wish, create a score for each species, although an overall score for all species is simpler.

The other boxes are tallied regardless of deer species, according to criteria in the box above (i.e. the rows "Racks" and from "Coppice" to "Grazing"). You can, if you wish, attempt to score by deer species for all of the rows but you will find it difficult to differentiate things like grazing, by deer species
For these the score is assigned according to the weight of tallies across the criteria. Both activity and impact increase from left to right. i.e. if most of the tally marks are towards the right hand side the score will be High..

Although it is not essential, it is recommended that you record the distance travelled on each survey in order to build up a reference record for activity signs/impacts per distance (e.g. per Km), this can help in ensuring consistent results in future surveys. You could use the distance data to help assign the score in the right hand column, guideline figures are given above in the description of the relevant Indicators.

If some data is not available because of the time of year, it might be best to wait for a further visit before completing the analysis of the score sheet.

It is important to keep the original score sheets from year to year because it allows you to compare the number and position of tally marks between surveys which might give show trends sooner than the overall score alone.

The Comments area is vital for a full interpretation of your results. Comments will vary between woods but the following are typically included:

> Remarks on canopy density where appropriate, expressed as a percentage of sky visible as it would be when the trees are in leaf.
> Changes in woodland management which might affect the survey from year to year.
> Notes such as:
> "in deer exclosures the plant growth is much better than growth outside" or "plant growth on open rides is as poor as under the canopy". These might both indicate significant impact.
> Presence of rabbits/hares These could be significant contributors to impacts. Signs are usually obvious. Hare and rabbit damage is easily confused with lower height deer damage.
> Unpalatable plants "nursing" vulnerable plants E.g. ash seedlings often reach a height of 20 cm or so before being browsed off because Dogs Mercury or other ground flora conceals it up to that height
> Normally unpalatable plants being grazed/browsed This may indicate very high numbers of deer. The reverse, where known palatable plants are untouched may mean lower deer numbers.
> The weather Fair weather is best for surveys e.g. rain may wash away deer signs or make them harder to see, prolonged dry weather may make racks less visible.

Observations of “old” impacts For instance there might be a lot of old fraying signs but very few new ones, or previously browsed stems might be showing signs of recovery. Both situations indicating the possibility of numbers being higher in the past.
Route details are vital to to remind you or the observer that succeeds you where you went.
Observations that indicate deer distribution such as recording areas where deer presence seems higher than elsewhere, can be useful to deer managers.

Interpretation of results

The distribution of tally marks should enable the right hand “Score” column to be completed. For both the Activity and Impact sections, decide where the majority of results / grades lie, e.g. if there is a majority of Moderate scores then the overall score for the site is Moderate.
Your overall score might need to be adjusted according to the comments that were made during the survey.

The aim of scoring is to come up with an overall impression of deer activity and impact, graded as; None/Minimal, Low, moderate or High. Record these in the summary area on the front of the sheet. Note that some indicators should be weighted more than others, e.g. if you get a high Racks (in wood) score, this would supersede any of the other Activity scores and the overall score for activity would be high.

The raw tally counts themselves are just as valuable as the index score for comparing records from year to year, and may help to give a more detailed indication of trends than the overall index scores.

The boxes relating to deer species on side 2 of the record sheet help to clarify the species to which the survey relates and indicate which might be causing most impact. It may not be possible to be confident in these judgements in which case more than one species may be named.

What the deer Activity score means

The Activity score can be used to monitor the relative deer activity on a site over time and hence give a very approximate indication of relative deer density in the survey area.

The Activity score can also be used to predict the likely level of impact in an area, however it is important to be aware that different plant species, habitats, and management objectives may have different deer activity thresholds for unacceptable damage. In the boulder clay woodlands for example the oxlip is very sensitive, perhaps because it emerges so early in the year (March), and a moderate activity score can result in high damage levels to the plant. Conversely significant damage to bluebells and dogs mercury in the same woodlands occurs only at a higher deer activity levels.
On sites where controlling damaging impacts is the primary management objective then the **impact score, rather than the activity score** should be used as the driver for impact prevention and culling strategy.

In general however the likely implications of increasing deer activity scores are:

None or minimal: Activity at this level is unlikely to negatively affect the woodland, the limited degree of grazing and browsing might even be beneficial to biodiversity. If this level of deer activity is desirable in the future, then it is sensible to have minimal deer management in place, mainly to monitor apparent deer numbers and to respond by culling if they increase.

Low: At this level, particularly sensitive features are at risk. Some damage is likely to occur to unprotected coppice, natural hardwood regeneration and to sensitive flora such as oxlips, anemones and orchids. If the sensitive features are of high importance, deer control should be put in place, deer numbers should not be allowed to increase, and some level of other protection such as fencing may have to be considered. Cooperation with neighbours may make it easier to control deer numbers. Even from low densities, deer numbers can increase rapidly if left unchecked.

Moderate: These scores are associated with damage to sensitive features, more general impacts and even a potential loss of biodiversity. If unchecked, activity at this level could result in progressive degeneration of coppice stools, loss of lower coppice layers and bramble thickets, little or no tree regeneration, and a reduction in the success of key flora. Deer control should always be considered. Habitat impact at this level is often not tolerable or sustainable, in which case deer numbers should be lowered rapidly until impact scores are tolerable. Collaborative management should always be considered.

High: Such a level of activity usually results in severe damage to many features of the wood. If unchecked, biodiversity will be severely affected, possibly resulting in irreversible change to woodland structure and species. Only species unpalatable to deer or capable of withstanding grazing thrive (e.g. ground ivy, Wood spurge, some grasses, bird cherry, aspen). Unprotected coppice stools might be killed in three years. Deer management is essential and should be targeted to achieve a rapid reduction in activity. This will often require a landscape scale approach, involving neighbouring landowners, to be effective, especially with the herding species.

What the deer Impact score means

The Impact score is a direct indicator of impact and if controlling impact is a management objective then the score should be used as the driver for impact prevention and culling strategy, rather than activity score or any other measure of deer abundance.

None/ Minimal: deer impacts at this level are unlikely to adversely affect any of the key woodland indicator species, coppice or regeneration. It is not expected that any loss of plants will occur and the woodland should be able to regenerate without the need for fencing or tree tubes.
It is advisable however to have a deer management policy in place so that the site can be monitored. If deer do become present or increase then control can be established quickly to prevent any unacceptable impacts occurring if that is a

management objective. Levels of impact at this stage are likely to be positive to bio diversity rather than negative.

Low: Impacts registered at this level are unlikely to have a detrimental effect on the majority of the woodland. Plants that are particularly palatable to deer will be affected, (e.g. Oxlip). Hardwood regeneration and coppice growth will show some impact but stems should be able to get quickly above browsing height.
Unfenced coppicing may be possible but some browsing will occur, growth rates and the quality of stems may be reduced. Small, isolated areas of coppice or natural regeneration will be more vulnerable than large areas. At this level of deer impact most woodland features will survive.

Moderate: Poor growth or loss of palatable woodland plants is very likely at this level of impact, coppice re-growth and natural regeneration will be affected and is unlikely to be successful unless fenced. Understory will deteriorate and reduce in density. Continuous bramble will start to be broken into smaller patches if larger deer species are present. Brash piling around coppice stools or dense dead hedging may protect coppice stools and regeneration but after 2 -3 seasons these will be broken down and deer will start to impact on lower coppice shoots and areas between the coppice stools, affecting regeneration and ground flora.
Temporary fencing should be regarded as a breathing space in which to reduce deer numbers otherwise when deer are able re-enter the previously fenced area they may cause considerable impact

High: Loss of all natural hardwood regeneration is likely and any un-fenced coppice will be severely browsed. If this continues coppice stools are likely to begin to die off. Most of the floral interest in the woodland will be lost, and even usually non-palatable plants will be browsed, grasses or sedges may begin to dominate the woodland floor where the canopy is not dense.
Over a long period the understory may be severely affected with simplification of the woodland structure. Some changes may be permanent.

These impact grades can be viewed as roughly equivalent to the “impact stages” described by A. Cooke (2009)[4], who describes how such stages could be used to inform woodland management for conservation.

Table 2: Palatable plant indicator species

Species	Time of year	Important factors
Herb species		
Bluebell	Apr-May	Eaten by fallow and mainly muntjac; leaves and flowers eaten, leaving stalks. Plants get smaller after years of sustained grazing but recover if protected.
Common spotted Orchid	Jun-July	Inflorescences eaten by fallow and muntjac, easy to measure bitten stalks. Damaged plants fail to set seed and decline with a long recovery time.
Hogweed	May-Jul	Flowers and leafy stems taken by fallow and roe mainly.
Oxlip	Mar- May	Flowers eaten by muntjac & flowers and leaves eaten by fallow. Very sensitive to damage, very slow to recover
Pendulous sedge	All Year	Survives grazing, smothers other flora. May dominate where grazing is intense on other plants. Flowers in light but not in shade.

Wood sedge	All Year	May be more palatable than Pendulous.Sedge. Centre of plant often eaten out at ground level.
Red Campion	May Jun	Flowers eaten off by roe, stops plants seeding causing decline. Flower stalks eaten at 90-100cm.
Wood anemone	Mar-May	Flowers eaten from prostrate stems by muntjac, roe and fallow, slow loss of population, slow to recover.
Woody species		
Ash	All Year	Young shoots eaten vigorously, stems may be broken down to reach them. Bark removed, mostly in winter. Coppice stools can be killed.
Bramble	All Year	Ends of young and flowering shoots are a favourite food for all deer species. Browsing height may indicate species. All green leaf may be removed by end of winter.
Honeysuckle	All year	Often present as short plants “nursed” to 15 cm or so by other ground flora but will climb if it finds support. May be held at 0-15 cm by heavy grazing, or prevented from climbing, or climbing plants will show clear browse line.
Hawthorn	Apr-Jul	Ends of young shoots eaten by all species of deer , often eat when in flower; commonly leave browse line, or topiary effect. Can grow very slowly away from browsing with leader eventually emerging from an otherwise dwarfed plant.
Hazel	Jun-Aug	Young shoots eaten by all deer species, especially coppice. Bark may be removed. Height of browse line can point to deer species.
Hornbeam	May-Aug	Young shoots eaten vigorously by all species of deer, bark removed from poles, coppice stools can be killed.
Ivy	All year	Climbing shoots eaten vigorously, especially in early spring when ivy may be only green plant in wood. Bark may be taken in prolonged hard weather.
Field maple	Jun-Aug	Young shoots eaten vigorously by all species of deer – clear browse line.
Rosa species	Jun-Aug	New growth of stems eaten by all deer species – the height can be a good indicator of the species. Browse line common.
Sallow/Willow	Jun-Aug	Young shoots eaten by all species, especially coppice. Bark often removed.
Wych Elm	May-Aug	Young shoots are favourite browse for all species of deer – at least as popular as ash. In winter bark is very often removed and eaten when other vegetation hidden by snow.
Holly	All year	Sometimes avoided but new growth is palatable. Is often dwarfed under canopy. Can grow very slowly away from browsing with leader eventually emerging from an otherwise dwarfed plant. Browse line may be very obvious.
Sweet Chestnut	All year	Young shoots eaten vigorously, stems may be broken down to reach them. Coppice stools can be killed.
Grasses	All year	Many species palatable, but can survive heavy grazing so may come to dominate woodland floor, especially where canopy is not dense.

Table 1b: Less palatable plant indicator species

False Brome	All year	Unpalatable to most deer; expands in range as other plants are eaten by deer.
Ground Ivy	All year	Unpalatable to deer; expands as other plants are eaten by deer..
Wood Spurge	All year	Unpalatable to most deer.
Nettle	When	Generally avoided but flowers may be eaten over very short

	flowering	period, mostly by fallow.
Dog's mercury	Mar-Aug	Leaves stripped from stalks by Muntjac, other deer species tend to avoid.

Further Information:

Wild deer Best Practice guides, available at www.thedeerinitiative.co.uk

[1] Cooke, A. S. (2006) *Monitoring muntjac deer* Muntiacus reevesi *and their impacts in Monks Wood National Nature Reserve.* English Nature Research Report No 681. English Nature, Peterborough.

[2] Cooke, A. S. (1997) Effects of grazing by muntjac (*Muntiacus reevesi*) on bluebells (*Hyacynthoides non-scripta*) and a field technique for assessing feeding activity. *Journal of Zoology* (London), 242, 365-410.

[3] Cooke, A.S. (2001) Information on Muntjac from studying ivy. Deer 11 (9)

[4] Cooke, A. S. (2009). Classifying the impact of deer in woodland. Deer 14(10) 35-38

[5] Cooke, A. S. (2007) Deer and damage scores for woodland monitoring. Deer 14(5), 17-20.