Native Woodlands Survey of Scotland (NWSS):

Summary of the survey plan, process and procedures

Aim and Objectives
The aim of the Native Woodlands Survey of Scotland (NWSS) is to undertake a baseline survey of all native, nearly native and planted woods on ancient woodland sites (PAWS) woodlands in Scotland in order to create a woodland map linked to a spatial dataset showing the type, extent and condition of those woods.

The objectives are to:
• Identify the location, type, extent, composition and condition of all native, nearly native woodlands and PAWS woodlands in Scotland;
• Produce a baseline digital woodland map of all native, nearly native and PAWS woodlands in Scotland;
• Collect information to enable future monitoring of the extent and condition of the total Scottish native woodland resource;
• Provide information to support policy development.

The information that will be collected by the survey is as follows:
• The location and extent of woods with ≥40% native species;
• The priority woodland types and NVC communities of all native woods (ie a woodland whose canopy is comprised of >50% native species);
• The condition attributes of all native woods, nearly native woods and PAWS woodlands.

Background:
An increasing emphasis is being placed on biodiversity through reporting requirements and legislation at both an international and national level. As a result of objectives and duties placed on the Forestry Commission from documents such as the Scottish Biodiversity Strategy (2000), the UK Biodiversity Action Plan (1994), the Scottish Forestry Strategy (2006), and the Nature Conservation Act (2004), the FCS has a duty to monitor and report progress and to enact necessary incentives and regulations regarding biodiversity in relation to native woodlands.

Despite a range of previous surveys, the location, extent and condition of all native woodlands in Scotland is not accurately known. The Native Woodlands Survey of Scotland is the first survey of the full extent of the resource rather than a plot based or sample based survey and so is able to detail location, extent and condition of all native woodlands. With a remit specific to native woodlands and a scope to survey the location, type, extent and condition of all native woodlands and PAWS woodlands, the NWSS covers a different area and scope to the previous National Inventory of Woodlands and Trees (NIWT) and the National Forest Inventory (NFI), which is currently underway.
Forestry Commission Scotland has commissioned the project and has responsibility for its development and implementation, with support from SNH. FCS took an initial steer from the Native Woodlands Partnership for Scotland, a group of stakeholders with an interest in the resource. Such partners and stakeholders helped shape the methodology and scope of the survey given their interest and duty in managing and protecting some of the areas that will be surveyed.

The minimum area of woodland that will be mapped is 0.1ha. Where the wood is greater than 0.5ha the wood will be subdivided into separate polygons of Interpreted Forest Types (IFTs). The minimum size of the subdivisions is 0.25ha.

Woodland is defined as wood that has:
- A minimum area of ≥0.1ha
- >20% canopy cover,
- a minimum width of 20m and
- a minimum height of 2m or the potential to achieve it.

This reflects the definition of ‘forest’ (Patenaude, 2005).

The woodland map is for all woodland, as defined above and also includes linear features either isolated or forming an external extension to the woodland.

The digital woodland map will be used to determine the locations for the field survey. The map that is being developed and used for the NWSS will also form the digital woodland map required by the NFI project.

All native and nearly native woodland will be field surveyed, although all candidate native woods need to be visited to determine their status as native, nearly native or non native (see below). This requires the survey team to field visit to approximately 730,000ha of woodland and field survey approximately 425,000ha of woodland.

*Once the field survey has been undertaken the subdivisions of the map will be refined and reflect priority woodland types with NVC communities and internal open broad habitat types.*

Native woodland and the terms used to describe different components of it are defined as follows:
- Native woodland is that containing >50% native species in the canopy.
- Nearly native woodlands are those with approximately ≥40% but ≤50% native species in the canopy.
- Candidate native woods are those that may contain native woods when remotely mapped from aerial imagery. The only woods excluded from this category are conifer woods outwith the pine zone (MacVean and Ratcliffe, 1964).

Given limited resources, the minimum size of woodland that will be surveyed in the field is 0.5ha. All native and nearly native woods above this minimum size will be field surveyed. Mapping to a smaller minimum size identifies potential priority woodlands such as riparian habitats, isolated woods with potential for genetic seed
sources and woods where native woods are scarce. This could be useful in Forest Habitats etc.

It should be noted that the NWSS differs from NFI in the following ways:

**Table 1: Comparison of scope for NWSS and NFI**

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>NWSS</th>
<th>NFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covers full extent of target resource</td>
<td>Sample based</td>
<td></td>
</tr>
<tr>
<td>Minimum Polygon Size</td>
<td>0.5ha (field survey) or 0.1ha (map)</td>
<td>0.05ha</td>
</tr>
<tr>
<td>Area covered</td>
<td>Scotland</td>
<td>GB</td>
</tr>
<tr>
<td>Target woods</td>
<td>Native, nearly native and PAWS woodlands</td>
<td>All</td>
</tr>
<tr>
<td>Level of data use</td>
<td>Site specific data for each wood</td>
<td>Statistical sample</td>
</tr>
<tr>
<td>Attributes</td>
<td>Woodland type, extent, location and condition attributes</td>
<td>Stand data including silvicultural systems, thinning regime plus a range of others including general site, forest health, mensurational data and social features.</td>
</tr>
</tbody>
</table>

Such an ambitious project is expensive and to reduce the costs and the time involved in delivering a full data set, a field survey methodology has been developed specifically for the project that is designed as a rapid survey approach. This introduces some element of subjectivity into the assessment and the project has imposed strict quality assurance guidelines and procedures to ensure that the confidence limits required of the survey uses can be met.

The quality checks that will be applied throughout the project include:
- digital map checks
- field mapping (spatial data quality) checks
- consistency checks on attribute capture (amongst surveyors)
- benchmarking on attribute capture (against an alternative method)
- training updates and reviews
- data validation

The confidence limits described in the Standard Operating Procedures applied to this project have been set following a benchmarking exercise that compares results of the method described against a quantitative plot based methodology undertaken by expert field surveyors.

**Outputs**

The main uses of the data will be:
- Setting a baseline for reporting targets for native woodlands and non native ancient woodland sites
- Strategic targeting of effort and resources: including informing policy scenario analysis and identifying opportunities for grant allocation
• Long term plans: supporting management planning and Forest Habitat Network planning
• Development control: enabling informed planning decisions to be taken.

The main deliverables from the project are:
• A baseline map identifying the location and type of all of Scotland’s native woodlands in the context of all Scotland’s woodlands;
• Reports by local authority areas and an incrementally increasing data set, eventually covering all native woodland in Scotland (complete by 2013);
• A database that can be used in conjunction with existing systems to spatially and statistically analyse data collected against other data sets.

Additionally, a regional indicator will be reported across a whole local authority area as a simple overall indication of the average health or condition of native woods for biodiversity. This will be based on an assessment of how many of four key condition attributes are in a range that is generally desirable. The attributes and their associated desired range are: canopy cover (50-90%), native species as % of canopy cover (90% or over), herbivore impact value (low, ie class A or B), and invasive non-native species cover (not more than 10%).

Key questions that the data will help to answer are:
• Where are the native woodlands?
• What type of native woodlands are there and how much is there of each type?
• Which woods are in good condition and have high conservation value?
• Where should limited resources and effort be focussed for native woodland management?

Design
The process for completion of the survey is set out below in Figure 1: Flow Chart of the NWSS Process.

Figure 1: Flow Chart of NWSS Process

Stage A. DIGITAL WOODLAND MAP PRODUCED.
This is used to identify the woods that require a field visit and the progress with production will determine an estimated schedule of work.

Stage B. CONTACT OWNERS AND AGENTS
This will determine any restrictions to access and notify owners and agents of the intention to survey.

Stage C. PROVIDE FIELD DATA TO SURVEYORS
This gives the survey team the map and all associated reference data required to carry out the survey. At this stage the team will prepare a more accurate schedule of work.
### Determining Sites for Field Visit

A digital woodland map is produced from OS Mastermap and recent ortho-rectified aerial photographs that are no more than five years old at the time of mapping. The map will be supplemented by a spatial data layer identifying new native woodlands grant aided by Forestry Commission Scotland. The woodland map shows the boundaries and locations of all woodlands in Scotland.

The map is subdivided at this stage where visible differences in woodland occur, such as conifers, broadleaves and open spaces. These subdivisions are called Interpreted Forest Types (IFTs).

This spatial data layer, the digital woodland map, is used to identify the locations of woods that will be visited during the survey. There is no authoritative way to identify native woodlands remotely. Thus candidate native woods must be visited to determine if they are to be surveyed. The only woods excluded from visit are those identified on the digital woodland map as having an IFT of ‘C’ (>80% conifer).

| Stage D. | **WOODLAND VISIT**  
At this stage the surveyors determine the extent of survey and data capture required at each location they visit. |
|---------|--------------------------------------------------|
| Stage E: | **MAPPING WOODLAND LOSSES, GAINS, INTERNAL BOUNDARIES AND AMEND ERRORS ON MAP**  
At this stage the surveyors will amend the boundaries on the digital map as required. |
| Stage F | **OTHER ATTRIBUTE DATA COLLECTED IN THE FIELD**  
At this stage the team record all attributes for native and nearly native woodland units (polygons) as required. This is an iterative process and may be done in conjunction with the woodland visit and mapping work. |
| Stage G. | **POST PROCESS, COLLATE FIELD DATA AND SECURELY STORE DATA**  
The surveyors return batches of data to the data manager and the data is then quality assured, post processed and stored. |
| Stage H. | **ANALYSE, REPORT AND SHARE DATA**  
The data manager prepares the data for use and ensures its accessibility. |
outwith the pine zone. In these cases the imagery must be reviewed by the field survey team to ensure no small polygons of mixed or broadleaved woodland occur.

In addition to the above method to identify sites that require a visit, for Plantations on Ancient Woodland Sites (PAWS), a reference data layer will be provided to the survey team in order to identify locations where non native ancient woodland sites must be visited and surveyed. These must be visited even if they are on mapped woodland with IFT ‘C’. This is illustrated in Figure 2 below.

**Figure 2: Decision tree for visiting woodland**

The survey schedule is determined as a result of:
- Availability of aerial imagery to determine mapping schedule. At the time of beginning the survey, there was not full coverage of aerial imagery across Scotland. The aerial photography was completed during 2009 and the digital woodland map will be complete by summer 2010;
- Efficiency of survey delivery/operations;
- Seasonal considerations including weather and ability to identify species as described in the NVC field guide;
- Access restrictions to land as a result of sporting activities or other uses affecting surveyor safety;
- Continuity of the area being surveyed.

Note: field survey work is undertaken all year round.

**Identifying Sites that Require Survey**

The field survey work will visit the identified ‘candidate native woodlands’ and assess whether they are survey subjects. Woods that will require field survey (survey subjects) are:

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**Identifying Sites that Require Survey**

The field survey work will visit the identified ‘candidate native woodlands’ and assess whether they are survey subjects. Woods that will require field survey (survey subjects) are:
- all non native ancient woodland sites as determined by existing data sets (i.e. sites over 2ha) and
- all woods with ≥40% native species

In order to determine whether a wood has ≥40% native species, the surveyor must determine the percentage canopy cover of the native species in the wood. Figure 3 illustrates how surveyors decide whether or not to survey woodland once visited.

For non survey subjects, the survey team will record the percentage of native species and the major species present. No amendment to woodland boundaries will be undertaken.

**Figure 3: Decision tree for surveying woodland**

![Decision tree for surveying woodland](image)

For all woods with ≥40% native species and those that are remnant ancient woodland (non native ancient woodland sites), all attributes will be collected.

**Carrying out the woodland survey**

GPS units were used in tandem with the aerial photographs and OS maps to ensure accurate mapping and subdivision of woodlands. Use of all-weather computers allowed for capture of all information digitally, removing a potentially costly and time consuming digitising phase.

The full list of species considered as native is available in the data description and survey protocol documents [insert link to this doc]. Scots pine was only considered native within the range specified by McVean & Ratcliffe (1964).

For each woodland area, the following information was collected:
- General woodland area data
  i.e. canopy cover, proportion of native species, proportion of planted to semi-natural,

- Species/stems data (for each of five size classes for each species)
  i.e. stem densities, canopy proportion, browsing impacts for each species/size class

- Habitat data
  i.e. proportions seen in the woodland of habitat types present (National Vegetation Classification (NVC) and Priority Woodland Type.

- Deadwood data
  i.e. representative estimate by size class

- Quality characteristics
  i.e. additional data useful for condition assessment

For non PAWS woodlands with less than 40% native species in the canopy collect:

- General woodland area data
  i.e. canopy cover and proportion of native species in the canopy

- Species/stems data
  i.e. only the dominant species/size class is recorded

Woodland loss
Any recent losses in native woodland area were recorded in comparison between the aerial photographs and what was observed at the time of field survey.

**QA method**

i. QA methodology for fieldwork
Before joining the survey team, individuals are trained and tested to meet the expected standards. One area, per surveyor, per year is quality assured using an extensive plot based survey method, with acceptance limits calculated for each variable collected, these are then used to assess the “walk through” survey results.

All members of the survey team are checked in this way as part of a rolling programme. The whole survey team is assessed every 6 months over 6 woodland areas at two different sites during both the winter and summer seasons. This allows for regular assessment of quality and consistency with individual feedback given to optimise performance.

Feedback and training continues throughout the period of survey to ensure the high standards set were achieved continually.
Customised quality assurance systems have also been developed and implemented for the mapping and data recording components of this survey. The whole project has been managed by a project manager working to a project board.

References
