Forest Research

Individual Tree Data Standard

Forest Research

Forest Research is the Research Agency of the Forestry Commission and is the leading UK organisation engaged in forestry and tree related research.

The Agency aims to support and enhance forestry and its role in sustainable development by providing innovative, high quality scientific research, technical support and consultancy services.

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Introduction

Purpose

A standard is an agreed way of doing something, such as managing a process or delivering a service, established by consensus and expert knowledge.[1] This new Individual Tree Data Standard (ITDS) describes a set of commonly collected variables that tree surveyors and data owners can use to assess their trees. The overall aim is to achieve better outcomes for tree managers, researchers and the public. Use of the ITDS will allow data to be reused for a variety of purposes beyond the intentions of original tree surveys.

The ITDS aims to:

- harmonise data collection and recording at the individual tree level, and
- promote the use of individual tree data across a diverse range of disciplines.

The objectives are:

- to provide a framework to align commonly collected tree data variables, and
- to make it easier to combine and analyse data from multiple sources.

The data standard has not been designed to be a single unified system for collection of tree data. Instead, it is intended to establish and encourage a common approach to individual tree data collection that will allow maximum flexibility while minimising additional work.

Although this Standard can be used in any situation, it may be most applicable to urban contexts, where trees are most often managed as individual entities.

[1] British Standards Institute. www.bsigroup.com/en-GB/standards/Information-about-standards/what-is-a-standard/.

Context

In the UK, it's estimated that there are 150 million urban trees.[2] Of these, perhaps 40 million have been surveyed and the data stored in local authority databases.[3] Depending on the objective (e.g. health and safety, or maintenance), surveys are informed by guidelines set out in a wide variety of sources, including but not limited to BS 5837, Capital Asset Valuation for Amenity Trees (CAVAT), i-Tree Eco, the Open Air Laboratories (OPAL) initiative Tree Health Survey, Quantified Tree Risk Assessment, Tree Evaluation Method for Preservation Orders (TEMPO), and the Veteran Trees Initiative Specialist Survey Method. Data are stored on a variety of platforms, such as Breadboard Labs Ltd's Curio, Azavea's OpenTreeMap, PlanIT Geo™'s TreePlotter™, Treework Environmental Practice's MyTrees and Treezilla (an Open University–Forest Research collaboration). While many methods overlap in their specifications for measuring trees and recording data, differences between them make it difficult or impossible to combine, compare or reuse the data. This prevents a knowledge-based approach to improving urban forest management,[4] optimising benefits from trees,[5] and reducing conflicts.[4]

Several initiatives encourage the re-use of public data. The Re-use of Public Sector Information Regulations (2015)[6] requires public sector organisations to make their information available for reuse in most cases. In 2017, the Geospatial Commission was created 'to maximise the value of all UK government data linked to location, and to create jobs and growth in a modern economy'. The UK government

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[2] O'Callaghan, D. P. (2005). Tree-related subsidence: Pruning is not the answer. *Journal of Building Appraisal*, 1, 113–129. Available at: https://doi.org/10.1057/palgrave.jba.2940011.

[3] Estimated from survey of local authorities.

[4] Britt, C. and Johnston, M. (2008). Trees in Towns II. Department for Communities and Local Government.

[5] Davies, H. J., Doick, K. J., Hudson, M. D. and Schreckenberg, K. (2017). Challenges for tree officers to enhance the provision of regulating ecosystem services from urban forests. *Environmental Research*, 156, 97–107. https://doi.org/10.1016/j.envres.2017.03.020.

[6] www.legislation.gov.uk/uksi/2015/1415/contents.

estimates that use of this data will create up to £11 billion of extra value for the economy every year.[7] A 2018 European Commission report estimated that solving problems with data reuse across the EU would save €10 billion every year for the academic sector alone, and provide another €16 billion every year in innovation opportunities that are currently being lost.[8]

Many sectors in which data are routinely generated have developed data standards: a set of rules or guidelines that outline the way in which data should be collected and formatted to facilitate data reuse. Implementation of a standard for data collection will make data transferable between different users, promoting a 'collect once, use many times' philosophy and enabling a step-change in data volumes available for urban planning and research.

A further benefit of collecting data within the framework of a data standard is that data quality, completeness and provenance are more easily tracked. This is especially valuable where data is collected by different user groups, such as researchers, professional surveyors and citizen scientists. The increased quantity and improved quality of data will enable landscape-scale management planning, world-leading research into urban trees, and improved environmental quality outcomes.

[7] www.geomatics-world.co.uk/content/article/uk-government-announces-new-geospatial-commission.

[8] European Commission (2018). Cost of not having FAIR research data. Directorate-General for Research and Innovation Open Science, European Commission.

Developing an Individual Tree Data Standard

The ITDS project was established in 2018 by The Open University and Forest Research in response to problems encountered when adding datasets to the open-source tree map Treezilla,[9] and a request from the Tree Health Citizen Science Network (THCSN)[10] to investigate data sharing issues.

The aim of the project was to address the disparate nature of individual tree survey data and to introduce standardisation.

In 2019, development of the ITDS was incorporated into the COMMUNITREE project. The COMMUNITREE project was developed by The Open University, Treework Environmental Practice Ltd, Natural Apptitude Ltd, and Forest Research. It was funded by the Geospatial Commission and aimed to draft a new data standard for tree data collection and demonstrate it in the citizen science application, Treezilla.

The Standard was developed through a review of current and best practice, and extensive stakeholder engagement using two workshops with representatives from government agencies, research institutions, software developers, data managers, tree officers, arboricultural consultants and charities, plus one-to-one consultations. The full process is summarised in Appendix 1.

[9] https://treezilla.org/.
[10] www.observatree.org.uk/about/uk-tree-health-citizen-science-network-2/.

Structure of the Standard

The data variables in this Standard are organised by priority:

- Required
- Recommended
- Optional

and by data group:

1. Survey Basics
2. Tree Basics
3. Site
4. Tree Age
5. Crown
6. Tree Health

There are 42 data variables. Five of them are required, 10 are recommended, and the remaining 27 are optional.

Required data

The five required data variables represent the minimum amount of information necessary for re-using data.

Required data variable	Description
Data collection date	The date on which the data was collected
Tree location coordinates	Latitude and longitude of a point close to the centre of the tree
Tree ID	Unique identifier assigned to each tree in a survey database.
Tree species	The tree identified at least to genus and preferably to species level
Stem diameter 1	Diameter of the tree's largest stem measured at 1.5 m height.

Recommended and optional data

Organisations and surveyors should add variables from the recommended and optional fields, as required by their needs. There is no intention to restrict the number or scope of variables that surveyors can record: data variables not listed in the Standard can also be collected. It is not necessary or appropriate to capture information for every data variable during every survey. Refer to Appendix 2 for examples.

Specialist surveys

The ITDS is not intended to replace specialist surveys, such as those needed to identify structural defects, nor should it interfere with their objectives. Such surveys may capture data variables that are included in the Standard. In these instances the Standard should be applied. It will not always be necessary to re-record these variables at subsequent surveys, though the surveyor may of course take the opportunity to update such data where expedient to do so.

Implementation

This document is not intended to prescribe how users implement the ITDS or to dictate survey methodology. The Standard has been designed to enable users to take many routes to achieve standardised tree data. For example, it is acceptable to measure and record stem circumference rather than stem diameter, as long as the final data includes calculated stem diameter. Similarly, there are numerous ways of recording tree location coordinates and it is possible to convert from one reference system to another in geographic information system (GIS)[17] software provided that appropriate information about the system used is recorded alongside

[17] A geographic information system is a framework to store, analyse and visualise geographically located information.

the data. This principle of 'many routes' applies to all the data variables in the Standard.

Wherever practical, values should be measured rather than estimated. Where values have been estimated, this should be made clear. One simple means of doing so is to enter estimated data as a negative number.

Metadata

Metadata or 'data about data' describes and gives information on other data. Metadata should describe the context in which the data is collected. From metadata, users should be able to understand how the data was collected, and its spatial and temporal coverage. Examples of metadata include field name, description, data type and publication date.

In 2004 the UK Gemini standard[18] created a core set of metadata elements to use when managing UK geospatial data. Adherence to Gemini ensures compliance with the INSPIRE framework.[19] INSPIRE is a pan-government initiative to improve spatial data sharing and compliance is a legal obligation for all UK public bodies.[20]

It is recommended practice to send metadata with all tree data records. Not only does this give information on the data collection landscape, it also helps deal with any divergence from the Individual Tree Data Standard. For example, data stored in different coordinate reference systems can be easily transformed using standard GIS and database software provided the original reference system is known.

18 https://guidance.data.gov.uk/publish_and_manage_data/harvest_or_add_data/harvest_data/gemini/#gemini-and-iso-19139-metadata.

19 https://inspire.ec.europa.eu/inspire-directive/2.

20 https://guidance.data.gov.uk/publish_and_manage_data/harvest_or_add_data/inspire/#publishing-inspire-location-data.

How to use this document

This document has been designed to provide sufficient information to enable users to implement the Standard in their work and is intended to be used for reference, not as a step-by-step guide to be read from cover to cover. It is not designed to restrict users to a particular survey methodology. The order in which the data variables are listed does not dictate the order in which data is collected in the field.

Figure 1 shows the grouping of data variables by priority and by data group. The data group colours are reflected in the section headers for ease of reference. Table 1 lists the data variables by their priority and is intended as a quick reference guide for users who are familiar with the descriptions. The rest of the document describes the data variables in greater detail, together with additional information as follows:

- *Background* boxes provide background description of a variable where this is not self-explanatory and provide rationale for inclusion of a variable or reference list, where appropriate.
- *Recommended good practice* boxes provide guidance without dictating data collection methods or database management, to ensure consistency within and across surveys with a minimal amount of additional work.
- *See also* boxes provide references to information in other parts of the document and to external sources of information.

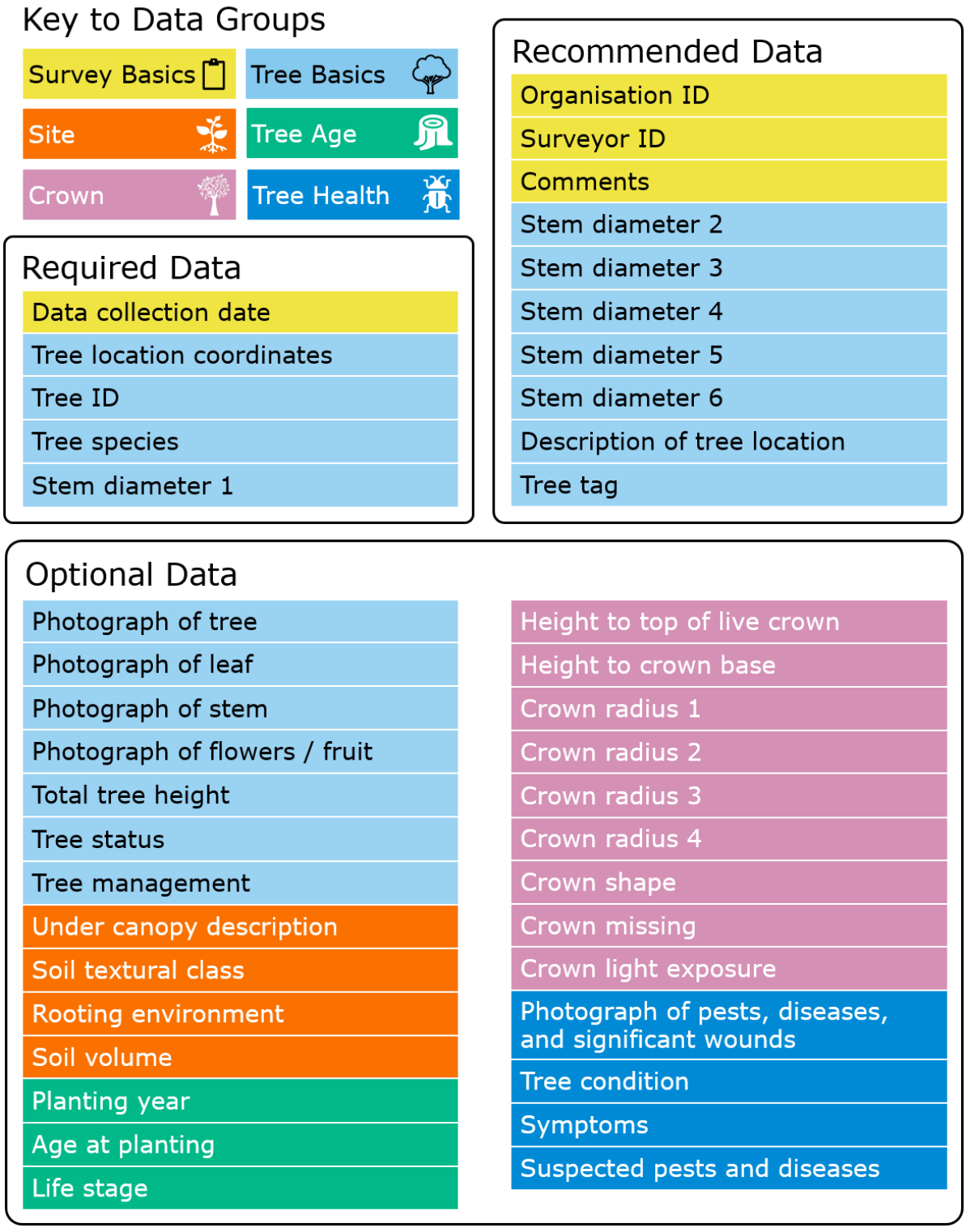

Figure 1. Data variables in the Individual Tree Data Standard categorised by priority (required, recommended, optional) and data group.

Table 1. Individual Tree Data Standard summary table

Data variable name	Priority	Data group	Type	Format	Options
Data collection date	Required	Survey Basics	Date	YYYY-MM-DD	
Tree location coordinates	Required	Tree Basics	Geopoint[21]	ETRS89 (European Terrestrial Reference System 1989)[22]	
Tree ID	Required	Tree Basics	Text		
Tree species	Required	Tree Basics	List	Single choice from options	BSBI complete list of taxon names

[21] A variable which describes a geographic location using two numbers. The format of the numbers depends on the spatial reference system used. e.g. latitude & longitude, eastings & northings or x & y.

[22] https://epsg.io/4258.

Data variable name	Priority	Data group	Type	Format	Options
Stem diameter 1	Required	Tree Basics	Integer[23]	cm	
Organisation ID	Recommended	Survey Basics	Text		
Surveyor ID	Recommended	Survey Basics	Text		
Comments	Recommended	Survey Basics	Text		
Description of tree location	Recommended	Tree Basics	Text		
Stem diameter 2 to 6	Recommended	Tree Basics	Integer	cm	
Tree tag	Recommended	Tree Basics	Text		
Photograph of tree	Recommended	Tree Basics	Photo	JPEG	
Photograph of leaf	Optional	Tree Basics	Photo	JPEG	
Photograph of stem	Optional	Tree Basics	Photo	JPEG	

[23] A whole number. No fractional information on the number is held.

Data variable name	Priority	Data group	Type	Format	Options
Photograph of flowers/fruit	Optional	Tree Basics	Photo	JPEG	
Total tree height	Optional	Tree Basics	Double[24]	Metres, to 1 decimal place[25]	
Tree status	Optional	Tree Basics	List	Single choice from options	Standing alive; fallen alive; standing dead; fallen dead; stump; removed; unable to locate; unknown
Tree management	Optional	Tree Basics	List	Multiple choice from options	Coppiced; lapsed coppice; pollarded; lapsed pollard; crown reduced; crown lifted; crown thinned; limb reduced; topped; pruned

[24] A number that includes fractional information, i.e. includes a number of decimal places.

[25] Decimal places (d.p.) are digits after the whole number or decimal point, e.g. 1.11 = 2 d.p. or 1.1 = 1 d.p.

Data variable name	Priority	Data group	Type	Format	Options
Under canopy description	Optional	Site	List	Multiple choice from options	Concrete; paving; tarmac; grass; soil; paving stones; flexible surfacing; raised planting bed; shrubs/scrub; tree pit; compacted ground
Soil textural class	Optional	Site	List	Single choice from options	Sandy; loamy sand; sandy loam; loam; silt loam; silt; sandy clay loam; clay loam; silty clay loam; sandy clay; silty clay; clay
Rooting environment	Optional	Site	List	Single choice from options	Unrestricted; restricted; highly restricted; unknown
Soil volume	Optional	Site	Integer	m^3	
Planting year	Optional	Tree Age	Date	YYYY	
Age at planting	Optional	Tree Age	Integer	Years	
Life stage	Optional	Tree Age	List	Single choice from options	Young; semi-mature; early mature; mature; late mature; ancient

Data variable name	Priority	Data group	Type	Format	Options
Height to top of live crown	Optional	Crown	Double	m (to 1 d.p.)	
Height to crown base	Optional	Crown	Double	m (to 1 d.p.)	
Crown radius 1 to 4	Optional	Crown	Double	m (to 1 d.p.)	
Crown shape	Optional	Crown	List	Single choice from options	Globular; ovoid; obovoid; conical; columnar; irregular; weeping; vase-shaped
Crown missing	Optional	Crown	List	Single choice from options	0–<25%; 25–<50%; 50–<75%; 75–100%
Crown light exposure	Optional	Crown	List	Single choice from options	0; 1; 2; 3; 4; 5
Photograph(s) of pests, diseases or significant wounds	Recommended	Tree Health	Photo	JPEG	

Data variable name	Priority	Data group	Type	Format	Options
Tree condition	Optional	Tree Health	List	Single choice from options	Good; fair; poor; dead/dying
Symptoms	Optional	Tree Health	List	Multiple choice from options	Aborted fruits; bark loss; bleeding; callusing; cankers (swollen or depressed); coatings; cracked bark; damage by leaf miners; defoliation; deposits; dieback of branches; dieback of canopy; dieback of twigs; discolouration of the leaves; epicormic growth; exit holes (D-shaped); exit holes (round); exudation of liquid/gum/frass; exudation or outgrowths; fungal fruit bodies; galls (leaves, buds, flowers, fruits); general decline; honey dew; leaf blotches; leaf necrosis; leaf spots; lesions; mined shoots; misshapen fruits; resin bleeds; signs of fungi; signs of insects; tar spots; wilting branches; wilting flowers; wilting leaves; wilting shoots

Data variable name	Priority	Data group	Type	Format	Options
Suspected pests and diseases	Optional	Tree Health	List	Multiple choice from options	Acute oak decline; anthracnose; aphids; bacterial canker; bark beetle; birds; blossom wilt and shoot blight; cankers; Chalara ash dieback; chronic oak decline; coral spot; crown gall; decay/bracket fungi; Dutch elm disease; fireblight; giant leaf blotch; Heterobasidion root rot; honey fungus; leaf blotch; leafhopper; leaf spot; leaf miner; Nectria canker; needle cast disease; needle diseases; other mammals; Phytophthora bleeding canker; Phytophthora root disease; pocket plum; powdery mildew; rust; scab; scale insects; squirrels; shoot blight; shot-hole disease; silver leaf disease; sooty bark disease; sooty moulds; tar spot; Verticillium wilt; woolly aphids

1 Survey Basics

1.1 Data collection date (required)

The date on which the data was collected in the ISO8601 format (YYYY-MM-DD). The collection date should be updated on each resurvey.

Background

The ISO8601 international standard covers the exchange of date- and time-related data. The purpose of ISO8601 is to provide an unambiguous and clearly defined method to represent date-time information, especially between countries.[26] Date and time values are ordered from the largest to smallest unit of time: year, month, day. Each value has fixed length and is padded with zeros where necessary. A significant benefit of this format is that it avoids problems with computerised sorting of data into chronological order.

1.2 Organisation ID (recommended)

Unique identifier signifying the organisation that is the source of tree data. The identifier represents the tree owner or the person(s) who commissions the survey, rather than the surveyor, and in most cases should not be changed between tree surveys.

Recommended good practice

Organisation ID is not essential where data is held by a single organisation. There should be one unique Organisation ID for each organisation represented in a dataset. Organisation ID can be included in Tree ID (see Section 2.2) to make every tree in a combined dataset unique. Organisation IDs can be names,

[26] www.iso.org/iso-8601-date-and-time-format.html

abbreviations, numbers, or combinations of the above (see example), as long as the receiving organisation can identify the source organisation.

Example: Smalltown Borough Council share tree data with Tree Research University, who therefore create an Organisation ID in their database. The form of the ID is unimportant (for example, it could be 'SmalltownBoroughCouncil', or 'SBC', or 'C001') provided that users can readily identify the source of the data.

1.3 Surveyor ID (recommended)

Unique identifier signifying the individual who most recently updated the data. This should be updated at each survey.

Recommended good practice

In recording this information, GDPR or other relevant regulations must be observed.

Example: Largetown Borough Council contracts Tree Care Co (TCC) to provide three surveyors Anne (A), Brad (B), and Charlie (C) for a tree survey in year YYYY. Surveyor IDs could be unique codes instead of surveyor names so that it is not possible to identify individuals from publicly available data. Examples include: 01YYYY, 02YYYY, 03YYYY; or TCC01, TCC02, TCC03; or TCCA, TCCB, TCCC.

Organisations may then hold the records linking surveyor IDs to names as far as that complies with GDPR or other relevant regulations.

1.4 Comments (recommended)

Free text field for any information considered relevant to the specific tree.

2 Tree Basics

2.1 Tree location coordinates (required)

A geographic location point containing the latitude and longitude of a point close to the centre of the tree. The geographic location point should use the European Terrestrial Reference System 1989 ETRS89 (EPSG:4258).

Background

A coordinate reference system (CRS), also known as a spatial reference system (SRS), is used to locate geographic data. A CRS specifies a datum and a coordinate system. A datum is a model or approximation of the shape of the Earth. A coordinate system describes how to identify points on the Earth's surface.

Coordinate systems can be 'geographic', in which points are plotted on a globe, for example as latitude and longitude, or they can be 'projected', in which points are plotted on a flattened representation of the globe.

Plotting data collected in one CRS using a different CRS will result in the data appearing out of place, often by hundreds of metres. It is relatively straightforward to translate between CRSs using widely available GIS software, but it is essential to report the CRS of data that is exchanged or shared.

Each CRS has a unique code under the European Petroleum Survey Group (EPSG) system. The open standards for government guidance and the INSPIRE Directive[27] specify the ETRS89 (EPSG:4258) CRS for all exchange of location points from UK data. ETRS89 adjusts for tectonic drift so that the recorded coordinates will return the surveyor to the same location even after several decades when the location would have drifted in other spatial reference systems.

[27] https://inspire.ec.europa.eu/inspire-directive/2.

Recommended good practice

Location data recorded in a CRS other than ETRS89 can accurately be transformed to ETRS89 only if sufficient metadata is supplied with tree survey data. It is therefore good practice to record which CRS was used for recording location data and to share this information when sharing tree data. In particular for lat/long coordinates it is helpful to specify the format (i.e. degree, minute, second or degree, decimal minute, or decimal degree).

2.2 Tree ID (required)

Unique identifier assigned to each tree in the database. The identifier belongs to the tree and should not be changed between surveys. The Tree ID must be unique within an organisation.

Recommended good practice

If an organisation has a single database of tree numbers, the Tree ID can be a simple sequential number and there is no requirement to include any other information.

If an organisation has multiple databases of tree numbers (e.g. numbering starts from 1 for each area of a city) then the Tree ID should include other information to make it unique within that organisation, such as:

- Site ID (number, name, or both, e.g. 033 or BridgeStreet)
- Area ID (number, name, or both, e.g. 4 or SouthWest)
- Volunteer organisation ID (number, name, or both, e.g. WeLoveTrees or WLT)
- External organisation ID (number, name, or both, e.g. 020 or SmalltownCC)

Possible formats for combining tree number 011 with the above information include:

- 020-4-BridgeStreet-011

- 020WLT4033011
- SmalltownCC4-033011 and so on

The purpose of including the additional information is to make the Tree ID unique within an organisation, rather than to make it uniquely identifiable outside an organisation.

2.3 Tree species (required)

The tree identified at least to genus and preferably to species level, with cultivar/variety if known. All entries should be from the BSBI (Botanical Society of Britain & Ireland) complete list of taxon names.[28] Trees that cannot be identified to the genus level should be recorded as 'Unknown'.

Background

The BSBI is one of the world's largest contributors of biological records. It supports the research and study of plants in Britain and Ireland, and their data informs scientific research. The complete list of taxon names from the BSBI's database enables cross referencing of species synonyms. The BSBI complete list contains information on scientific name, common name, taxonomic authority, and national status.[28]

See also

To facilitate adoption of the Standard, the BSBI is building a definitive list of accepted taxon names for all known tree species in the UK. This list will be published alongside the Standard at: www.forestresearch.gov.uk/research/urban-tree-benefits/individual-tree-data-standard/.

[28] https://bsbi.org/taxon-lists.

2.4 Stem diameter 1 (required)

Diameter of the tree's largest stem measured at 1.5 m height. On multi-stemmed trees up to six stems can be recorded; stems should be recorded in size order, starting with the largest. On resurvey, the data for all six of the largest stems should be re-entered in size order, starting with the largest stem. Stem diameter should be rounded down, to a whole centimetre.

Recommended good practice

Whenever possible stems should be measured directly rather than estimated. In a survey where some stem diameters can only be estimated, users should also measure the diameter of accessible stems to calibrate estimates and ensure a higher level of accuracy.

See also

Guidance for measuring trees can be found in:

- BS 5837:2012: Trees in Relation to Design, Demolition and Construction – Recommendations (available from the British Standards Institution).[29]
- Forest Mensuration: A Handbook for Practitioners (available from the Forestry Commission).[30] *Note that standard practice in commercial forestry is to measure stem diameter at 1.3 metres, rather than the 1.5 metres specified in the Standard.*
- Measuring Trees (available from the Tree Register of the British Isles).[31]
- Veteran Trees Initiative Specialist Survey Methodology (available from the Ancient Tree Forum).[32]

[29] https://shop.bsigroup.com/en/ProductDetail/?pid=000000000030213642.
[30] www.forestresearch.gov.uk/research/forest-mensuration-a-handbook-for-practitioners/.
[31] www.treeregister.org/more/measuring-trees/.
[32] www.ancienttreeforum.org.uk/resources/other-publications/.

- Ancient Tree Inventory (available from the Woodland Trust).[33]

2.5 Stem diameter(s) 2 to 6 (recommended)

Diameter of the tree's 2nd (3rd, 4th, 5th, 6th) largest stem(s) measured at 1.5 m height. See Section 2.4: Stem Diameter 1.

2.6 Description of tree location (recommended)

Free text field to enable surveyors to capture additional information required to find the tree, where applicable.

Recommended good practice

Examples of additional information include post code, ///what3words, street name, identifying a specific tree within a group of trees, or where the tree location might be hidden e.g. tree is in passageway between house numbers 45 & 47.

2.7 Tree tag (recommended)

Record tree tag number where added or already present on the tree. Should be captured exactly as written on the tag.

Recommended good practice

Ideally the tree tag number would be a sequential number linked to the Tree ID; this will be difficult to maintain when recording for a large number of trees. If multiple tags are present on the tree, separate using a semi-colon, e.g. '0010; 15; T21'.

[33] https://ati.woodlandtrust.org.uk/how-to-record/.

2.8 Photograph of tree (optional)

Clear photograph(s) of the whole tree.

Background

Photographs contain a wealth of information that can be evaluated by human observers, and are often used to check tree information. Increasingly computers are performing this task. Machine learning is a form of artificial intelligence in which computers look for patterns within large datasets. Machine learning algorithms automatically improve their accuracy based on experience. Improvements in accuracy therefore result from increasing volumes of data, rather than through human intervention.

Photographs of trees can help contribute to training data for machine learning algorithms for identification of tree species and tree pests and diseases. Machine learning has been successfully applied in identifying plant species and pests and diseases from photographs (e.g. PlantNet).[34]

Recommended good practice

Photographs are recommended for surveys in which organisations identify the need for further validation (e.g. citizen science projects, school groups). Photographs are also useful in locating trees on resurvey.

The photograph should be centred on the subject, zoomed in as close as possible while still showing the whole subject, sharp/focused and clear of fingers. Where possible an object of approximate known size should be included to give scale. For capturing change over time, photographs should be taken from the same vantage point.

Filenames should include the Tree ID (and Organisation ID where appropriate), what the photograph features, the date the photograph was taken (YYYY-MM-DD),

[34] https://plantnet.org/en/.

and the sequential record number where the first photograph of the tree is 1, the second is 2, and so on.

Example: Photograph of Tree ID 13 taken for the first time on 8 June 2020. The filename could be 000013_tree_20200608_1.

In systems that generate a photograph ID that is incompatible with the suggested filename formats, organisations may add a data field to enable recording of both filenames.

See also

Guidance for taking photographs of trees, leaves, stems, and symptoms can be found in the Observatree photo guide.[35]

2.9 Photograph of leaf (optional)

A clear, close-up photograph of the foliage, if present. This will usually be of a single leaf, or of several leaves where a single leaf is not practical (e.g. most conifer species).

Recommended good practice

The leaf should be on the tree, or collected from the tree, as leaves lying near the base of trees do not always belong to that tree. Leaf morphology can vary within a single tree; users are encouraged to capture the range of foliage shapes present on the tree. Photographs will ideally be taken during the growing season. If used for identification purposes the leaf should be without damage or disease, but photographs of leaves may also be useful for pest and/or disease identification.

[35] www.observatree.org.uk/wp-content/uploads/2020/07/Observatree-photo-guide.pdf.

See also

See Section 2.8 (Photograph of tree) for good photography practice and file naming conventions.

2.10 Photograph of stem (optional)

A clear, close-up photograph of the stem to help with identification. Photograph should clearly show the bark characteristics.

Recommended good practice

Where the focus of the survey is ancient or veteran trees the photograph of the stem should show ageing or decay characteristics.

See also

See Section 2.8 (Photograph of tree) for good photography practice and file naming convention.

2.11 Photograph of flowers/fruit (optional)

A clear, close-up photograph of the flowers or fruit, if present.

Recommended good practice

Flower or fruit should be on the tree, or collected from the tree, as flowers/fruit near the base of trees do not always belong to that tree.

If used for identification purposes the flower or fruit should be without damage or disease, but these photographs may also be useful for pest and/or disease identification.

See also

See Section 2.8 (Photograph of tree) for good photography practice and file naming convention.

2.12 Total tree height (optional)

Vertical distance from the ground to the tip (alive or dead) of the tree measured in metres. Where tools and experience allow, total tree height should be measured to the nearest 0.1 m. Otherwise total tree height should be rounded to the nearest half metre or whole metre according to the specifications of the survey, the ability of the surveyor, and the method of measurement or estimation.

Recommended good practice

For trees without a clearly defined tip, measurement should be to a point that equals the maximum height of the crown, as best can be judged.

The total height should include any dieback at the tip (this distinguishes the measurement from height to top of crown). Total height should be measured where possible from a distance of at least one tree height away from the tree.

2.13 Tree status (optional)

A general description of the tree's status. Single choice from: *standing alive; fallen alive; standing dead; fallen dead; stump; removed; unable to locate; unknown*.

2.14 Tree management (optional)

A field for noting clear evidence of past or current management that has affected the shape of the crown/tree. Multiple choice from: *Coppiced; Lapsed coppice; Pollarded; Lapsed pollard; Crown reduced; Crown lifted; Crown thinned; Limb reduced; Topped; Pruned.*

Coppiced	Cut down to within 300 mm (12 in) of the ground at regular intervals, with the intention of encouraging regrowth of multiple shoots

Lapsed coppice	Coppiced in the past but not maintained by cycles of cutting
Pollarded	Top of tree removed at a prescribed height to encourage multi-stem branching from that point on the main stem or principal branches
Lapsed pollard	Pollarded in the past but not maintained by cycles of cutting
Crown reduced	Crown (the foliage-bearing portions) reduced in height and/or spread by shortening of twigs and/or branches, while the main framework has been retained
Crown lifted	Lowest branches removed from the crown and/or prepared for future removal, to achieve vertical clearance above the ground
Crown thinned	A portion of small, live branches removed from throughout the crown to produce a uniform density of foliage around an evenly spaced branch structure
Limb reduced	Branch shortened or removed
Topped	Large portions of the crown removed by horizontal cuts, generally through the main stems. Often used to describe indiscriminate pruning.
Pruned	Branches/twigs/shoots cut and removed for the purposes of management

See also

More information can be found in:

- BS 3998:2010: Tree Work - Recommendations (available from the British Standards Institution)[36]
- A Brief Guide to Tree Work Terminology and Definitions (available from the Arboricultural Association)[37]

[36] https://shop.bsigroup.com/ProductDetail?pid=000000000030089960.
[37] www.trees.org.uk/Help-Advice/Public/A-brief-guide-to-tree-work-terminology-and-definit.

3 Site

3.1 Under canopy description (optional)

Broad description of dominant ground covers in the tree's planting situation. Area of interest is defined by the dripline (i.e. the area defined by the outermost circumference of a tree canopy where water drips from and onto the ground). Multiple choice from: *Concrete; paving; tarmac; grass; soil; paviors (e.g. interlocking bricks); flexible surfacing; raised planting bed; shrubs/scrub; tree pit; compacted ground*.

Recommended good practice

All ground covers that represent more than 25% of area should be included. Surveyors may include groundcovers that are less 25% if they are felt to have a significant effect on the tree.

3.2 Soil textural class (optional)

Estimation of soil particle size from the proportions of sand, silt and clay. Single choice from: *Sandy; loamy sand; sandy loam; loam; silt loam; silt; sandy clay loam; clay loam; silty clay loam; sandy clay; silty clay; clay*.

Background

Classes are based on the textural groupings in the Land Information System (LandIS) national soil map, operated by Cranfield University's National Soil Resource Institute.[38] LandIS was established in the 1970s and is the national portal for geographical soil and soil properties data.

[38] www.cranfield.ac.uk/centres/soil-and-agrifood-institute/research-groups/national-soil-resources-institute.

Recommended good practice

Information will normally be collected at planting using visual assessment or the 'feel' method.[39] Soil assessment should only be conducted if relevant permissions have been sought.

3.3 Rooting environment (optional)

Above-ground estimate of whether the tree's rooting environment is restricted or not when considering the tree's expected size at maturity. This field will not normally be collected at planting, when soil volume is a better measure. Single choice from:

Unrestricted	Open grown trees, those without any observable restriction of soil availability e.g. trees in grasslands, forests or parks
Restricted	Normal/well planned soil pits
Highly restricted	Soil pits with too little soil for the tree
Unknown	Unable to determine from available evidence

3.4 Soil volume (optional)

Amount of soil available for the tree roots to grow recorded in integer cubic metres (m^3). Estimates can be used if based on visual assessment of a disturbed soil pit. Soil below 1.5 m should not be included in the volume estimate. This field will normally be completed at planting only (see Appendix 2).

[39] Thien, S. J. (1979). A flow diagram for teaching texture-by-feel analysis. *Journal of Agronomic Education*, 8, 54–55. Available at https://acsess.onlinelibrary.wiley.com/doi/abs/10.2134/jae.1979.0054.

4 Tree Age

4.1 Planting year (optional)

The year the tree was planted in the ISO8601 format YYYY. Planting year should be recorded at planting of new trees, where known for recently planted trees, or where reliable records allow.

4.2 Age at planting (optional)

Age of the tree at planting in years. For grafted trees the age is counted from the year of grafting.

4.3 Life stage (optional)

Life stage of the tree. Broad categorisation based on physical characteristics of the tree. Categories are aligned to BS 5837 and descriptions are adapted from those in Trees in Towns II.[40]

Single choice from:

Young	Obviously planted within the last three years (unless as a heavy or extra-heavy standard)
Semi-mature	Recently planted and yet to attain mature stature; up to 25% of attainable age
Early mature	Almost full height, crown still developing and seed bearing; up to 50% of attainable age
Mature	Full height, crown spread, seed bearing; over 50% of attainable age

[40] Britt, C. and Johnston, M. et al. (2008). Trees in Towns II. A new survey of urban trees in England and their condition and management. Research for Amenity Trees No. 9. Prepared for Department for Communities and Local Government, London.

Late mature	Full size, die-back, small leaf size, poor growth extension
Ancient	A tree that has reached a great age in comparison with others of the same species

See also

Tree life stage is difficult to define and to measure. Categories and descriptions in available guidance are imperfect and are the focus of much debate. Further consideration is given in Appendix 3.

Information about identifying ancient trees is available from:

- The Woodland Trust[41]
- The Ancient Tree Forum[42]

[41] www.woodlandtrust.org.uk/trees-woods-and-wildlife/british-trees/ancient-trees/
[42] www.ancienttreeforum.org.uk/resources/

5 Crown

5.1 Height to top of live crown (optional)

The vertical distance between the ground and the level of the highest live foliage (top of live crown) measured in metres. Where tools and experience allow, height to top of live crown should be measured to the nearest 0.1 m. Otherwise height to top of live crown should be rounded to the nearest half metre or whole metre according to the specifications of the survey, the ability of the surveyor, and the method of measurement or estimation. Ideally this should be measured during the growing season.

5.2 Height to crown base (optional)

The vertical distance between the ground and the point on the stem level with the lowest live foliage that is included in the crown, measured in metres. Epicormic[43] growth is not included within this measurement if it is not part of the crown. If the crown base touches the ground, zero is an acceptable value. Where tools and experience allow, height to base of crown should be collected to the nearest 0.1 m. Otherwise height to base of crown should be rounded to the nearest half metre or whole metre according to the specifications of the survey, the ability of the surveyor, and the method of measurement or estimation. Ideally this should be measured during the growing season.

[43] Epicormic, or adventitious, refers to new growth from new or dormant buds, on or underneath the bark of a mature woody stem or branch.

5.3 Crown radius 1 to 4 (optional)

The length in metres of a straight horizontal line from the edge of the crown on one side of the tree to the centre of the tree's main stem, recorded to one decimal place (i.e. to the nearest 0.1 m). This is often described as the spoke method. Ideally this should be measured during the growing season.

Recommended good practice

Crown radius fields should be used to store the widths of the crown measured from the four cardinal compass points to the centre of the main stem. It is recommended that the order should be north, south, east and west. Where one or more cardinal points are inaccessible, the accessible crown radii should be measured and used to estimate the missing cardinal points. In some cases it will be necessary to estimate all four radii.

5.4 Crown shape (optional)

This is a simple description of the volumetric shape of the tree crown and must be recorded as one of the following options: *Globular; ovoid; obovoid; conical; columnar; irregular; weeping; vase-shaped.* See Figure 2 for illustrations of crown shapes.

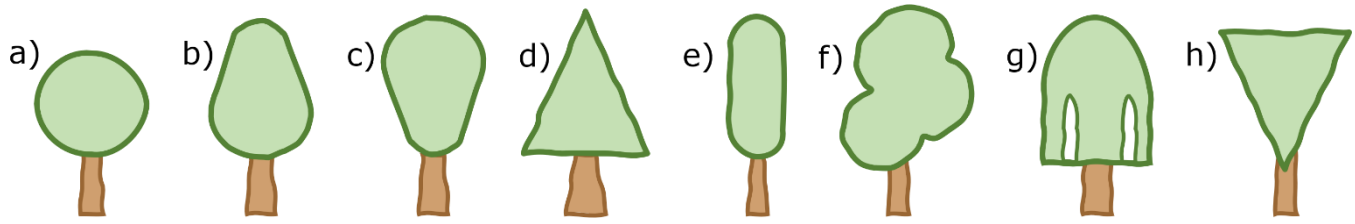

Figure 2. Representative crown shapes. a) globular; b) ovoid; c) obovoid; d) conical; e) columnar; f) irregular; g) weeping; h) vase-shaped

See also

These crown shapes are described in detail in Tree Species Selection for Green Infrastructure: A Guide for Specifiers, available from the Trees & Design Action Group.[44]

5.5 Crown missing (optional)

An estimate of the amount of crown that is missing when considering the typical expected crown size. The expected crown size should take into account typical crown shapes for that species and how the physical environment has constrained growth; surveyors will use a degree of judgement. The estimate should include areas of crown removed through management (e.g. limb removal), and areas of the crown that have died or are in a poor state of health. Single choice from: *0–<25%; 25–<50%; 50–<75%; 75–100%*.

5.6 Crown light exposure (optional)

Number of faces/sides of the crown that receive direct or diffuse sunlight from above or from the side. There are a maximum of five faces: four sides, assessed as vertical planes, and the top, assessed as a horizontal plane. See Figure 3 and Figure 4 for illustrations of crown light exposure. Single choice from: *0; 1; 2; 3; 4; 5*.

Recommended good practice

A face should be not counted if:

- an obscuring object is taller than that crown side, or

[44] www.tdag.org.uk/species-selection-for-green-infrastructure.html.

- an obscuring object is within one average crown width of the stem, and at least as tall as the measured tree.[45]

Note that north-facing sides can receive diffuse sunlight.

[45] i-Tree (2020). i-Tree Eco Field Guide v6.0.

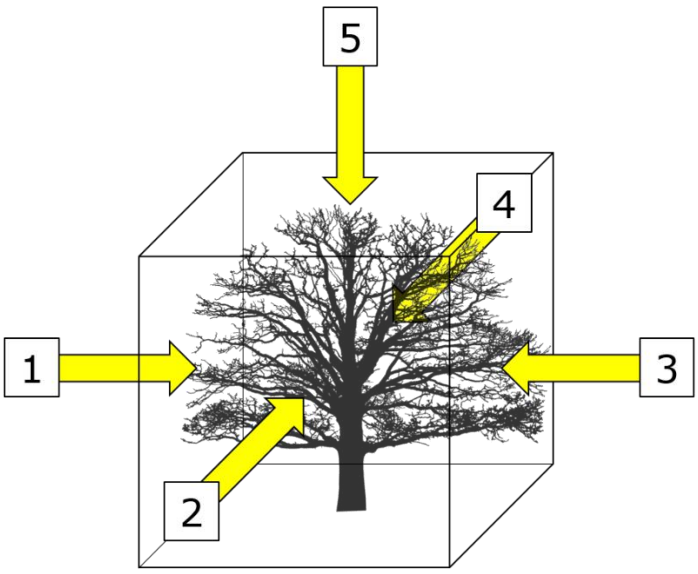

Figure 3. Diagram illustrating a tree crown exposed to five sides of light (four vertical planes and one horizontal plane).

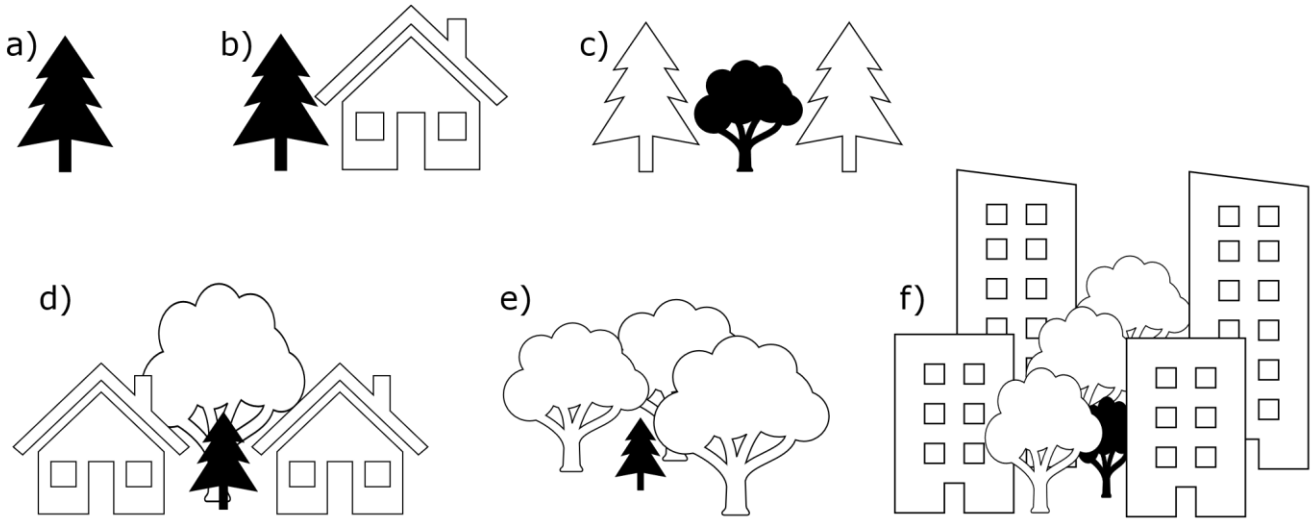

Figure 4. Examples of crown light exposure. a) Open-grown tree exposed to five sides of light. b) Tree adjacent to building exposed to four sides of light (top and three sides). c) Tree between tall trees exposed to three sides of light (top and two sides). d) Tree enclosed by two buildings and a tall tree, exposed to two sides of light (top and front). e) Tree enclosed and overshadowed by taller trees, exposed to one side of light (front face). f) Tree surrounded and overshadowed by tall buildings and trees, exposed to zero sides of light.

6 Tree Health

6.1 Photograph(s) of any pests, diseases, or significant wounds (optional)

A clear, close-up photograph of any symptoms of pests and/or diseases present, or of significant wounds that may be affecting tree health and/or structural integrity.

Recommended good practice

Each photograph should focus on one symptom (i.e. fungal fruiting body or bleeds on stem); be centred; sharp; without fingers; and with a natural or neutral blurred background where possible.

See also

See Section 2.8 (Photograph of tree) for good photography practice and file naming convention.

6.2 Tree condition (optional)

A general description of the tree's condition, based upon the presence/absence of symptoms that would generally impact tree health. The description applies to the whole tree, encompassing the crown, trunk (including the root collar) and roots. Categories are based on the descriptions in Trees in Towns II[46] and have been adapted to reflect responses during public consultation.

[46] Britt, C. and Johnston, M. et al. (2008). Trees in Towns II. A new survey of urban trees in England and their condition and management. Research for Amenity Trees No. 9. Prepared for Department for Communities and Local Government, London.

Single choice from:

Good	No evidence of disease or damage. Full leaf, no die-back, good branch structure
Fair	Minor evidence of disease/damage. Good reactive growth to previous stress/damage (e.g. healed calluses). Minor deadwood. Not life threatening
Poor	Extensive evidence of disease or damage. Dieback in crown, poor callus growth on wounds
Dead/dying	Obviously moribund, severely diseased

6.3 Symptoms (optional)

List of common symptoms indicating ill-health in the tree or a decline in tree condition. Multiple choice from: *Aborted fruits; bark loss; bleeding; callusing; cankers (swollen or depressed); coatings; cracked bark; damage by leaf miners; defoliation; deposits; dieback of branches; dieback of canopy; dieback of twigs; discolouration of the leaves; epicormic growth; exit holes (D-shaped); exit holes (round); exudation of liquid/gum/frass; exudation or outgrowths; fungal fruit bodies; galls (leaves, buds, flowers, fruits); general decline; honey dew; leaf blotches; leaf necrosis; leaf spots; lesions; mined shoots; misshapen fruits; resin bleeds; signs of fungi*; *signs of insects; tar spots; wilting branches; wilting flowers; wilting leaves; wilting shoots.*

6.4 Suspected pests and diseases (optional)

List of suspected pest and diseases affecting the tree. Multiple choice from: *Acute oak decline; anthracnose; aphids; bacterial canker; bark beetle; birds; blossom wilt and shoot blight; cankers; Chalara ash dieback; chronic oak decline; coral spot; crown gall; decay/bracket fungi; Dutch elm disease; fireblight; giant leaf blotch; Heterobasidion root rot; honey fungus; leaf blotch; leafhopper; leaf spot; leaf miner; Nectria canker; needle cast disease; needle diseases; other mammals;*

Phytophthora bleeding canker; Phytophthora root disease; pocket plum; powdery mildew; rust; scab; scale insects; squirrels; shoot blight; shot-hole disease; silver leaf disease; sooty bark disease; sooty moulds; tar spot; Verticillium wilt; woolly aphids.

Background

Pests and diseases are an increasing threat to trees across the UK. Recording information on them can support local and national surveillance and monitoring. TreeAlert has been set up to gather information about the health of the nation's trees, woodlands, and forests. This information will support important tree health monitoring and surveillance work, contribute to ongoing scientific research in this field and, ultimately, support efforts to protect the nation's trees.

Recommended good practice

Pests and diseases that are of immediate concern should be reported as soon as possible to TreeAlert: https://treealert.forestresearch.gov.uk/.

See also

More information can be found in:

- Observatree Field Identification Guides[47]
- Pest and disease resources from Forest Research[48]

[47] www.observatree.org.uk/resources/download-and-read/guides/.
[48] www.forestresearch.gov.uk/tools-and-resources/fthr/pest-and-disease-resources/.

Appendix 1: Process of developing the Individual Tree Data Standard

Figure A1 summarises the full process of developing the Standard.

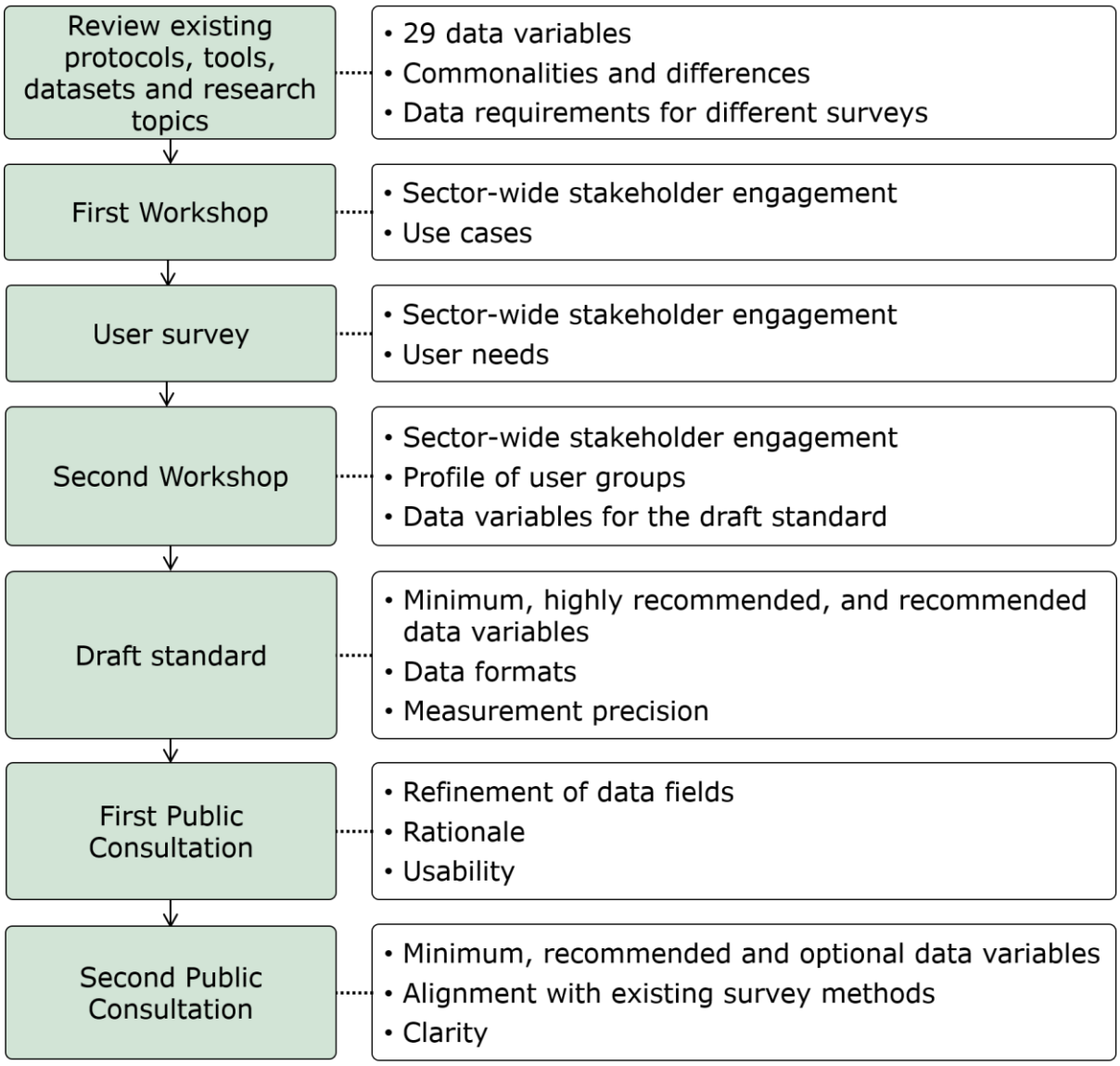

Figure A1. Processes and outcomes during the development of the Individual Tree Data Standard

The following organisations/individuals helped with the development of the draft Standard: Animal and Plant Health Agency (APHA), Arbor Cultural, Barcham Trees, Coventry University, Department for Environment, Food & Rural Affairs (DEFRA), Duramen Consulting, Field Studies Council, Forest Research, Forestry Commission, Hayden's Arboricultural Consultants, Municipal Tree Officer Association (MTOA), National Trust, RA Information Systems, Royal Horticultural Society, The Open University, Treeconomics, Treework Environmental Practice, The Tree Council, PlanIT Geo™ , the University of the West of England, and the Woodland Trust.

In November 2019, the project team invited comment on the draft Standard in a public consultation that closed in February 2020. Seventy organisations/individuals responded to the consultation with representation from across the sector and from all four nations of the UK. The need for a standard was overwhelmingly supported.

The first consultation generated a wealth of valuable feedback. However, the project team decided that a second round of consultation was necessary to address possible misconceptions and to allow community scrutiny of key structural changes to the Standard.

There were 18 individual and organisational responses to the second consultation from: four individuals, the Ancient Tree Forum, Better Tree Care Associates, Bristol Tree Forum, David Archer Associates, Ethos Environmental Planning, London Borough of Camden, London Borough of Hillingdon, M&A Treecare and Training, Nature Based Solutions, Royal Botanic Garden Edinburgh, South Lanarkshire Council, West Lothian Council, Wolverhampton City Council, and the Woodland Trust.

Appendix 2: When to collect data

Some data fields are best collected at planting and others are suitable for collecting at any time.

Example 1: Tree age data

Planting year and *Age at planting* are recorded at planting. At subsequent surveys *Life stage* is a more appropriate variable to record.

Data variable name	Record at planting	Record in subsequent surveys
Planting year	✓	✗
Age at planting	✓	✗
Life stage	✗	✓

Example 2: Site data

Soil volume recorded at planting is the best measure of the amount of soil available for roots. Where possible and practical, soil volume should be recorded at planting. Where impossible or impractical, and at subsequent above-ground surveys, it is more appropriate to record *Rooting environment*.

Planting is a good opportunity to record *Soil textural class*, but it may also be possible to record this at subsequent surveys, depending on the site.

Data variable name	Record at planting	Record in subsequent surveys
Rooting environment	(✓)	✓
Soil textural class	✓	✓
Soil volume	✓	✗

Appendix 3: Tree life stage

Life stage	Trees in Towns II description	Other considerations
Young	Obviously planted within the last three years (unless as a heavy or extra-heavy standard)	May have self-sown so reference to recent planting not always relevant. Growth rate may be slow until established[49]
Semi-mature	Recently planted and yet to attain mature stature; up to 25% of attainable age	Still in formative period. Crown developing, foliage increasing, and tree adding wood to the stem in annual increments of increasing volume but equal width[49]
Early mature	Almost full height, crown still developing and seed bearing; up to 50% of attainable age	Almost full height and crown spread, but crown still developing. Tree adding annual increments of increasing volume but equal width[49]
Mature	Full height, crown spread, seed bearing; over 50% of attainable age	Tree has reached its full height and crown spread. Tree adding annual increments of equal volume and decreasing width, so growth rings get closer together[49]
Late mature	Full size, die-back, small leaf size, poor growth extension	Tree has attained its full size and may be showing signs of damage, senescence or dieback and reduced extension growth. Annual production of new wood is reduced and ring width declines
Ancient	A tree that has reached a great age in comparison with others of the same species	Refer to existing guidance from the Woodland Trust and the Ancient Tree Forum.

[49] White, J. (1998). Estimating the Age of Large and Veteran Trees in Britain. Forestry Commission.

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