Standards for Conducting Tree Inventories in Urban Environments

Version 1.0

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FOREWORD

These standards were produced within the framework of on-going environmental assessment, Built Environment programme, at SLU, with co-funding from Partnership Alnarp, SKL (Swedish town and county councils) Malmö City Streets Department, Svenska Bostäder, E-planta ekonomiska förening, Jönköping municipality, The Church of Sweden's employer organisation, the churchyard management departments in Jönköping, Malmö, Nacka and Gothenburg, Umeå municipality and Gothenburg Parks and Nature Department. We hope that these standards will act as an aid for practitioners, authorities and city officials. We also hope that in the long run they will form the basis for standardisation of tree inventories and thereby contribute to the creation of a national tree database that facilitates communication between organisations and people working in different ways with tree inventories and tree care issues.

We want to thank the organisations that funded the work and the participants in the Delphi study, which made it possible to rank the many parameters. These included Anders Ohlsson Sjöberg, Anna Flatholm, Anu Riikonen, Arne Mattson, Björn Embrén, Dan Haubo, Elisabet Lindkvist, Garry Lindquist, Harald Kratschmer, Henrik Morin, Klaus Schneider, Klaus Stritzke, Michael Jackson, Oliver Bühler, Per Anker Pedersen, Stefan Lagerqvist, Örjan Stål, and other participants who wished to remain anonymous.

Finally, a special thank you to Hanna Fors for her skilful illustrations of many of the parameters in this publication.

Alnarp, 23 March 2012

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Tim Delshammar

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INTRODUCTION

Tree inventories and collections of data on trees have become increasingly common within different areas of work relating to the urban outdoor environment. It is important that such work is carried out with a high degree of precision and quality. If the methods and inventory parameters applied are comparable, different actors are better able to benefit from each other's experiences and the procurement process is more straight-forward. Therefore, on 1 January 2010, the Department of Landscape Management, Design & Construction at SLU-Alnarp started work on developing guidelines for use during collection of data on trees. This set of standards is the end-product of that work.

As a complement to the standards, the authors have produced a report describing the rationale behind their choices and definitions of the different parameters, together with examples of areas of application for information on trees. That report will hopefully answer any questions arising when working with these standards.

BEFORE BEGINNING THE INVENTORY

These standards include a large number of parameters that can be used in an inventory. However, it is not necessary to use all these parameters, as this would greatly prolong the processes of information collection and database updating. Therefore we recommend a thorough analysis of the intended areas of application for the information before the inventory begins, in order to select the inventory parameters to be used in addition to the parameters recommended as standard in the next chapter.

When collecting information in the form of a manual inventory, some form of hand-held computer is a great help for storing the data. This device and the software used for processing the data must be compatible with the other systems used in the organisation. The information can then be used by different people in the organisation, which can allow e.g. excavation damage to be reduced, since the data on trees can be introduced into the cable and pipe maps.

It is also helpful if the geographical coordinates are recorded during data recording on trees, since this is very useful in the future work on the trees and also makes it possible to locate an individual tree again. The experience in earlier inventories that used number boards fixed to trees is that major problems arise if these signs disappear.

INVENTORY PARAMETERS

The different parameters are divided into six different areas. The first four of these are mainly measured in the field, while the last two relate to documentation and technical data in databases.

Descriptive inventory parameters deal with basic information about, for example, tree position, species, size and the like.

Vitality and safety relate to the risk elements that can be associated with certain trees, together with damage and tree vitality.

Tree values describe the values of the tree from different perspectives and include, for example, biological and cultural value.

Measures and maintenance needs are recommendations on how the tree should be dealt with and the measures that should be taken, which includes for example pruning and cutting.

Database metadata are parameters that are mainly of an administrative character, such as when the tree was last inventoried and who conducted this inventory.

Documentation of management refers to details of tree production in the nursery, planting and upkeep.

Through a so-called Delphi study, three different groups of users were asked to rank the various inventory parameters in order of importance. In brief, the study involved anonymous participants within a group ranking the importance of selected parameters on a scale from 1 (least importance) to 10 (highest importance). Participants were then informed about the ranking given by the others and the process was repeated until the group had reached consensus. The different groups comprised city officials, researchers and arborists. These three groups were chosen because they have different areas of interest and thus presumably different demands for information on trees.

For each parameter, the mean value is given for all groups and for each one of the three groups. These values can be found after the description of the parameter in the form: (M:10.0 C:10.0 R:10.0 A:10.0), where M stands for Mean value, C for City officials, R for Researchers and A for Arborists.

From this investigation, the following five parameters were identified as being the most important:

- 1.1.2 Tree species, scientific (M: 10.0)
- 2.1.1 Visual assessment of vitality class (M: 9.8)
- 1.4.1 Coordinates (M: 9.6)
- 2.4.1 Risk of injury to the public or material damage (M: 9.4)
- 5.1.1 Tree ID (M: 9.2)

Of the parameters relating to trunk circumference or trunk diameter, *1.3.3 Trunk diameter 1.3 metre height* emerged as the parameter that received the highest score (5.7). Since this parameter is very commonly used nationally and internationally, and is also very important in many models, we opted to include it as one of the most important parameters. There are alternative ways to measure tree trunks, for example circumference instead of diameter. Within the Swedish plant nursery sector, trees are often measured at one metre height. We strongly recommend that diameter is measured instead of circumference, and that the measurement is made at the narrowest point under 1.3 metre height. This is the method of measurement most commonly used internationally. It therefore provides the scope to compare data between authorities.

We recommend that the five highest ranked parameters and *Trunk diameter 1.3 metre height* are always used in tree inventories.

The parameters that were rated numbers 6-10 after the 5 highest ranked were:

- 2.3.3 Fungi (M: 9.0)
- 5.3.8 Date of previous inventory (M: 9.0)
- 4.1.1 Maintenance category (M: 9.0)
- 3.4.1 Preservation value (M: 9.0)
- 1.4.4 Street or park tree (M: 8.8)

PROPOSED INVENTORY PARAMETERS

1. DESCRIPTIVE INVENTORY PARAMETERS

1.1 SPECIES AND TYPE

1.1.1 DECIDUOUS OR CONIFEROUS

Specify whether the tree is deciduous or coniferous.

Record as:

- Coniferous tree
- Deciduous tree

Specify as: Coniferous tree or Deciduous tree

(M:4.9 C:5.9 R:4.3 A:4.4)

1.1.2 TREE SPECIES, SCIENTIFIC NAME

PROPOSED STANDARD PARAMETER

Specify family, species and variety, plus where appropriate whether the tree is an E-plant. When in doubt, the analyst should only record the parts of the name that are known for certain.

E-plant or similar should always be recorded if this can be confirmed, for example through delivery documents.

It is recommended that Family, Species, Variety and E-status are recorded as separate parameters (in other words in separate columns) in databases, since this makes it considerably easier to carry out searches in the material.

Specify as: *Family – species* -'Variety' - E

(M:10.0 C:10.0 A:10.0)

1.1.3 TREE SPECIES, COMMON NAME

Record the common name for the tree.

Specify as: Free text

(M:7.9 C:7.8 R:7.7 A:8.1)

1.1.4 TREE SEX

Record the sex of the tree, for example:

- Both male and female (monoecious)
- Male
- Female
- Unknown
- Sterile

Specify as: Free text

(M:4.8 C:3.9 R:6.0 A:4.4)

1.2 AGE

1.2.1 AGE PHASE/AGE CLASS

Estimated age phase of the tree:

- **Young** (juvenile phase). Trees in the juvenile phase can often lack flowers and fruit, but they instead often have a high growth rate.
- **Adult** (reproductive phase). The tree is assessed as being adult and thus often has flowers and fruit. Trees in this adult phase often have slower growth than trees in juvenile phase.
- **Old**. The tree is assessed as being old, which is often characterised by declining growth and vitality.

Specify as: Free text with a choice of Young, Adult or Old

(M:8.7 C:7.9 R:9.3 A:9.0)

1.2.2 PLANTING YEAR

Estimated or confirmed planting year.

Specify as: YYYY and Estimated or Confirmed.

(M:8.2 C:9.4 R:9.0 A:6.3)

1.2.3 ESTIMATED LENGTH OF LIFE

The estimated total length of life of the tree at the specific site. Note: Not the remaining length of life. Takes consideration of factors including species, growing site, vitality and damage.

Specify as: Number of years

(M:5.3 C:4.5 R:6.3 A:5.0)

1.3 SIZE

1.3.1 SIZE ACCORDING TO CLASSES

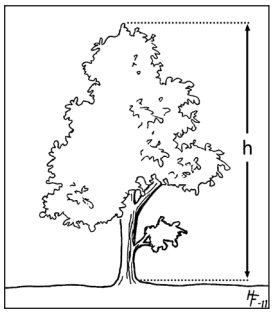
Record tree size according to the following classes:

- Very large
- Large
- Medium
- Small

Specify as: Free text

(M:6.2 C:4.5 R:7.8 A:6.3)

1.3.2 TREE HEIGHT



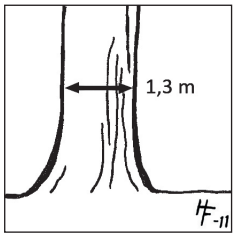
Record tree height. This is measured from the base of the tree trunk to the apex.

Specify as: Metres to one decimal

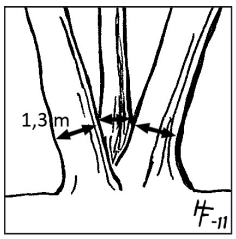
(M:6.4 C:4.8 R:7.6 A:6.9)

1.3.3 TRUNK DIAMETER 1.3 METRE HEIGHT

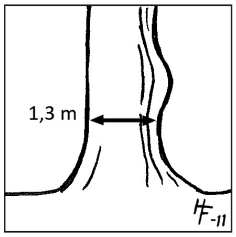
PROPOSED STANDARD PARAMETER



Record tree diameter. The diameter must be measured at the narrowest point under 1.3 metres above the ground (known as "diameter at breast height", DBH). For trees with specific shapes, the following applies:

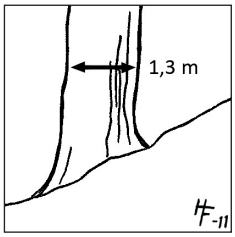


Multistem trees: Measure each stem separately and combine these values. If there are more than six stems with a diameter of more than 2.5 cm, measure the six thickest stems at 30 cm height above ground level. Omit the other stems.

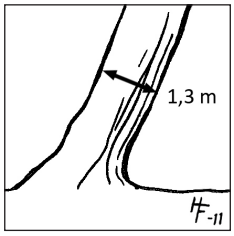


Trees with an irregular trunk: Measure at the narrowest point under any outgrowths.

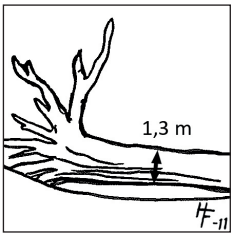
Trees growing on a slope: Use the upper part of the slope as the baseline when measuring the 1.3 metre height. The measurement should begin at the root collar and not at any mulch or other added material.



Leaning tree: The 1.3 metre height is measured from the underside of the incline.



Living fallen trees: The 1.3 metre height is measured from the root collar up the trunk as though the tree were still standing.



Specify as: Centimetres

(M:5.7 C:3.3 R:7.3 A:6.5)

1.3.4 MEASUREMENT METHOD FOR TRUNK DIAMETER/STEM CIRCUMFERENCE

Record the method used to measure the trunk diameter/trunk circumference of the tree. For example:

- Calliper
- Measuring tape
- D-tape
- Biltmore stick

Specify as: Free text

(M:3.0 C:2.1 R:4.2 A:2.7)

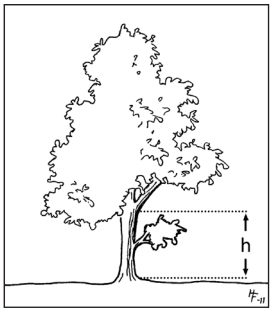
1.3.5 NUMBER OF STEMS

Record the total number of stems. To be included in the count, a stem should have a diameter of more than 2.5 centimetres at 1.3 metre height.

Specify as: Number

(M:6.9 C:4.8 R:8.1 A:7.9)

1.3.6 TRUNK HEIGHT

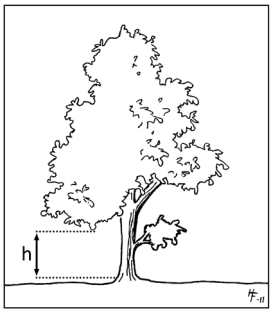


Record the height of the trunk from the base up to the first branch belonging to the crown.

Specify as: Metres to one decimal

(M:6.5 C:4.9 R:7.4 A:7.1)

1.3.7 FREE HEIGHT UNDER THE CROWN (LOWEST HANGING BRANCH)

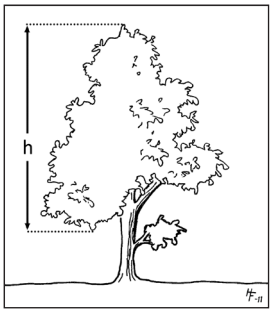


Record the height from the ground level up to the lowest hanging branch belonging to the crown.

Specify as: Metres to one decimal

(M:6.4 C:3.9 R:8.0 A:7.2)

1.3.8 CROWN HEIGHT (LOWEST BRANCH TO APEX))



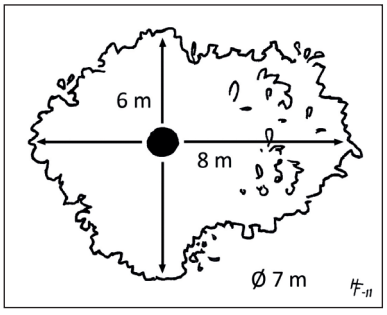
Record the height of the crown from from the first branch belonging to the crown up to the uppermost apical shoot, even if this is dead.

Specify as: Metres to one decimal

(M:4.1 C:2.5 R:5.7 A:4.0)

1.3.9 CROWN DIAMETER

Record the cross-crown diameter of the tree. Where the crown is irregular, the measurement is the mean value of the crown spread from the starting point at the trunk.



Specify as: Full metres

(M:6.9 C:5.4 R:7.3 A:8.0)

1.3.10 CROWN VOLUME

Record the volume of the tree crown in cubic metres. The crown is counted from the lowermost branch belonging to the crown up to the uppermost shoot.

Specify as: Full cubic metres

(M:3.2 C:2.3 R:4.7 A:2.8)

1.3.11 PROPORTION OF CROWN MISSING

Record the percentage amount of the crown that is missing. This can be estimated based on a conceptual cross-section through the crown.

Specify as: A percentage value in a 5 per cent range, for example 0, 1-5, 6-10 % etc.

(M:4.0 C:2.3 R:5.7 A:4.2)

1.3.12 FREE TEXT CONCERNING TREE SIZE

Free text box where the person carrying out the tree inventory can record comments in continuous text. Prepared phrases, taken from different inventory manuals, are available for specific areas. For example:

- Multistem
- Lying tree
- Crooked crown
- Twin-stem
- Trunk diameter at ground level

Specify as: Free text

(M:6.4 C:3.3 R:9.3 A:6.7)

1.4 TREE POSITION

1.4.1 GEOGRAPHICAL COORDINATES

PROPOSED STANDARD PARAMETER

Record the geographical coordinates of the tree. The recommended coordinate system is SWEREF 99 TM, but the inventory should primarily be carried out in the coordinate system used by the organisation in question, for example:

- SWEREF 99 TM
- RT90
- SWEREF 99
- VGS 84

Specify as: X- and Y-coordinates

(M:9.6 C:10.0 R:9.7 A:9.1)

1.4.2 STREET ADDRESS

Record the street address of the tree. Street address and tree number counted from the start of the street to the end on the side with even house numbers. The start of the street is taken as the first tree on that side with the lowest house number.

Numbering of trees continues in the same way from the lowest number on the side with odd house numbers.

Specify as: Street name and serial number for the tree, for example North Street 1.

(M:8.3 C:7.6 R:8.9 A:8.3)

1.4.3 POSITION WITHIN THE PROPERTY

Record where on the property the tree is standing by giving the point of the compass:

- South
- North
- East
- West

Specify as: Free text

(M:6.0 C:5.1 R:6.5 A:6.3)

1.4.4 STREET OR PARK TREE

Record whether the tree is a street tree or park tree. By street tree is meant a tree that requires maintenance owing to its proximity to technical infrastructure (not electricity lines). This applies to all trees in pavements, central reservations and refugia. It can also include trees in the vicinity of roads, streets, cycle paths or squares. Other trees in public places are counted as park trees.

Is most easily recorded as:

- Street tree
- Park tree

If further specification is required, the following can be used, for example:

- Asphalted cycle path
- Centre refugium
- Natural land tree
- Parking place
- Park tree
- Square
- Tree by streets
- Courtyard tree

Specify as: Free text

(M:8.8 C:9.0 R:9.1 A:8.1)

1.4.5 TYPE OF PLANTING

Record how the tree is planted in relation to other trees, for example:

- Avenue/row of trees
- Shrubbery
- Group
- Forest/nature
- Solitaire tree

Specify as: Free text

(M:7.4 C:5.6 R:8.4 A:8.0)

1.4.6 FUNCTION AT THE SITE

Record whether the tree has a particular function at the specific site, for example:

- Privacy
- Windbreak
- Particle filtration
- Aesthetic

Specify as: Free text

(M:5.4 C:3.0 R:7.0 A:6.1)

1.4.7 ORIENTATION OF THE GROWING SITE

Record the orientation of the planting site as regards exposure to sunlight:

- North
- West
- South
- East

Specify as: Free text

(M:4.3 C:2.6 R:5.7 A:4.7)

1.4.8 LAND USE (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

This entire parameter is taken from the Swedish Environmental Protection Agency's publication *Inventory of Trees with High Conservation Value in the Cultivated Landscape* (2009).

Record land use within 50 m radius of the tree as the current dominant land use (maintenance/activity). Where doubt exists, measures carried out in the previous 5 years should be recorded:

- Tree felling
- Grazing
- None
- Groundwork
- Clearing/thinning
- Mowing
- Other

Specify as: Free text

(M:4.8 C:1.8 R:7.0 A:5.7)

1.4.9 SOIL COVER AROUND THE TREE TRUNK

Record the dominant soil cover within 1 metre from the tree trunk, for example:

- Asphalt (excluding different types of permeable types of asphalt)
- Concrete grid
- Concrete slabs
- Paving stones
- Gravel
- Iron grid
- Mowed lawn area
- Mulch
- Natural land
- Permeable asphalt
- Planting

Specify as: Free text

(M:7.2 C:5.0 R:8.3 A:8.4)

1.4.10 SOIL COVER UNDER THE TREE CROWN

The growing site is classified as the dominant surface type under the tree crown:

- Asphalt (excluding different types of permeable types of asphalt)
- Concrete grid
- Concrete slabs
- Paving stones
- Gravel
- Iron grid
- Mowed lawn area
- Natural land
- Permeable asphalt
- Planting

Specify as: Free text

(M:7.9 C:5.8 R:9.0 A:9.0)

1.4.11 TYPE OF PLANTING BED

Record whether the tree has a specialist planting bed, for example:

- Skeleton soil

Specify as: Free text

(M:8.1 C:8.9 R:8.9 A:6.6)

1.4.12 SOIL PROTECTION AROUND THE TREE

Record whether the tree has a surrounding grid and the type of grid, for example:

- Concrete grid
- Forged iron grid
- HDPE plastic grid

Specify as: Free text

(M:8.1 C:7.4 R:9.0 A:8.0)

1.4.13 TRUNK GUARD

Record whether the tree has a trunk guard and the type of guard, for example:

- Traffic buffer
- Animal guard

Specify as: Yes/No and type

(M:8.2 C:7.9 R:9.1 A:7.6)

1.4.14 SIZE OF PLANTING SITE

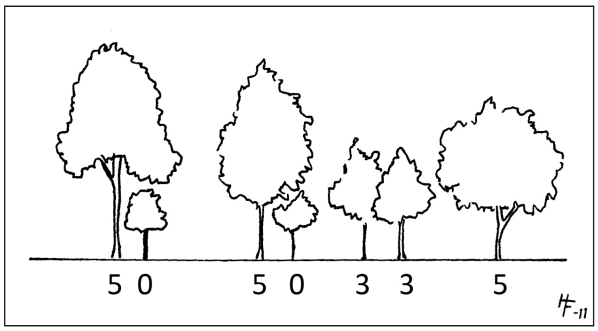
Record the size of the open area under the tree crown that comprises permeable material, including planting bed, flowerbeds, free-draining gravel and permeable asphalt.

Specify as: Number of square metres

(M:5.8 C:3.5 R:7.5 A:6.3)

1.4.15 LIGHT EXPOSURE

Record how many sides of the tree are unshaded. The maximum number of sides is five, with the upper surface of the crown counting as one side and the sides of the crown as the other four sides.



Specify as: 0-5

(M:3.7 C:2.1 R:5.0 A:4.0)

1.4.16 AVAILABLE SOIL VOLUME

Record the estimated volume of soil available to the tree.

1. > 15 m^2
2. 10-15 m^2
3. 5-10 m^2
4. < 5 m^2

Specify as: 1-4

(M:4.4 C:3.8 R:5.3 A:4.2)

1.4.17 SOIL TEXTURE AND PH

Record the dominant soil texture under the tree crown, together with the current pH value, for example:

- Gravel
- Clay soil
- Glacial till
- Sandy soil
- Silty soil
- Unknown

Specify as: Free text and pH value

(M:6.0 C:3.8 R:8.1 A:6.2)

1.4.18 INFILTRATION INLET FOR AIR

Record whether the tree has an infiltration inlet for air.

Specify as: Yes/No

(M:6.6 C:6.4 R:7.3 A:6.1)

1.4.19 SLOPE UNDER THE TREE CROWN

Record the estimated or measured slope under the tree crown.

Specify as: Degrees

(M:4.2 C:2.5 R:4.6 A:5.7)

1.4.20 ROAD SALTING AT THE SITE

Record whether salting takes place under the tree crown.

Specify as: Yes/No

(M:7.2 C:4.8 R:8.9 A:8.0)

1.4.21 PLANTING SITE EDGING

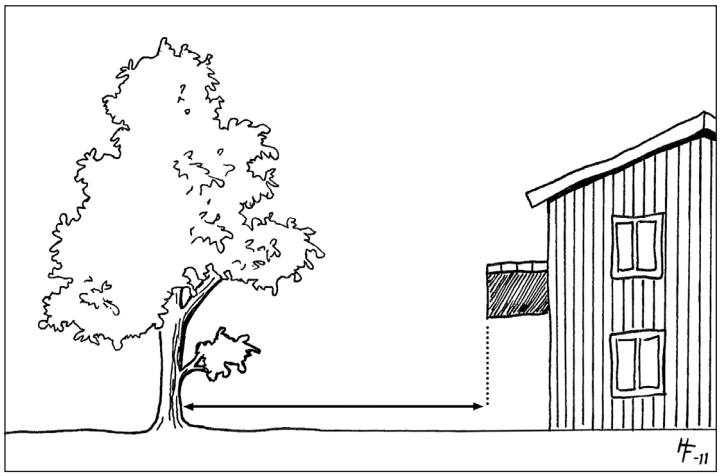
Record whether the planting site is surrounded by high edging, for example to prevent salt intrusion into the plant bed.

Specify as: Yes/No

(M:4.6 C:2.6 R:5.4 A:5.9)

1.4.22 DISTANCE TO NEAREST HOUSE

Record the distance between the tree and the nearest part of a house if this is within 18 metres and has three or fewer floors (two floors plus attic). Record also the direction in which the tree borders this house. This is done by measuring the number of degrees, with North as 0 and South as 180 degrees. Taller houses are counted as buildings according to parameter *1.4.23 Distance to nearest building/ object*.



Specify as: Metres to nearest house and degrees to this house

(M:4.7 C:3.6 R:5.3 A:5.2)

1.4.23 DISTANCE TO NEAREST BUILDING/OBJECT

Record the distance between the tree and the nearest part of a building, house or other object (including natural objects). Record also the direction in which the tree borders this object. This is done by measuring the number of degrees, with North as 0 and South as 180 degrees.

Specify as: Metres to nearest object and degrees to this

(M:4.8 C:2.6 R:6.0 A:5.8)

1.4.24 TECHNICAL INFRASTRUCTURE CLOSE TO THE TREE

Record whether there is any technical infrastructure under or over the tree crown, including under the ground. Record also the type of infrastructure in question, for example:

- Sewage pipes
- Electricity lines
- Gas pipes
- Railway lines
- Mains water pipes
- No visible infrastructure

Specify as: Free text

(M:7.1 C:4.5 R:9.1 A:7.8)

1.4.25 CONFLICTS WITH PROPERTY AND TECHNICAL INFRASTRUCTURE

Record whether the tree is in a conflict situation with some type of infrastructure. By conflict situation is meant that either the tree or the infrastructure is being negatively affected, for example:

- Confirmed root intrusion
- Displacement of kerbstones
- Displacement of, or impact on, headstones
- Displacement of, or impact on, walls
- Displacement of, or impact on, fences
- Root emergence (in different types of surface covering)
- Damage to building façade
- Reduced light entry in premises
- Obscured sight of lamp posts or street lights or damage to these
- Obscured sight of signs or damage to these
- In the way of pedestrian, cycle or vehicle traffic

Specify as: free text.

(M:7.7 C:5.4 R:9.0 A:8.7)

1.4.26 ACTIVE GRAVE PLOTS UNDER THE TREE CROWN

Record whether there are active grave plots (coffin or urn burial plots) under the tree crown, or sufficiently close so that they can affect the tree during future grave digging work.

Specify as:

- Coffin burial plot
- Urn burial plot
- No conflict

(M:5.4 C:1.5 R:8.0 A:6.6)

1.4.27 FREE TEXT DESCRIBING THE POSITION OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Burial of coffins is forbidden
- The tree has been moved here from a previous planting
- The plant bed has been renovated
- Infrastructure has been repaired after damage by the tree

Specify as: Free text

(M:6.6 C:2.6 R:9.4 A:7.7)

2. VITALITY AND SAFETY

2.1 VITALITY

2.1.1 VISUAL ASSESSMENT OF VITALITY CLASS

PROPOSED STANDARD PARAMETER

Vitality assessment based on factors such as a visual evaluation of the tree's crown structure according to the table and picture examples below. Vitality assessment using light throughflow comes from a German manual (Roloff, 2001). However, it should be pointed out that this method is not suitable for all types of tree, since for example the maidenhair tree, *Ginkgo biloba*, would never achieve vitality 1.

It is also important to note that tree vitality and degree of damage are two different parameters.

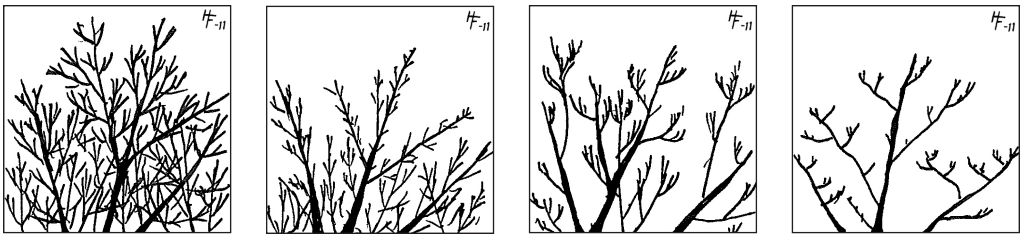
For example, a willow stool can be vitality 1 despite having a damaged crown and sometimes a hollow trunk.

Specify as	Vitality category	Description
1	Good vitality.	The tree may be damaged, but growth and scar tissue formation are still good. Dense crown with good shoot growth. Crown light throughflow: 0-10%
2	Moderate vitality	Somewhat limited growth. Vitality 1 trees can temporarily be at this vitality level owing to e.g. drought. The tree is considered capable of recovering to vitality 1. Crown light throughflow: 11-25%
3	Poor vitality	The tree has poor vitality with very limited chances of recovering without remedial action. Crown light throughflow: 26-60%
4	Very poor vitality	The tree is in very poor condition, practically dead. Crown light throughflow: 61-99%

Specify as: 1-4

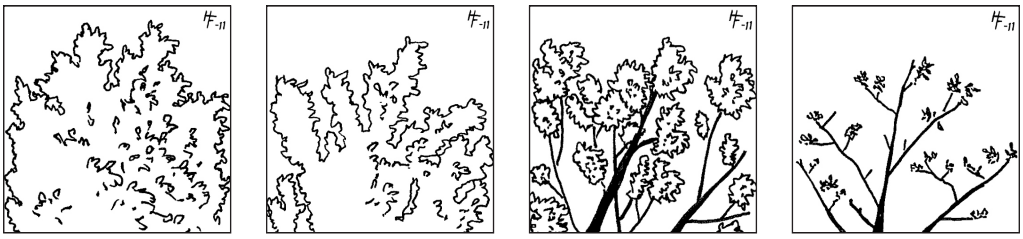
(M:9.8 C:9.8 R:9.9 A:9.8)

Examples of vitality, winter



1. **2.** **3.** **4.**

Examples of vitality, summer



2.1.2 SHOOT GROWTH

Mean value for growth of annual shoots. This is measured on at least three of the year's shoots at different places around the crown, for example in sun, shade and in the centre of the crown. The measurements are only made on the current year's growth, or on the previous year's growth if the inventory is carried out in winter or spring.

Specify as: Centimetres

(M:6.1 C:4.5 R:7.3 A:6.4)

2.1.3 LEAF DENSITY, LEAF SIZE AND LEAF COLOUR

Record the tree's crown density, leaf size and colour.

Specify as: Free text

(M:6.6 C:4.5 R:8.7 A:6.6)

2.1.4 FREE TEXT DESCRIBING TREE VITALITY

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Leaf size
- Dieback
- Dead leaves
- Dead branches
- Unusual leaf colour for the species
- Elevated temperature in trunk and crown
- Crown shape
- Reduced ability to form scar tissue over damage
- Reduced growth (shoot, stem, leaf)
- Large amount of fruit
- Early flowering
- Early hibernation
- No flowering

Specify as: Free text

(M:7.9 C:5.9 R:9.0 A:8.8)

2.2 DAMAGE

2.2.1 DAMAGE CLASS

The most important aspect in the evaluation is how the damage will affect the tree in the long term. The percentage ranges indicated are only intended to be used as a guide by the person carrying out the inventory, since a small injury to the tree in terms of area can have a great negative impact if it occurs at a critical point for the tree. Bear in mind also that for an injury to be classified as worthy of recording, it has to have a long-term negative impact on the tree.

If the authority intends to carry out a basic investigation, the following table should be used:

Specify as	Category	Description
1	**None**	*No damage worth recording can be seen.*
2	**Mild**	*Mild, minor pruning damage, minor root collar damage.* *In terms of size, not exceeding 10% of trunk base circumference, trunk circumference or crown area.*
3	**Moderate**	*Moderate, small areas lacking bark right in to the wood, moderate number of dead branches, minor top rot, minor fungal attack.* *In terms of size, not exceeding 25% of trunk base circumference, trunk circumference or crown area.*
4	**Serious**	*Serious damage, for example major fungal attack, loose bark right in to the wood, large dead branches.* *For damage not showing rots or cavities, the damage exceeds 25% of trunk base circumference, trunk circumference or crown area.*

Record as: 1-4

(M:8.1 C:7.6 R:9.7 A:6.9)

2.2.2 DAMAGE CLASS, DETAILED

The most important aspect in the evaluation is how the damage will affect the tree in the long term. The percentage ranges indicated are only intended to be used as a guide by the person carrying out the inventory, since a small injury to the tree in terms of area can have a great negative impact if it occurs at a critical point for the tree. Bear in mind also that for an injury to be classified as worthy of recording, it has to have a long-term negative impact on the tree.

If the authority intends to carry out a detailed investigation, the following tables should be used:

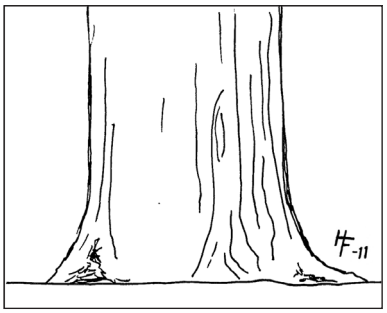
Root damage/root collar damage

This damage category refers to both the root system and the root collar.

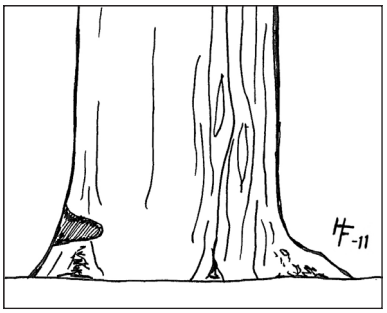
Specify as	Category	Description
1	**None**	*No damage worth recording can be seen.*
2	**Mild**	*There is damage to the root collar, for example lawnmower damage. In terms of size, not exceeding 10% of root collar circumference.*
3	**Moderate**	*Moderately large parts are damaged, but no rot is visible. In terms of size, not exceeding 25% of root collar circumference.*
4	**Serious**	*Fungal attack, cavities, loosening bark without scar tissue formation.* *For damage not showing rots or cavities, the damage exceeds 25% of root collar circumference.*
5	**Probable**	*There are signs that root damage may have occurred, for example signs of excavation in the vicinity of the tree.*

Specify as: 1-5

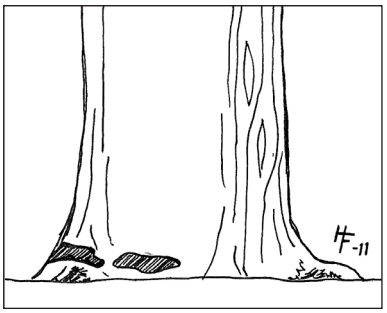
1.



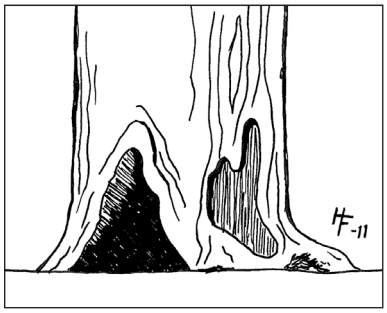
2.



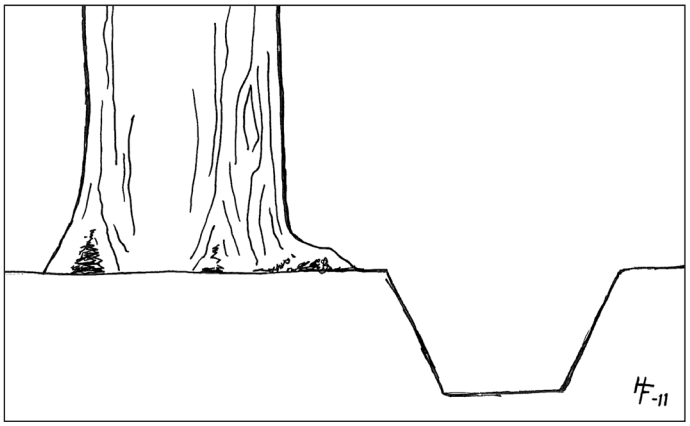
3.



4.



5.



Trunk damage

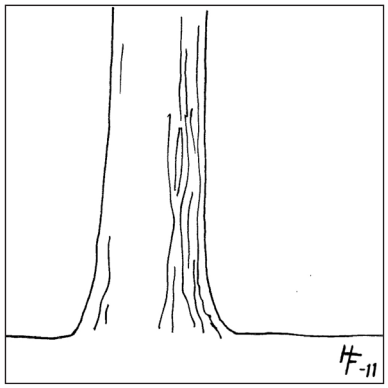
The most important aspect in the evaluation is how the damage will affect the tree in the long term. The percentage ranges indicated are only intended to be used as a guide by the person carrying out the inventory, since a small injury to the tree in terms of area can have a great negative impact if it occurs at a critical point for the tree. Bear in mind also that for an injury to be classified as worthy of recording, it has to have a long-term negative impact on the tree.

This damage category refers to the entire trunk, from the root collar up to the first branch that forms part of the crown.

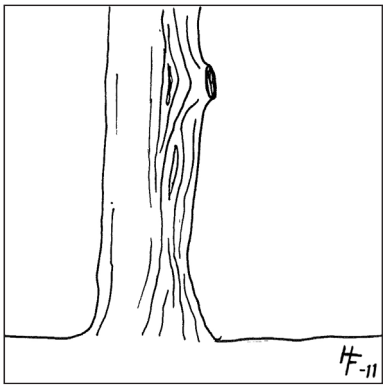
Specify as	Category	Description
1	**None**	*No damage worth recording can be seen.*
2	**Mild**	*Minor damage, for example from pruning.* *In terms of size, not exceeding 10% of trunk circumference.*
3	**Moderate**	*Limited damage, small cavities, minor fungal attack.* *In terms of size, not exceeding 25% of trunk circumference.*
4	**Serious**	*Rot damage, large pieces of bark have loosened.* *For damage not showing rots or cavities, the damage exceeds 25% of trunk circumference.*

Specify as: 1-4

1.



2.



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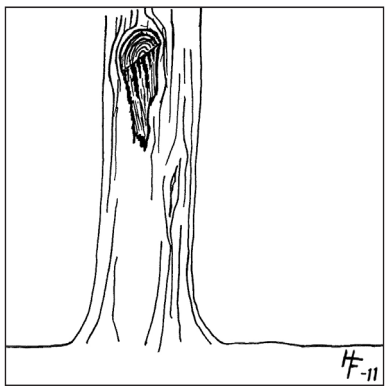
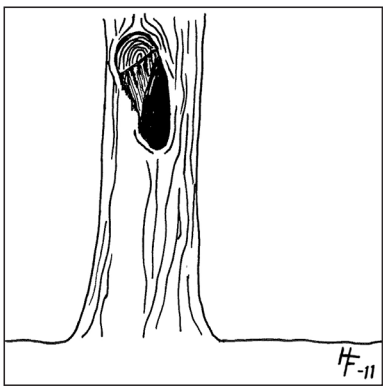


4.



Crown damage

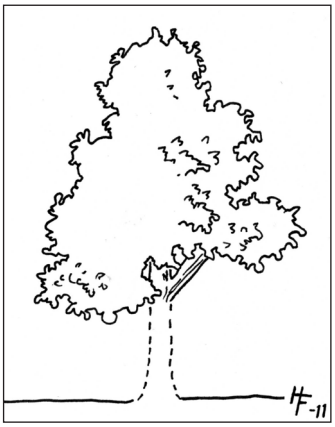
The most important aspect in the evaluation is how the damage will affect the tree in the long term. The percentage ranges indicated are only intended to be used as a guide by the person carrying out the inventory, since a small injury to the tree in terms of area can have a great negative impact if it occurs at a critical point for the tree. Bear in mind also that for an injury to be classified as worthy of recording, it has to have a long-term negative impact on the tree.

This damage category refers to the entire crown, from the first branch that forms part of the crown to the uppermost apical shoot.

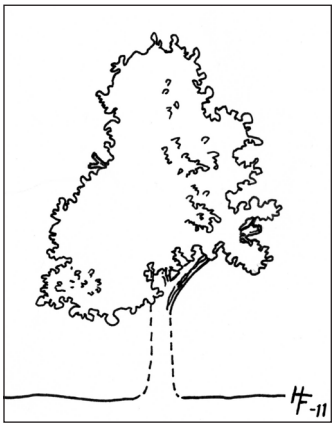
Specify as	Category	Description
1	**None**	*No damage worth recording can be seen.*
2	**Mild**	*Minor damage, for example from pruning.* *In terms of size, not exceeding 10% of the crown.*
3	**Moderate**	*Limited damage, small cavities, minor fungal attack, minor top rot, dead branches, desiccated branches, damaged or dead apical shoot.* *In terms of size, not exceeding 25% of the crown.*
4	**Serious**	*Major fungal attack, large dead branches, large sections of dead branches.* *For damage not showing rots or cavities, the damage exceeds 25% of the crown.*

Specify as: 1-4

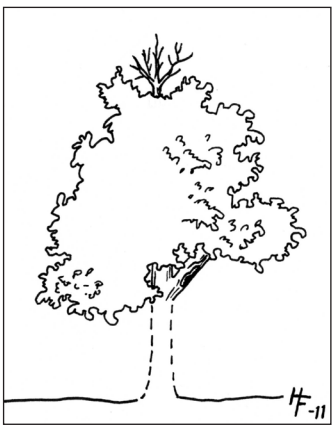
1.



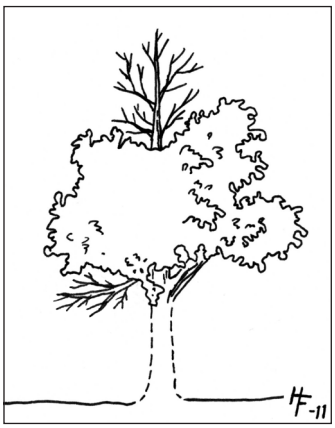
2.



3.



4.



2.2.3 MECHANICAL DAMAGE

Record the type of mechanical damage, for example:

- Pruning
- Vehicle impacts
- Excavation
- Storm damage
- Fire damage

Specify as: Free text

(M:7.7 C:6.1 R:8.4 A:8.7)

2.2.4 SITE DISTURBANCE

Record whether there are any signs of soil disturbance in the vicinity of the tree, for example:

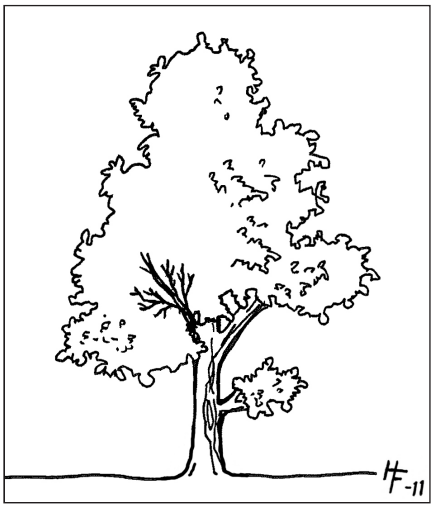
- Erosion
- Excavation
- Felling (forestry)
- Construction work
- Undergrowth clearing

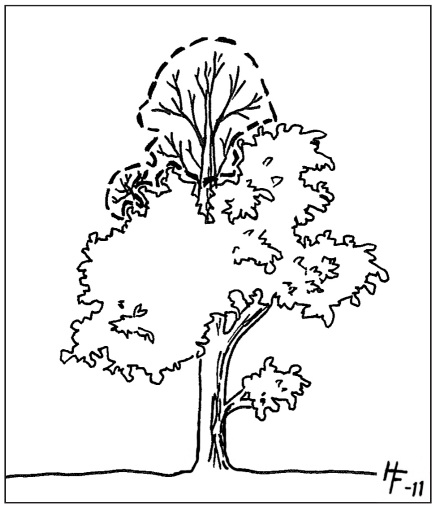
Specify as: Free text

(M:6.7 C:6.1 R:6.8 A:7.2)

2.2.5 AMOUNT OF DIEBACK

Record the estimated percentage amount of dieback in the tree. The amount of dieback is taken as the proportion of dead branches in the upper part of the crown. If there are dead branches in the lower part of the crown, these are included in the total only if they continue up into the upper part of the crown. The lower branches are considered as being outcompeted and not as dieback if there is a lack of contact with the upper part of the crown.





Specify as: A percentage value in a 5 per cent range, for example 0, 1-5, 6-10 % etc.

(M:7.0 C:5.6 R:9.0 A:6.3)

2.2.6 RISK OF DAMAGE ARISING FROM SURFACE GRIDS

Risk of intrusion into the trunk, specify as remediation category:

1. No need
2. Within the near future
3. As soon as possible
4. Acute

Specify as: 1-4

(M:6.5 C:6.5 R:6.0 A:7.0)

2.2.7 WORK NEEDED TO TRUNK GUARD

Record whether the trunk guard is in need of adjustment, repair or removal, specify as remediation category:

1. No need
2. Within the near future
3. As soon as possible
4. Acute

Specify as: 1-4

(M:6.6 C:6.9 R:6.3 A:6.8)

2.2.8 FREE TEXT DESCRIBING DAMAGE TO THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Resistograph

Specify as a percentage of trunk diameter; 1 = 100%, 2 = 50-75%, 3 = 25-50%, 4 <25%

- **Overall damage**
  - Pruning damage
  - Lawnmower damage
  - Animal damage
  - Fracture
  - Vehicle impact
  - Damage done by tool (knife, axe, etc.)

- **Root damage/Root collar damage**
  - Fruiting bodies, fungus
  - Excavation damage
  - Signs of excavation in the vicinity of the tree
  - Semi-circular cracks in the ground
  - Vehicle impact damage
  - Rot at the trunk base
  - Damaged roots
  - Damage by lawnmower
  - Cracks in the ground

- **Trunk damage**
  - Bacterial ooze from the trunk
  - Pruning damage
  - Fruiting bodies, fungus
  - Cavity
  - Ingrown bark
  - Vehicle impact damage
  - Rot damage
  - Trunk cracks
  - Major trunk damage
  - Previous top pruning
  - Piled up material against the trunk
  - Swollen areas on the trunk
  - Increasing incline

- **Crown damage**
  - Fruiting bodies, fungus
  - Broken branches
  - Dead branches
  - Poorly attached branches
  - Major damage to branches
  - Dieback
  - Ingrown bark
  - Cracks
  - Pruning damage
  - Previous top pruning
  - Inadequate pruning

Specify as: Free text

(M:7.8 C:5.8 R:9.6 A:8.2)

2.3 DISEASES AND PESTS

2.3.1 DISEASES AND PESTS

Record any diseases present, for example:

- Dutch elm disease
- Ash dieback
- Leaf mould
- Horse chestnut bleeding canker
- Chestnut blight
- Horse chestnut leaf miner
- Phytophthora
- Willow scab
- Scale insects
- Unknown

Specify as: Free text

(M:8.5 C:7.3 R:8.4 A:9.7)

2.3.2 DISEASES AND PESTS IN THE VICINITY OF THE TREE

Record whether there are any known diseases or insects/pests in the vicinity of the tree that can attack the tree, for example:

- Dutch elm disease
- Ash dieback
- Horse chestnut bleeding canker
- Horse chestnut leaf miner
- Chestnut blight
- Scale insects

Specify as: Free text.

(M:5.2 C:3.4 R:4.3 A:7.9)

2.3.3 FUNGI

Record the incidence of fungi on or near the tree. If fungi are found, this does not necessarily mean a higher risk. Specify as:

1. Fungal bodies not present
2. Fungal bodies present on the ground under the tree crown
3. Fungal bodies present on the ground at the tree trunk
4. Fungal bodies present on the tree

Specify as: 1-4

(M:9.0 C:8.0 R:9.6 A:9.6)

2.3.4 FUNGI, DETAILED

Record the type of fungus present on or near the tree, for example:

- Birch bracket (*Piptoporus betulinus)*
- Dryad's saddle (*Polyporus squamosus)*
- Honey fungus (*Armillaria mellea)*
- Giant polypore (*Meripilus giganteus)*
- Chaga mushroom (*Inonotus obliquus)*
- False charcoal (*Ustulina deusta)*
- Sulphur polypore (*Laetiporus sulphureus)*

Specify as: Free text, preferably with both the common and scientific name.

(M:7.7 C:6.4 R:7.7 A:9.0)

2.3.5 FREE TEXT DESCRIBING PESTS AND DISEASES AFFECTING THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Treated with fungicide
- Unknown disease that should be investigated
- Fungal species should be investigated
- Vole or rabbit damage

Specify as: Free text

(M:7.8 C:4.8 R:9.9 A:8.8)

2.4 RISK AND SAFETY

2.4.1 RISK OF INJURY TO THE PUBLIC OR MATERIAL DAMAGE

The examples provided for this parameter should only be considered a guide, since for example some trees with major damage and fungal attack can still be regarded as risk-free owing to their position or to the stability of the remaining wood. Alternatively, the person carrying out the inventory may have personal experience of damage or risk indicators that allows them to assess the risk classes differently than proposed here.

Specify the risk class according to the table below.

Specify as	Category	Description	Example
1	**Low risk**	*The tree shows no signs of posing a risk of injury to person or property in the foreseeable future.*	• The tree shows no tendencies for weakness, a risky growth pattern or a disease that can affect tree stability. • The tree is too small to pose a risk.
2	**Moderate risk**	*The tree may pose a certain risk to person or property.*	• Some dieback. • Small branches with ingrown bark. • Minor bark/trunk damage. • Sparse foliage. • The tree has minor top rot. • Small poorly attached branches.
3	**High risk**	*The tree should be dealt with immediately to prevent injury to person or property.* Remedial action recommended within 3-6 months.	• Small dead branches overhanging streets or other place where they risk hitting someone/ something. • Cavities in the trunk or gaps in the crown that are considered a risk to tree stability. • Large areas of ingrown bark. • The tree has major top rot. • Large poorly attached branches.

4	**Extreme risk**	*The tree poses a direct risk to person or property. Urgent action is needed.* Immediate notification. Remedial action recommended within 0-2 weeks.	• Large dead branches overhanging streets or other place where they risk hitting someone/ something. • Major fungal attack at the base of the trunk. • Rot in large roots. • Fungal attack. • Leaning tree without obvious stabilisation. • Combination of different types of tree damage which together are considered to result in an extreme risk of injury to person or property.

Specify as: 1-4

(M: 9.4 C:9.5 R:9.3 A:9.6)

2.4.2 WEIGHT/SIZE OF TREE OR TREE SECTION AT RISK OF FALLING

Record the estimated weight of the part of the tree that is at risk of falling.

Specify as: Kilogrammes

(M:4.6 C:3.1 R:5.1 A:5.6)

2.4.3 FREE TEXT DESCRIBING THE RISK AND SAFETY OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Branches smaller than 10 cm in diameter at risk of falling
- Branches larger than 10 cm in diameter at risk of falling
- Root tangle that can strangle trunk growth
- Fungal rots or signs of rot on the root collar or roots (for example fruiting bodies or cavities)
- Cracks or bulges in the ground
- Branches poorly attached to the trunk
- Blight attack
- Heart attacked by fungus (for example through fruiting bodies or cavities)
- Sapwood attacked by fungus (for example through fruiting bodies or cavities)
- Veins/shallow cracks on the tree
- Lack of a visible root collar (in such cases the tree looks like a telegraph pole)
- The tree has horizontal or vertical cracks
- If the tree is leaning, specify by how many degrees from the perpendicular
- The crown has increased growth in unexpected places
- Poor growth of branches or other signs of weakness in the crown
- The tree is leaning at an unnatural angle
- Roots sticking up from the ground or cracks in the roots.

Specify as: Free text

(M:8.1 C:5.8 R:9.9 A:8.8)

3. TREE VALUES

3.1 BIOLOGICAL VALUE

3.1.1 SIZE OF HOLES ON THE TRUNK OR BRANCHES (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

This entire parameter is taken from the Swedish Environmental Protection Agency's publication *Inventory of Trees with High Conservation Value in the Cultivated Landscape* (2009, page 16).

By hole is meant the entry hole to a cavity in the wood. Damage to bark that has scarred over, shallow woodpecker holes, splits in the wood and broken branches are not counted as holes. Holes between root and soil (e.g. trees on pedestals) are counted only if there is a cavity in the wood. In the assessment, the value is recorded according to the hole class distribution. The lowest value for a hole to be recorded is a diameter of 3 cm. Only a single value is recorded and the classification is made on the basis of the largest entry hole. If the tree has more than one entry hole, this can be noted in the Hole Stage comments. Classes:

1. No visible holes
2. Entry hole < 10 cm in diameter
3. Entry hole 10-19 cm in diameter
4. Entry hole 20-29 cm in diameter
5. Entry hole ≥ 30 cm in diameter

Specify as: 1-5

(M:5.0 C:5.0 R:4.4 A:5.6)

3.1.2 CHARACTERISTICS (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

This entire parameter is taken from the Swedish Environmental Protection Agency's publication *Inventory of Trees with High Conservation Value in the Cultivated Landscape* (2009, page 17).

The following characteristics are specified in the Swedish Environmental Protection Agency's report:

- Not assessed
- Trunk wood lacking bark
- Traces of fire
- High-set crown
- Normal shaped tree
- Sap flow
- Spreading branches
- Ant hills (only of the *Formica rufa* group)
- Other

Specify as: Free text.

(M:4.6 C:3.8 R:4.6 A:5.6)

3.1.3 WOOD MOULD VOLUME
(SWEDISH ENVIRONMENTAL PROTECTION AGENCY)
(WOOD MOULD = DEAD WOOD, LEAVES, OLD BIRDS' NESTS, ETC.)

This entire parameter is taken from the Swedish Environmental Protection Agency's publication *Inventory of Trees with High Conservation Value in the Cultivated Landscape* (2009, page 16).

A small cavity has relatively little wood mould, while a very large cavity can contain a rather large amount of wood mould, provided it does not have an entry hole in contact with the ground, which reduces the amount of wood mould. The assessment consists of a volume calculation (AREA x DEPTH).

Four classes as follows:

1. Wood mould volume not calculable
2. ≤ 10 litres wood mould
3. 10 litres - 1 m^3 wood mould
4. ≥ 1 m^3 wood mould

Specify as: 1-4

(M:4.0 C:3.8 R:3.7 A:4.4)

3.1.4 AMOUNT OF DEAD WOOD

Record the amount of dead wood as a percentage of the total amount of wood in the tree.

Specify as: A percentage value in a 5 per cent range, for example 0, 1-5, 6-10 % etc.

(M:4.3 C:3.6 R:5.1 A:4.2)

3.1.5 FREE TEXT DESCRIBING THE BIOLOGICAL VALUE OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Hole stage
- Giant tree, at least 1 metre in trunk diameter, measured at breast height (1.3 metres).
- Red-listed species
- Signal species
- Large tree, trunk diameter 0.5-1 metre, measured at breast height (1.3 metres).

Specify as: Free text

(M:7.2 C:4.8 R:8.6 A:8.3)

3.2 AESTHETIC VALUE

3.2.1 AESTHETIC VALUE

Record the aesthetic value of the tree. This parameter can be used to identify individuals with particularly high conservation value.

1. High aesthetic value
2. Normal aesthetic value
3. Low aesthetic value
4. No aesthetic value

Specify as: 1-4

(M:6.4 C:5.1 R:7.4 A:6.6)

3.2.2 CHARACTER TREE

Record whether the tree is considered to be a character tree, which means an individual tree that is significant for the site, based on factors such as growth pattern, species and position.

Specify as: Free text

(M:7.4 C:7.8 R:7.9 A:6.4)

3.2.3 SUITABILITY OF THE SPECIES FOR THE SITE

This parameter is included in systems such as VAT03, which is a Danish evaluation method for trees developed by Randrup (2005). When the method is used, the appropriateness of the species for the site should be rated on a scale from 1 to 5, where 5 is the highest. In assessing the suitability of the species for the site, factors such as the following should be included:

- Soil type
- Climate
- Tolerance to air pollution if such exists
- Tolerance to salt stress if such exists
- Other site characteristics that can affect the tree

In applying VAT03, it is strongly recommended that the entire description of the method is procured and that the person carrying out the inventory is trained in use of the method.

Specify as: 1-5

(M:5.1 C:3.4 R:7.3 A:4.6)

3.2.4 ENVIRONMENT-ENHANCING CHARACTERISTICS

This parameter is included in systems such as VAT03, which is an economic evaluation method for trees (Randrup, 2005). When the method is used, the suitability of the species for the site should be rated on a scale from 1 to 5, where 5 is the highest. In assessing the environment-enhancing characteristics of the species at the site, factors such as the following should be included:

- Biological diversity
- Noise
- Potential allergy problems
- Light
- Air
- Windbreak
- Shade

In applying VAT03, it is strongly recommended that the entire description of the method is procured and that the person carrying out the inventory is trained in use of the method.

Specify as: 1-5

(M:4.7 C:2.8 R:6.6 A:4.7)

3.2.5 ARCHITECTONIC SUITABILITY OF THE TREE

This parameter is included in systems such as VAT03, which is an evaluation method for trees (Randrup, 2005). When the method is used, the suitability of the species for the site should be rated on a scale from 1 to 5, where 5 is the highest. In assessing the architectonic characteristics of the tree at the site, factors such as the following should be included:

- Whether the tree functions as an optical focus and orientation point
- Whether the tree enhances or detracts from the environment in which it stands
- Whether the tree is part of an avenue of trees

In applying VAT03, it is strongly recommended that the entire description of the method is procured and that the person carrying out the inventory is trained in use of the method.

Specify as: 1-5

(M:4.6 C:2.8 R:4.9 A:6.1)

3.2.6 VISIBILITY

This parameter is included in systems such as VAT03, which is an evaluation method for trees (Randrup, 2005). When the method is used, the suitability of the tree species for the site should be rated on a scale from 1 to 5, where 5 is the highest. In assessing the visibility of the tree at the site, factors such as the following should be included:

- Number of people who can see the tree
- Number of trees present in the surroundings

In applying VAT03, it is strongly recommended that the entire description of the method is procured and that the person carrying out the inventory is trained in use of the method.

Specify as: 1-5

(M:4.1 C:3.9 R:5.0 A:3.3)

3.2.7 FREE TEXT DESCRIBING THE AESTHETICS OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text, for example:

- Flowers
- Scent
- Decorative bark
- Decorative fruit
- Decorative leaves

Specify as: Free text

(M:7.3 C:4.3 R:9.3 A:8.3)

3.3 CULTURAL HISTORY VALUE

3.3.1 CULTURAL HISTORY VALUE

The cultural history value of a tree is determined by its relation to human activity. Therefore trees in an urban environment always have a cultural history value since such trees are in general always planted there. Trees that have self-established in areas that are not actively managed by humans, for example ditch banks and woods and which are not normally treated as individuals generally have a low cultural history value.

Trees that are considered to be of great importance, for example for the character of a churchyard, by forming part of an important avenue or planted by/for an important person have a particularly high cultural history value.

Specify the cultural history value of a tree and the grounds for the assessment.

Cultural history value	Category	Example
1	**High cultural history value**	• Important avenue • Tree planted by/for an important person
2	**Cultural history value**	• Urban environment • Churchyard • Park
3	**Low cultural history value**	• Tree in natural area without cultural links • One of a group of small trees on the edge of a park
4	**No cultural history value**	• Self-sown tree in an area people do not normally pass through • Young tree in nature-like planting

Specify as: 1-4

(M:6.9 C:5.3 R:7.4 A:7.9)

3.3.2 CULTURAL HISTORY VALUE OF THE TREE FROM A NATIONAL PERSPECTIVE

Record whether the tree has a cultural history value from a local, regional or national perspective. This is specified for example according to:

- Local interest
- Regional interest
- National interest

Specify as: Free text

(M:5.9 C:4.7 R:7.0 A:6.1)

3.3.3 PART OF THE ORIGINAL PLANTING

Record whether the tree is considered to be part of the original planting.

Specify as: Yes/No

(M:5.7 C:4.4 R:5.9 A:6.8)

3.3.4 CLONE OF OLDER INDIVIDUAL

Record whether the tree is a clone of an older tree that has existed or is still present in the planting, for example:

- Cutting
- Side shoot
- Sucker

Specify as: Free text

(M:5.3 C:3.8 R:5.3 A:6.9)

3.3.5 FREE TEXT DESCRIBING THE CULTURAL HISTORY VALUE OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text. More detail can be provided here on whether events are associated with the tree, for example:

- ”King Karl Xll once rested here on his way to Norway.”
- ”This tree was brought home by Axel von Fersen in 1800.”
- ”This tree is a commemorative tree planted at the time of the first owner’s marriage.”

Specify as: Free text

(M:7.8 C:4.8 R:9.3 A:9.3)

3.4 CONSERVATION VALUE

3.4.1 CONSERVATION VALUE

Record the conservation value of the tree. Consideration must be given to factors such as the tree's placement, vitality, aesthetics, biological diversity and any visible damage.

1. Very great conservation value
2. Great conservation value
3. Worthy of conservation
4. Not worthy of conservation

Specify as: 1-4

(M:9.0 C:8.6 R:9.3 A:9.0)

3.4.2 FUTURE TREES

Record trees that are important to save for the future, for example because they will take over when older trees have disappeared.

Specify as: Free text

(M:6.8 C:5.6 R:7.1 A:7.6)

3.4.3 PROTECTION VALUE (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

Record the protection value of the tree according to the Swedish Environmental Protection Agency's parameters.

- Old tree
- Thick tree
- Coppiced tree
- Tree with holes
- Other

Specify as: Free text

(M:8.0 C:8.8 R:8.0 A:7.2)

3.4.4 OFFICIAL PROTECTION

Record whether the tree has official protection or an even stronger form of statutory protection, for example:

- Cultural heritage listing
- Environmental listing
- World heritage listing

Specify as: Free text

(M:7.4 C:6.0 R:7.3 A:9.0)

3.4.5 FREE TEXT DESCRIBING THE CONSERVATION VALUE OF THE TREE

Free text box where the person carrying out the inventory can record comments in continuous text, such as why the tree is particularly worthy of conservation.

Specify as: Free text

(M:7.6 C:4.8 R:9.4 A:8.7)

4. MEASURES AND MAINTENANCE NEEDS

4.1 MAINTENANCE

4.1.1 MAINTENANCE CATEGORY

Record the maintenance category into which the tree falls:

- Arcade pruned
- Guarantee maintenance
- Street tree
- Coppiced
- Park tree
- Solitaire tree
- Stool coppiced
- Structural pruning

Specify as: Free text

(M:9.0 C:8.6 R:9.6 A:8.7)

4.1.2 MAINTENANCE PROGRAMME

Record whether there is a care or maintenance programme for the tree; record also any reference number or other code that may make it easier to locate the document.

Specify as: Free text

(M:7.7 C:6.0 R:9.0 A:8.0)

4.1.3 PRUNING

Record the pruning interval, for example:

- Even-numbered years
- Odd-numbered years
- Every year

Specify as: Free text

(M:8.1 C:6.5 R:9.1 A:8.7)

4.1.4 FERTILISATION PROGRAMME FOR THE TREE

Record how often the tree should be fertilised, and the dose and compound to be used.

Specify as: Free text

(M:5.4 C:6.1 R:3.9 A:6.2)

4.1.5 IRRIGATION PROGRAMME FOR THE TREE

Record how often the tree should be irrigated and the amount of water to be used in each irrigation event.

Specify as: Free text

(M:7.1 C:7.9 R:6.1 A:7.3)

4.1.6 MAINTENANCE TECHNICIAN

Record who carries out the maintenance work on the tree, for example:

- In-house maintenance staff
- Contractor A
- Contractor B

Specify as: Free text

(M:5.9 C:6.2 R:5.3 A:6.1)

4.1.7 PREVIOUS MAINTENANCE

Record the maintenance previously carried out on the tree, for example:

- Fertilisation
- Coppicing
- Crown stabilisation
- Trunk clearance
- Irrigation

Specify as: Free text

(M:6.4 C:4.4 R:6.9 A:7.9)

4.1.8 FREE TEXT DESCRIBING TREE MAINTENANCE

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Structural pruning
- Crown stabilisation
- Crown reduction
- Year of procurement of crown stabilisation, and brand and type

Specify as: Free text

(M:7.4 C:3.3 R:9.4 A:9.7)

4.2 REQUIREMENTS AND TIME FACTORS FOR MAINTENANCE AND REMEDIAL MEASURES

4.2.1 NEED FOR A TREE GUARD

Record whether there is a need for a tree guard and the type of guard that should be used in that case, for example:

- No need
- Vehicle buffer
- Fence
- Trunk guard
- Binding
- Warning signs

Specify as: Free text

(M:6.7 C:4.1 R:8.3 A:7.6)

4.2.2 NEED FOR A NEW PLANT BED

Record whether the tree needs a new plant bed in order to correct or prevent regressive development.

Specify as: Free text

(M:7.2 C:6.5 R:7.0 A:8.2)

4.2.3 PROPOSED REMEDIAL MEASURES

Proposed remedial measures are recorded in a separate free text box, but it is strongly recommended that this consists of ticking a series of prepared descriptions.

Remedial measure	**Description**	**Example**
Pruning back from fixed object	The tree needs to be pruned since it is already, or will be, in conflict with a fixed object.	Road signs, lamp posts, walls of buildings.
Irrigation requirement	Record whether the tree has an irrigation requirement and the type of irrigation equipment recommended in that case.	Drip irrigation or irrigation with a tanker.
Trimming/suckers	Removal or brushwood, suckers or other type of superficial growth from the tree.	Brushwood on limes.
Felling	The tree needs to be felled.	Trees standing very close to a road.
Felling and replacement	The tree needs to be felled and replaced with a new tree.	Tree in parkland.
Fertilisation requirement	Record whether there is a fertilisation requirement for the tree and the type of fertiliser recommended in that case. The decision must be based on a total analysis of the soil, including pH, soil type and current nutrient status.	NPK
Consultation requirement	Further investigation is needed in order to allow a correct assessment.	Tree with potential fungal attack, suspected damage up in the crown.
Crown reduction	The crown needs to be reduced through pruning. This applies to all or part of the crown for reason other than pruning back from a fixed object.	Tree with ingrown bark, possibly with cracks forming.
Crown stabilisation	The crown needs to be stabilised with cables, struts or other form of stabilising measure.	Tree with ingrown bark, possibly with cracks forming.
Mulching	Record whether there is a need to apply mulch in order to improve the growing site of the tree.	Mulch under the tree crown.

Root barrier	There is a need for a root barrier to prevent root growth.	Geotextile to decrease the risk of root intrusion into sewage pipes.
Stabilisation	Record whether there is a need for any type of stabilisation.	Tree support to stabilise the tree.
Site improvement	Some form of soil improvement measure is recommended to improve the site conditions for tree growth.	Removal of surface pavement, soil loosening, fertilisation, etc.
Safety pruning	The tree needs to be pruned for safety reasons.	Dead branches overhanging the road or cycle path. Branches with cracks forming.
Removal of concrete grids	The tree is already damaged or risks being damaged by a concrete grid. Alternatively, the tree has affected the concrete grid so that this poses a maintenance or safety problem.	The tree roots have lifted the concrete grid or the grid is growing into the trunk or roots.
Remove dead branches	Removal of any dead branches.	Dead branches overhanging cycle path or road.
Remove tree support	The tree support should be removed.	The tree support has no function, risks damaging or has damaged the tree.
Structural pruning	Structural pruning is necessary so that the tree can develop in a good way.	Removal of double tops, ingrowth of bark or lifting of crown.
Lightning conductor	The tree needs to have a lightning conductor installed.	Tree especially worthy of conservation on open site.
Other, specify	Any other remedial measures needed.	Any other remedial measure.

Specify as: Free text

(M:8.3 C:8.3 R:7.6 A:9.2)

4.2.4 RECOMMENDED TIMING OF REMEDIAL MEASURE

Record the recommended timing of the remedial measure:

1. None (longer time than 5 years)
2. Future (within 5 years)
3. Soon (within 3-6 months)
4. Acute (within 0-2 weeks)

Specify as: 1-4

(M:7.9 C:8.0 R:7.0 A:8.8)

4.2.5 RECOMMENDED TIMING OF REMEDIAL MEASURE (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

If the Swedish Environmental Protection Agency's timing categories for remedial measures are used, the following times apply:

1. None
2. Future (> 10 years)
3. Soon (within 3-10 years)
4. Acute (within 2 years)

Specify as: 1-4

(M:4.5 C:3.6 R:3.8 A:6.2)

4.2.6 ESTIMATED COST OF REMEDIAL MEASURES

Record the total cost of the proposed remedial measures.

Specify as: Dollars/Euros/Pounds per tree

(M:4.4 C:5.8 R:3.6 A:3.9)

4.2.7 FREE TEXT DESCRIBING MAINTENANCE AND REMEDIAL MEASURES

Free text box where the person carrying out the inventory can record comments in continuous text. The prepared statements proposed for this specific area are:

- Fauna depot
- The tree needs to be moved
- Tree sculpture
- More precise time factor

Specify as: Free text

(M:6.8 C:3.5 R:9.4 A:7.6)

5. DATABASE METADATA

5.1 IDENTIFICATION AND SURROUNDINGS

5.1.1 TREE-ID

PROPOSED STANDARD PARAMETER

Unique number for every tree

Specify as: Unique number

(M:9.2 C:7.8 R:10,0 A:9.8)

5.1.2 AUTHORITY/OWNER

Record the authority in charge or owner of the tree, for example:

- Buildings department
- Streets department
- Church
- Parks department
- Private

Specify as: Free text

(M:8.1 C:7.7 R:8.1 A:8.6)

5.1.3 LOCAL NAME

Record the name of the location in which the tree is standing. This information makes it easy to find the tree within a certain area, for example:

- North park
- South park
- East park
- West park

Specify as: Free text

(M:7.4 C:6.3 R:7.9 A:8.2)

5.1.4 TYPE OF AREA

Record the type of area in which the tree is standing, for example:

- Residential area, single occupancy houses
- Street environment
- Industrial area
- Commercial area
- Churchyard
- Residential area, multi-occupancy houses
- Park
- Rural environment

Specify as: Free text

(M:4.7 C:2.1 R:5.6 A:6.3)

5.1.5 ROAD TYPE

If the tree is standing close to a road, record the class of road in question, for example:

- Street
- Foot-/cycle path
- Road
- Motorway

Specify as: free text

(M:5.9 C:2.9 R:7.7 A:7.2)

5.1.6 DISTANCE FROM TREE TO VEHICLE TRAFFIC

Record the distance from the tree to the nearest road or parking space.

Specify as: Metres

(M:6.1 C:3.3 R:7.4 A:7.6)

5.1.7 TRAFFIC INTENSITY

Record number of vehicles per day on the road nearest to the tree.

Specify as: Whole numbers

(M:4.0 C:2.3 R:5.3 A:4.6)

5.2 FREE TEXT DESCRIBING IDENTIFICATION AND SURROUNDINGS

Free text box where the person carrying out the inventory can record comments in continuous text. For example if the tree previously belonged to another area.

Specify as: Free text

(M:6.5 C:2.8 R:9.1 A:7.6)

5.3 INVENTORY DATA

5.3.1 DATE OF DECISION ON INVENTORY

Record the date on which a decision was made to carry out the inventory.

Specify as: YYYY-MM-DD

(M:4.4 C:4.1 R:3.9 A:5.1)

5.3.2 AIM OF THE INVENTORY

Record the aim of the inventory, for example:

- Species inventory
- Base inventory
- Climate resource inventory
- Maintenance planning
- Safety inventory
- Economic evaluation of trees
- Decision support

Specify as: Free text.

(M:5.2 C:3.9 R:5.3 A:6.4)

5.3.3 AIM OF THE INVENTORY (SWEDISH ENVIRONMENTAL PROTECTION AGENCY)

Record the aim of the inventory according to the Swedish Environmental Protection Agency's classification.

- Base inventory Natura 2000
- Individual findings
- Environmental assessment
- Regional inventory
- Maintenance plan, conservation plan
- Monitoring of Natura 2000
- Remedial programme
- Other

Specify as: Free text

(M:3.8 C:2.8 R:2.4 A:6.1)

5.3.4 DATE OF REGISTRATION

Record the date on which the tree was first registered in the database.

Specify as: YYYY-MM-DD

(M:8.1 C:8.3 R:9.9 A:6.2)

5.3.5 REGISTERED BY

Record the full name of the person who registered the tree in the database for the first time.

Specify as: First name Surname

(M:7.0 C:5.5 R:9.3 A:6.2)

5.3.6 DATE OF FIRST INVENTORY

Record the date on which the tree was first inventoried.

Specify as: YYYY-MM-DD

(M:7.7 C:6.6 R:10,0 A:6.4)

5.3.7 PERSON WHO CARRIED OUT THE FIRST INVENTORY

Record the full name of the person who inventoried the tree for the first time.

Specify as: First name Surname

(M:6.8 C:5.9 R:9.0 A:5.7)

5.3.8 DATE OF LATEST INVENTORY

Record the date on which the tree was last inventoried.

Specify as: YYYY-MM-DD

(M:9.0 C:9.0 R:10,0 A:7.9)

5.3.9 PERSON WHO CARRIED OUT THE LATEST INVENTORY

Record the full name of the person who carried out the latest inventory of the tree.

Specify as: First name Surname

(M:7.7 C:6.9 R:9.1 A:7.0)

5.3.10 PROFESSIONAL TITLE OF THE PERSON WHO CARRIED OUT THE LATEST INVENTORY

Record the relevant qualifications of the person who carried out the inventory at the time of inventory. For example:

- Arborist
- Arboriculture student
- Biologist
- Biology student
- Landscape architect
- Landscape architecture student
- Landscape construction engineer
- Landscape construction student

Specify as: Free text

(M:4.1 C:3.9 R:3.8 A:4.6)

5.3.11 DATE OF NEXT PLANNED INVENTORY

Record the date when the next inventory should be carried out.

Specify as: YYYY-MM-DD

(M:6.4 C:5.6 R:6.6 A:7.1)

5.3.12 DATE OF DATABASE UPDATING

Record the date on which the information in the database is changed, in other words not the date of inventory if these are not done on the same day.

Specify as: YYYY-MM-DD

(M:8.2 C:8.0 R:9.3 A:7.3)

5.3.13 PERSON WHO UPDATED THE DATABASE

Record the full name of the person who carried out the latest update of the database.

Specify as: First name Surname

(M:6.4 C:5.4 R:7.9 A:6.0)

5.3.14 TYPE OF INVENTORY

Record the way in which the inventory was carried out visually or technically, for example with a resistograph.

Specify as: Free text

(M:7.2 C:5.6 R:8.0 A:8.1)

5.3.15 FREE TEXT FOR INFORMATION ON THE INVENTORY

Free text box where the person carrying out the inventory can record comments in continuous text. For example weather or special conditions during the inventory.

Specify as: Free text

(M:6.9 C:3.3 R:9.4 A:7.9)

5.4 TREE REMOVAL

5.4.1 DATE OF REMOVAL

Record the date on which the tree was removed.

Specify as: YYYY-MM-DD

(M:6.9 C:7.6 R:6.3 A:6.8)

5.4.2 REASON FOR REMOVAL

Record the reason for removing the tree, for example:

- Construction work
- New development
- Dead, lack of water
- Dead, disease
- Dead, vandalism
- Dead, other
- Risk tree

Specify as: Free text

(M:8.5 C:8.0 R:9.1 A:8.2)

5.4.3 AGE CHECK ON REMOVAL

Check and record the age of the tree at the time of removal.

Specify as: Actual age in years

(M:5.2 C:4.1 R:4.1 A:7.2)

6. DOCUMENTATION OF MANAGEMENT

6.1 NEW PLANTING

6.1.1 DATE OF PLANTING

Record the date on which the tree was planted.

Specify as: YYYY-MM-DD

(M:8.6 C:8.1 R:9.3 A:8.4)

6.1.2 PLANTING SEASON

Record the planting season using one of the following categories:

1. January-March
2. April-June
3. July-September
4. October-December

Specify as: 1-4

(M:5.0 C:4.9 R:4.1 A:6.0)

6.1.3 COST OF THE TREE

Record the procurement costs for the tree, including for example transport, planting and upkeep costs.

Specify as: Dollars/Euros/Pounds

(M:4.2 C:3.3 R:3.7 A:5.6)

6.1.4 PLANT NURSERY

Record the name of the plant nursery that supplied the tree.

Specify as: Free text

(M:6.9 C:6.1 R:6.7 A:8.0)

6.1.5 TRUNK SIZE AT PLANTING

Record trunk circumference 1 metre above the ground.

Specify as: Standard values, for example 18-20 cm

(M:8.7 C:8.9 R:8.4 A:8.7)

6.1.6 PRODUCTION METHOD

Record the production method used for the tree, for example:

- Bare rooted
- Root ball
- RCB (Root Control Bag)
- Spring-ring

Specify as: Free text.

(M:6.8 C:5.4 R:6.7 A:8.4)

6.1.7 PLANTING CONTRACTOR

Record the name of the contractor that carried out planting. Where appropriate, record the main contractor and subcontractor.

Specify as: Name of contractor

(M:7.2 C:7.8 R:6.0 A:7.8)

6.1.8 PLANTING BED FOR NEW PLANTING

Record the planting method used, for example:

- Skeleton soil according to AMA 10, DCL.131
- Skeleton soil according to AMA 10, DCL.132
- Superplanting bed

Specify as: Free text

(M:8.4 C:8.4 R:8.7 A:8.0)

6.1.9 SOIL COVER USED AT NEW PLANTING

Record whether, and in such case the type, of soil cover used when the tree was newly planted, for example:

- Bark mulch
- Other type of mulch
- Wood chips
- Geotextile
- Gravel
- Compost
- No soil cover used

Specify as: Free text

(M:7.1 C:6.4 R:7.3 A:7.6)

6.1.10 IRRIGATION DURING THE ESTABLISHMENT PHASE

Record how often and how much water the tree received as irrigation during the establishment phase, for example:

- 40 litres 2 times/week

Specify as: Free text

(M:7.0 C:5.1 R:8.4 A:7.6)

6.1.11 MONITORING OF IRRIGATION REQUIREMENT DURING THE ESTABLISHMENT PHASE

Record how the irrigation requirement was monitored during the establishment phase, for example:

- No monitoring
- No data
- Soil moisture meter
- Site visit
- Protocol
- Other method

Specify as: Free text

(M:5.7 C:4.4 R:6.4 A:6.4)

6.1.12 TREE SUPPORT

Record whether the tree has a support.

Specify as: Yes/No

(M:6.4 C:4.9 R:6.6 A:7.9)

6.1.13 CHECK OF TREE SUPPORT

Record when the tree support was last checked.

Specify as: YYYY-MM-DD

(M:6.3 C:4.3 R:7.0 A:7.6)

6.1.14 PRUNING AT ESTABLISHMENT

Record whether the tree was pruned at establishment.

Specify as: Yes/No

(M:7.4 C:5.5 R:7.6 A:9.1)

6.1.15 FREE TEXT REGARDING NEW PLANTING

Free text box where the person carrying out the inventory can record statements in continuous text. For example, damage to the tree on delivery.

Specify as: Free text

(M:7.4 C:3.5 R:9.1 A:9.4)

REFERENCES

Swedish Environmental Protection Agency [Naturvårdsverket] (2009). *Inventory of Trees with High Conservation Value in the Cultivated Landscape* [Inventering av skyddsvärda träd i kulturlandskapet]. Accessed from: http://www.naturvardsverket.se/upload/02_tillstandet_i_miljon/Miljoovervakning/undersokn_typ/landskap/skyddsvarda_trad.pdf. 2012-03-19 (in Swedish)

Randrup, T.B. (2005). Development of a Danish model for plant appraisal. *Journal of Arboriculture* 31(3), 114-123

Roloff A. (2001). *Tree crowns: insight and practical meaning of a complex natural phenomenon* [Baumkronen. Verständnis und praktische Bedeutung eines komplexen Naturphänomens]. Verlag Eugen Ulmer, Stuttgart, (in German).

Sörensson, M. (2008). *AHA – a simple method for evaluating conservation priorities of trees in South Swedish parks and urban areas from an entomo-saproxylic viewpoint* [AHA – en enkel metod för prioritering av vedentomologiska naturvärden hos träd i sydsvenska park- och kulturmiljöer]. Entomologisk Tidskrift 129 (2): 81-90. Uppsala, (in Swedish)