

## Bartlett Inventory Solutions (BIS) Tree Inventory & Management Plan Data Collection Attributes, Descriptions and Options

If you are considering having a tree inventory conducted on your property, one of the most important steps is to determine what information will be collected for each tree or for the site (Figure 1). What information is to be collected and how it is to be presented are what drive the entire inventory process.

The Bartlett Inventory Solutions (BIS) team can work with you to determine this information and help guide you through the entire inventory process from start to finish. There are many categories of information that can be recorded for a tree, and the most common are presented in this technical report. Keep in mind that data to be collected is not limited to the items on this list, however, the data that is to be collected must be known before field work begins on-site.

**Figure 1: Bartlett Inventory Solutions uses Trimble® 24-channel GPS receivers to collect location and attribute information in the field**



### Recommended Field Data Attributes and Descriptions

<b>Data Field</b>	<b>Description/Options</b>
Botanical Name	According to local ISA chapter Tree Species list
Common Name	According to local ISA chapter Tree Species list
Tree ID Number	Sequential Numbering
Diameter at Breast Height (DBH) (4.5' above grade), or Caliper (12" above grade)	Inches (Centimeters) Record up to 6 largest stems
Number of Stems	Record total number of stems

Continues

Recommended Field Data Attributes and Descriptions (Continued)

<b>Data Field</b>	<b>Description/Options</b>
Condition Class	Dead Poor – Most of the canopy is affected with dieback, undesirable leaf color, leaf size and new growth. Parts of the tree are in the process of failure. Fair – Parts of the canopy has undesirable leaf color, leaf size and new growth. Tree or parts of the tree are likely to fail. Good – Tree health and condition is acceptable.
Plant Part of Concern	Branches Crown Roots Stem
Primary Target	Building, Lighting, Parking, Sidewalk, Walking Path, etc.
Secondary Target	Building, Lighting, Parking, Sidewalk, Walking Path, etc.
Likelihood of Failure*	Imminent Probable Possible Improbable
Likelihood of Impacting a Target*	High Medium Low Very Low
Consequences of Failure*	Severe Significant Minor Negligible
Overall Risk Rating* (Ranks the relative degree of risk for prioritizing remedial treatments when managing large tree populations)	Extreme – Failure imminent and there is a high likelihood of impacting a target. High – Mitigation measures should be taken. Moderate – Mitigation and/or retaining and monitoring may be recommended. Low – Some trees with this level of risk may benefit from mitigation or maintenance measures, but immediate action is not usually required.

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\* These fields are based on the ISA Best Management Practices for Tree Risk Assessment and ANSI standard A300 (Part 9)-2011 Tree Risk Assessment a. Tree Structure Assessment.

Recommended Field Data Attributes and Descriptions (Continued)

<b>Data Field</b>	<b>Description/Options</b>
Advanced Assessments Needed	Crown Roots Stem
Risk Mitigation Priority	Priority 1 Priority 2 Priority 3
Risk Mitigation Recommendation	Clean, Raise, Reduce, Thin, Remove, Structural, Cable, Brace Rod, Ground Support
Risk Related Root Collar Excavation (RCX)	Excavation of dirt/mulch from around the stem/root flare.
Risk Related Defect/Observation	Cavity, Co-dominant Stems, Crack, Fungi/Conks, Girdling Roots, Sidewalk Lifting, etc.
Risk Related Pest/Disease	Borers, Suspected Phytophthora Canker/Root Rot, Vines, etc.

Additional Tree Characteristics, Attributes & Descriptions

There are many optional tree attributes that can be recorded during data collection that are in addition to the recommended attributes. The following sections outline several types of additional information. However, it is very important to know that with the addition of attributes to be recorded in the field, the amount of time spent per tree and for the entire inventory will increase. In some instances, these additional attributes can add significant time to the tree inventory time estimate.

<b>Data Field</b>	<b>Description/Options</b>
Age Class	New Planting – A tree that is not yet established. Young – Established tree that has not been in the landscape for many years. Semi-mature – Established tree that has not yet reached full growth potential. Mature – A tree within its full growth potential. Over-mature – A tree that is declining or beginning to decline due to its age.
Canopy Radius	Feet (Meters) - Estimate from stem to drip line of canopy
Dedicated	It will be noted if the tree has a dedication and the dedication description will be recorded.

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Additional Tree Characteristics, Attributes & Descriptions (Continued)

Data Field	Description/Options
Defect/Observation	Cavity, Co-dominant stems, Crack, Fungi/Conks, Girdling Roots, Sidewalk Lifting, etc.
Estimated Value (Based on a modified version of the Trunk Formula Method; does not consider cost of purchase and installation of the largest available "like tree.")	Size (DBH) x Species Factor (Determined by local ISA chapter) x Condition Factor x Location Factor
Height Class	Small – <15' (<5 meters) Medium – 15' - 40' (5 -12 meters) Large – >40' (>12 meters)
Height	Feet (Meters) – Measurement from ground to top of tree
Location Type	Foundation, Median, Open, Street Tree, Well
Location Value (An average rating for the site and the tree's contribution and placement)	Excellent Good Fair Poor Unacceptable
Mulch Needed	Mulch is recommended to help improve soil conditions.
Overhead Lines	Within the tree canopy Within 10' of the tree canopy
Pest/Disease	Borers, Leaf Spot, Mites, Phytophthora, Scale, Vines, etc.
Root Zone Infringement (Based on dripline; estimated grayscape impact on root zone)	<25% 25%-50% 51%-75% >75%
Significant Tree (A notation can be made in the field to identify significant trees and designate them according to a certain classification.)	Artistic Tree Champion Tree Class Tree Feature Tree Historical Tree Tour Tree

## Tree Maintenance Attributes & Descriptions

Data Field	Description/Options
Tree Care Priority	<p>Priority 1 – To be addressed in years 1 or 2 of the management cycle. Priority 1 may include trees with large dead wood, structural defects, located in exposed sites, high aesthetic value, and/or parts that are currently negatively interacting with infrastructure, such as branches that touch buildings, interfere with signage or lighting, or obstruct pathways.</p> <p>Priority 2 – To be addressed in years 2 or 3 of the management cycle. Priority 2 may include trees with small dead wood, developing structural defects, located in semi-exposed sites, moderate esthetic value, and/or parts that are anticipated to negatively interact with infrastructure, such as branches that touch buildings, interfere with signage or lighting, or obstruct pathways.</p> <p>Priority 3 – To be addressed in year 3 of the management cycle. Priority 3 may include trees with small dead wood, developing structural defects, located in lesser used sites, and/or parts that are anticipated to negatively interact with infrastructure, such as branches that rub on buildings, interfere with signage or lighting, or obstruct pathways.</p> <p>Priority 4 – To be addressed in year 4 of the management cycle. Used for longer management cycles where some Priority 3 recommendations may be noted as a Priority 4.</p> <p>Priority 5 – To be addressed in year 5 of the management cycle. Used for longer management cycles where some Priority 3 and 4 recommendations may be noted as a Priority 5.</p>
Clean	Selective pruning to remove one or more of the following parts: dead, diseased, and/or broken branches.
Clean Size	0.5” 1” 2” 4”
Thin	Selective pruning to reduce density of live branches.
Thin Percent	5% 10% 15% 20%
Raise	Selective pruning to provide vertical clearance.

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### Tree Maintenance Attributes & Descriptions (Continued)

<b>Data Field</b>	<b>Description/Options</b>
Raise Height	Total height the tree's canopy should be raised to (14', 22', etc.). Height to raise the tree canopy for clearance (5', 10', etc.).
Raise From	Bench, Building, Driveway, Street, Wall, etc.
Reduce	Selective pruning to reduce height and/or spread.
Reduce From	Branch weight, Building, Light, Street, Wall, etc.
Structural	Selective pruning to improve tree structure.
Removal	Remove Wildlife Snag
Lightning Protection (LP)	New Inspect Repair
Plant Health Care (PHC)	Adelgid Treatment, Bark Beetle Treatment, Borer Treatment, Dutch Elm Disease Treatment (DED), Mite Treatment, Scale Treatment, etc.
Root Collar Excavation (RCX)	Excavation of dirt/mulch from around the stem/root flare.
Soil Care	Root Invigoration™ – Perform Bartlett's patented Root Invigoration™ to improve aeration and promote more efficient root growth, especially for high-value trees in disturbed areas.  Soil Rx® – Following lab test results from soil sampling, implement Bartlett's Soil Rx® program, which is a prescription fertilization program, to balance soil chemistry and optimize conditions for plant growth.  Micronutrient – Micronutrient deficiency observed and recommended for management.

### Address Information & Tree Pictures

Address information can be recorded for a tree, if applicable. In instances where specific address information cannot be determined, the approximate location can be recorded. Pictures can also be taken during the inventory to illustrate examples of pests, defects, dedicated trees, etc. Please note, where address information or pictures are required for every tree, these will add significant time to the field data collection portion of the inventory.

<b>Data Field</b>	<b>Description/Options</b>
Address	House/Building address which may include the Street Name, City, State, Postal Code, etc.
Pictures	Pictures can be taken of defects, pests, conditions, or memorial trees/plaques

## Custom Fields

Depending on client needs, additional information may be requested to be collected in the field that is not represented in this technical report. The Bartlett Inventory Solutions team considers these “custom fields” and can accommodate almost any information or field that is requested. The team can work with the client to determine the required fields and all information/options that would be needed. A few examples are provided below.

<b>Data Field</b>	<b>Description/Options</b>
Bird Nest Present	It can be noted if a bird nest is present.
Invasive Species	The tree is a noted invasive species in the area.
Native Species	It can be noted if the tree is native to the area/state.
Parasitic Plant	It can be noted if there is a parasitic plant present on the tree.
Maintenance Level	If the client has maintenance levels designated for the campus/area, which level the tree is in can be recorded.

## i-Tree Analyses & Assessments to Estimate Environmental Services

Environmental services information and results can also be provided with a Bartlett Inventory Solutions inventory and management plan, using the i-Tree software suite developed in-part by the USDA Forest Service. The tool that is used in conjunction with field data collection is i-Tree Eco. i-Tree Eco is used to assess entire urban forest areas (parks, residences, large areas, campuses), including street tree populations, to help quantify the environmental services being provided. Depending on how the information will be used, i-Tree Eco can significantly increase the total field time required to complete the inventory. i-Tree Eco can be conducted on a complete (all trees) or sample (certain trees or areas) basis.

<b>Data Field</b>	<b>Description/Options</b>
i-Tree Eco	Measurements that may be recorded in the field: Species, DBH, Total Tree Height, Live Top, Crown Base, Crown Width N/S and E/W, Percent Crown Missing, and Percent Crown Dieback.

Results from i-Tree Eco analyses can include: carbon storage, carbon sequestration, air pollution removal, leaf area/biomass, oxygen production, avoided runoff, reduction in health incidences, etc.

The i-Tree software suite also offers several tools that can be used remotely, where no field data collection is required. The Bartlett Inventory Solutions team is able to conduct these remote assessments from the office using the i-Tree software, aerial imagery, and details provided by the client. The results from the assessments are then compiled and presented in a complete assessment report. These remote i-Tree assessments can be conducted in conjunction with a Bartlett Inventory Solutions tree inventory, or independently.

The three remote assessments that Bartlett Inventory Solutions can conduct are listed below.

<b>Data Field</b>	<b>Description/Options</b>
i-Tree Canopy	Used to assess large areas (cities, towns, counties, large campuses, etc.) and provide estimates of the benefits that the tree population in that area is providing. The software can also be used to help estimate the percentage of different land cover types within the given area.
i-Tree Design	Used to assist in selecting a tree species and its planting location in relation to a given structure. The software estimates, or predicts, the future benefits that the planted tree will provide over a given period of time.
i-Tree Species	Used to provide lists of suitable tree species based on site location (plant hardiness zone) and the client's needs such as trees that are well suited to remove air pollutants or storing carbon.

### Additional Features That Can Be Inventoried & Designated

There are several features, besides trees, that can be inventoried and/or designated during the course of the inventory and management plan creation processes. Depending on the situation, for example pending construction projects, it is important to provide additional information (critical root and tree protection zones) to help the client manage the trees during these activities. Examples of additional features that can be inventoried and/or designated are provided below.

<b>Data Field</b>	<b>Description/Options</b>
Bird Box	Bird boxes present.
CAD Reference Point	Locations can be recorded to serve as reference points when using the inventory in AutoCAD.
Critical Root Zone	Critical root zones can be calculated and denoted as an area around the tree.
Hedge	Tree/Plant hedges can be recorded and denoted as lines.
Management Area	Areas for specific management such as vegetation, invasive species, etc.
Maintenance Zone	Specific maintenance areas on campus determined by their location.
Planting Space	Small – Small maturing tree (<15' in height). Medium – Medium maturing tree (15-40' in height). Large – Large maturing tree (>40' in height).
Tree Protection Zone	Tree protection zones can be calculated and denoted as an area around the tree.
Tree Stump	Small Medium Large



## Bartlett Inventory Solutions Management Plan

The Bartlett Inventory Solutions team examines and evaluates (quality assurance) all data that is collected in the field to make sure it is as accurate as possible. After the quality assurance check has been completed, the team works to create all the associated maps (overlain on aerial imagery), tables, and summaries with the use of GIS programs and our web-based management program, ArborScope™. All data and information is then collated into an in-depth, descriptive, and easy to understand management plan. The management plan will also include examples/pictures from the field and Bartlett Tree Research Laboratories Technical Reports to try and further our client's knowledge and help educate them about issues/concerns on their property.

There are numerous ways that the inventory information can be provided to the client. Examples of common deliverables are provided below.

- Printed copy of the management plan (2 copies can be provided)
- PDF version of the management plan
- Shapefile with all field data represented
- Geodatabase
- Excel spreadsheets
- Access database
- AutoCAD files (.dwg, .dxf; this request must be made before data collection starts)
- Various file types (.csv, .mdb, .dbf, .txt, etc.)

It may be possible to import existing customer data into the Bartlett Inventory. A copy of any useful existing data must be made available prior to data collection to ensure the data are compatible with our inventory information and deliverables.

Bartlett Inventory Solutions is also able to present the information collected in the field in other layouts besides a full management plan. Depending on the information collected, these could be an Executive Summary, Summary Report, Tree Risk Assessment Report, i-Tree Analysis or Assessment Report, etc.

### ArborScope™

ArborScope™ ([arborscope.com](http://arborscope.com)) is our web-based tree inventory and management program. ArborScope™ is the latest in sustainable, high-tech landscape management software that allows tree managers to



systematically track and plan for tree maintenance needs. The program allows for customization of each inventory and gives the client complete control over their data and access to their data. Inventories and data will be overlaid on Google™ Maps and the program will provide a simple and efficient means to view, update, and query any collected information. Information can be displayed in map, table, standard or custom report views.

Please contact the Bartlett Inventory Solutions team at 704-588-1150 or your local Bartlett Arborist Representative to find out more information or to schedule a conference call or webinar presentation.

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**Founded in 1926, The Bartlett Tree Research Laboratories is the research wing of Bartlett Tree Experts. Scientists here develop guidelines for all of the Company's services. The Lab also houses a state-of-the-art plant diagnostic clinic and provides vital technical support to Bartlett arborists and field staff for the benefit of our clients.**

