

## Brief Explanation of and Uses for i-Tree Eco Reports

### Charts:

**Number of Trees by Land Use** – This report contains two graphs and one table. A bar graph depicts the estimated number of trees for each land use category within the project. A pie chart depicts the percentage of trees in each land use category. A table shows the number and percentage of trees by land use category.

Uses – This shows where most of the trees are located in the community. Note: if some land use categories are larger in area than others, then they may have more trees simply because the land use area is larger. It may be better to look at Tree Density by Land Use to see the proportional number of trees by a standardized area (acre or hectare).

**Tree Density by Land Use** – This report contains one bar graph and one table. A bar graph depicts the estimated number of trees per a unit of area (acre or hectare) as well as the density of trees for the entire project area (city, county, region). A table numerically shows the density of trees by land use category as well as for the entire project area.

Uses – This information allows you to compare the standardized amount of trees growing in each land use category. Note: high tree densities may occur in land-uses, like vacant areas, that encompass a small portion of the city's total area.

**Leaf Area by Land Use** - This report contains two graphs and one table. A bar graph depicts the estimated amount of leaf surface area for each land use category within the project. A pie chart depicts the percentage of leaf area estimated to be in each land use category. A table numerically shows the amount and percentage of leaf surface area by land use category.

Uses – Leaf area is what provides most of the environmental services. The greater the leaf area a tree has the greater the shade that is provided, the greater the carbon that is sequestered, the greater the amount air pollution that is removed, and the greater the amount of storm-water that is intercepted. This report shows where all of the leaf area is located in the community. Caution: if one or more of the land use categories is much larger than the others, then they will naturally have more leaf area in them. It may be better to look at Leaf Area Density by Land Use to see the amount of leaf area by a unit area (acre or hectare).

**Leaf Area Density by Land Use** - This report contains one bar graph and one table. A bar graph depicts the estimated amount of leaf area per a unit of area (acre or hectare) as well as the density of leaf area for the entire project area (city, county, region). A table numerically shows the density of leaf area by land use category as well as for the entire project area.

Uses – This information allows you to compare the amount of leaf area in each land use category. It can give some indication as to the relative amount of benefits that are being provided by trees in that land use category.

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**Origin of Live Trees, Percent by Land Use** – This report contains one bar graph and one table.

A bar graph depicts the percentage of the tree population that is native to your state, continent, or hemisphere. It also depicts the percentage of the tree population that is native to some other continent. This information is broken-down by land use area as well as for the entire project area.

Uses – This information gives you some idea as to the percentage of native versus non-native species that make up your urban forest. If you have a large percentage of non-native species, you may want to consider developing recommended tree planting lists or an educational program to encourage land-owners to plant native species.

**Carbon Storage by Land Use** - This report contains two graphs and one table. A bar graph depicts the calculated amount of elemental carbon that is stored in trees for each land use category within the project. A pie chart depicts the percentage of elemental carbon calculated to be in each land use category. A table numerically shows the amount and percentage of elemental carbon that is stored in trees by land use category.

Uses – Through the process of photosynthesis, trees remove carbon dioxide from the atmosphere and store the carbon in their wood and leaves throughout their lives. This report shows where all of the carbon that is being stored in trees is located in the community. Caution: if one or more of the land use categories is much larger than the others, then they will naturally have more trees in them and, depending on the size of those trees, may have a greater amount of stored carbon. It may be better to look at Carbon Storage Density by Land Use to see the amount of carbon stored in trees on an area basis (acre or hectare).

**Carbon Storage Density by Land Use** - This report contains one bar graph and one table. A bar graph depicts the calculated amount of elemental carbon stored in trees on a per unit of area basis (acre or hectare) as well as the density of carbon storage for the entire project area (city, county, region). A table numerically shows the calculated amount of elemental carbon stored in trees by land use category and for the entire project area.

Uses – This information allows you to compare the calculated amounts of carbon as stored in trees in each land use category. Larger trees store large amounts of carbon for many years both above and below ground. One example of how to use this report is if your community is interested in reducing its carbon footprint, this report can help you to plan for future development strategies. If you have a land use category that is storing a large amount of carbon, you may want to consider restricting activities that could remove that carbon so as to retain the carbon storage capacity.

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**Annual Carbon Sequestration by land use** – This report contains one bar graph and one table. A bar graph depicts the calculated gross and net amount of elemental carbon that is sequestered in trees for each land use category within the project on an annual basis. A table numerically shows the numerical value of elemental carbon that is sequestered in trees by land use category annually. Growth and mortality rates of different land-uses are accounted for.

Uses – Through the process of photosynthesis, trees sequester carbon dioxide from the atmosphere and store the carbon in their wood and leaves. Sequestration is based on tree size, growth rate, and tree condition. This report quantifies the elemental carbon that is being sequestered by trees by land use type. Caution: if one or more of the land use categories is much larger than the others, then they will naturally have more trees in them and, depending on the size of those trees, may have a greater amount of carbon sequestration. It may be better to look at Carbon Sequestration Density by Land Use to see the amount of carbon being sequestered by trees on an area basis (acre or hectare). Carbon offset markets use CO<sub>2</sub> rather than C. To quantify the amount of carbon being sequestered as units of CO<sub>2</sub> rather than units of elemental carbon; take the value in the table for each land use area and multiply it by 3.67 (the molecular weight of CO<sub>2</sub>).

**Carbon Sequestration Density by Land Use** - This report contains one bar graph and one table. A bar graph depicts the calculated amount of elemental carbon sequestered by trees on a per unit of area basis (acre or hectare) as well as the density of carbon sequestration for the entire project area (city, county, region). A table numerically shows the calculated amount of elemental carbon sequestered by trees by land use category and for the entire project area.

Uses – This information allows you to compare the calculated amounts of carbon sequestered by trees in each land use category. One example of how to use this report is if your community is interested in reducing its carbon footprint, this report can help you to plan for future development strategies. If you have a land use category that is sequestering a large amount of carbon, you may want to consider preserving existing trees in that land use area so as to not disrupt the carbon sequestering ability.

**Monthly Pollutant removal by Trees and Shrubs** - This report contains one graph and one table. A graph depicts the calculated amount of carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter less than 10 microns; such as soot (PM<sub>10</sub>), and sulfur dioxide (SO<sub>2</sub>) removed by tree and shrub leaf area by month. The amount of leaf area, pollution concentration and the leaf off periods are considered. A table numerically shows the calculated amount of pollutant removed by trees by month.

Uses – Shows the pollution removal ability of the existing tree and shrub leaf area over a year. This information could then be used to help develop an air quality attainment plan for the EPA.

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## Brief Explanation of and Uses for i-Tree Eco Reports

### Tables:

**Percent of Tree Species Population by Land Use and DBH** – This table gives percentages of each species in a particular diameter size class within each land use area. The species in each land use category are sorted from most predominant to least predominant. For each land use category, a total percentage of all trees by diameter size class is also given.

Uses – Can determine the amount and size of specific species in each land-use area. This is useful for determining if you need to change (increase plantings or removals) or preserve (protection ordinances) trees in certain areas of your cities. Particularly good to identify areas of management concern such as having an over-mature population of a weak-wooded species. This may facilitate targeting education efforts to the residents or businesses living in that land use area regarding the need for removal of that species of a certain diameter class (or health rating) and replanting with a more appropriate species.

**Percent of Tree Species Population by DBH** – This table gives percentages of each species in a particular diameter size class for the entire area of interest. The species are sorted from most predominant to least predominant.

Uses – Can determine the amount and size of specific species in the project area. See uses for Percent of Tree Species Population by Land Use and DBH above.

**Percent of Condition for Trees by Land Use** - This table gives percentages of each species in a particular crown condition class within each land use area. The species in each land use category are sorted from most predominant to least predominant. For each land use category, a total percentage of all trees by crown condition class is also given. The condition classes are E (<1% crown dieback), G (1-10% dieback), F (11-25% dieback), P (26-50% dieback), C (51-75% dieback), D (76-99% dieback), and K (100% dieback).

Uses – This table can help determine which species are doing well in a particular land use category or how well all the trees in a land use area are doing as a whole. If a particular species has more trees in the higher dieback category for a particular land use area, then decisions about the use of that species in that land use area can be more easily made. This information could also help a manager quickly see if biotic factors (i.e. emerald ash borer) are possible causes. Note- this only measures crown condition and does not account for tree stem and root condition.

**Percent of DBH and Condition Classes for Trees by Land Use** - This table gives percentages of each species' crown condition class by diameter size class within each land use area. The species in each land use category are sorted from most predominant to least predominant. For each land use category, a total percentage of all trees by crown condition class is also given. The condition classes are E (<1% crown dieback), G (1-10% dieback), F (11-25% dieback), P (26-50% dieback), C (51-75% dieback), D (76-99% dieback), and K (100% dieback).

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Uses – This table can help determine which species by diameter size class are doing well or doing poorly in a particular land use category. The table also allows one to see which diameter class is doing poorly as a whole. The information in this table could also help a manager determine those species that are perhaps over-mature or are experiencing some other stressors at a particular size class.

**Percent of Trees by Condition Class** - This table gives percentages of each species in a particular crown condition class. The species are sorted from most predominant to least predominant in the entire project. The condition classes are E (<1% crown dieback), G (1-10% dieback), F (11-25% dieback), P (26-50% dieback), C (51-75% dieback), D (76-99% dieback), and K (100% dieback).

Uses – This table gives a cursory look at the condition of each species and can help a manager quickly determine which species are doing well or doing poorly. It is recommended that one view **Percent of Condition for Trees by Land Use** and **Percent of DBH and Condition Classes for Trees by Land Use** to get a more detailed look at each species.

**Origin of Live Trees, Percent by Land Use** - This table gives, by land use area, the percentage of the tree population that is native or exotic to the project area.

Uses – A manager can quickly assess the origin of the urban forest in each stratum and determine if policy is needed to encourage the planting of native species.

**Susceptibility of Trees to {Gypsy Moth, Asian Long Horned Beetle, Emerald Ash Borer, Dutch Elm Disease} by Land Use** – This report is a series of four tables quantifying the percentage of leaf area, the cumulative leaf area, number of trees, and total monetary value of the forest in each stratum as well as the entire project area that is susceptible, resistant, and immune to that biotic pest.

Uses – With this report a manager can assess potential urban forest losses due to biotic factors and begin to plan to mitigate these potential losses.

**Percent of Predicted Land Use in Actual Land Use** – When collecting plot data in Eco, field crews record what the actual land use of each plot is. Many times it differs from the land cover type. For example, in a forested land cover type the actual land use for a plot may be residential. This report shows by percentage how each stratum is actually being used.

Uses – This report shows trends in how the land is being used overall. A manager would expect to see a forested land use type be comprised predominantly of vacant or wetlands, however, if it is comprised of something other than these, then the manager may want to consider re-stratifying the project. This information may also be useful as is to demonstrate to planners/policy-makers land use changes.

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**Species Diversity Indices** – This table summarizes the area comprised by the different land-uses/strata, the total area and number of trees sampled, and the total number of living tree species in each stratum and on a per hectare basis. The Shannon, Menhinick, Simpson, Evenness and Rarefaction diversity indices are also provided.

Uses- This table can be used to quickly determine the total number of trees sampled in your project area as well as the numbers of tree species in each strata and the project area in both total numbers and on a per unit area basis. It also provides the total number of plots and the total area that was actually sampled in each strata. Managers can use this to determine the total number of species in your project area and identify areas of high and low tree diversity in your project; the number of species found per unit area (SPP/HA) is particularly useful for this. The Simpson and Menhinick diversity indices can be used to compare and assess tree diversity among strata. Generally, the greater the number, the greater is the diversity. The Shannon, Evenness and Rarefaction indices are sensitive to sample size so their use for management decisions is not recommended.

**Percent Ground Cover by land use** - When collecting plot data in Eco, field crews record the percentage of each ground cover type such as asphalt, cement, grass, etc. as well as the percentage of the plot that is covered by tree and shrub canopy. An estimate of tree plantable space is also determined. This report shows the percentage of ground cover types as well as canopy cover and plantable space for each stratum and area of interest collectively.

Uses – This report shows trends in pervious versus impervious surface cover for each stratum and collective area of interest. The sum of percentages for cement, asphalt, and building determine imperviousness while the sum of duff/mulch, herbs, grass, wild grass, and water determine pervious surface coverage. Bare soil and rock are intermediate between pervious and impervious. The tree percentage estimates can be used to help set or assess tree canopy goals. The percent plantable space can help a manager determine stocking levels. The amount of impervious surface can often be used to assess stormwater problem areas. This information may also be useful as is to demonstrate to planners/policy-makers land use changes.

**Total estimates for trees by species** - This table gives estimated values for the number of trees, stored carbon, gross and net carbon sequestration per year, leaf area, leaf biomass, and monetary value of all species inventoried in the entire area of interest. The species are sorted from most predominant to least predominant.

Uses – This table can be used to give an overall view of the urban forest structure, function, and value for the entire area of interest.

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**Total estimates for trees by land use** - This table gives estimated values for the number of trees, stored carbon, gross and net carbon sequestration per year, leaf area, leaf biomass, and monetary value of all species inventoried in each stratum. The species are sorted from most predominant to least predominant.

Uses – This table can be used to give a more specific view of the urban forest structure, function, and value for each stratum as a whole or by species.

**Leaf area and biomass for trees by DBH and land use** – This table estimates the leaf surface area and leaf biomass for each species inventoried in each stratum by size class. Total leaf surface area and leaf biomass for the stratum as a whole is also provided. The species are sorted from most predominant to least predominant.

Uses – Leaf area and leaf biomass are what provide environmental services. Generally, larger trees provide greater leaf area and biomass. This report can be used to help a manager determine the amount of leaf area and biomass each stratum has, which species are providing those services, and in which size class the majority of those services are being provided. This can help a manager plan for the urban forest’s sustainability.

**Leaf area and biomass for shrubs by land use** – This table estimates the total leaf surface area and leaf biomass for each shrub species inventoried in each stratum as well as leaf area and biomass density. Total leaf surface area and leaf biomass for the stratum as a whole is also provided. The species are sorted from most predominant to least predominant.

Uses – Shrub leaf area and leaf biomass also provide environmental services. This report can help a manager demonstrate the importance that vegetation plays in providing services to the community; the greater the leaf area and biomass the greater the amount of benefits.

**Leaf area and biomass for trees and shrubs by land use** – This table estimates the total leaf surface area and leaf biomass for each species (trees and shrubs) inventoried in each stratum as well as leaf area and biomass density. Total leaf surface area and leaf biomass for the entire stratum is also provided. The species are sorted from most predominant to least predominant.

Uses – This report can help a manager demonstrate the importance that vegetation plays in providing services to the community; the greater the leaf area and biomass the greater the amount of environmental services.

**Per area estimates for trees** - This table gives estimates for the density of trees, stored carbon, leaf area, leaf biomass, and monetary value of all species inventoried in each stratum. The species are sorted from most predominant to least predominant. Densities are also given for the entire stratum.

Uses – Because these estimates are reported on a per unit area, this report can be used to compare urban forest structure and benefits among strata.

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**Energy Effects** – These tables show how trees affect heating and cooling energy consumption for residential houses and the compensatory value associated with it. Negative values denote that the trees in the area of interest have a negative affect or cost the community money. The table also estimates the amount of carbon that is avoided by reduced electricity production due to shading.

Uses – This report can help a manager demonstrate the monetary importance that trees play in providing services to the community.

**Pollution Removal** – These tables estimate the amount of air pollution removed by the urban forest collectively by month and the monetary value associated with it.

Uses – This report can help a manager demonstrate the monetary importance that trees and shrubs play in providing services to the community.

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