Rapid Assessment of the Economic benefits provided by BGANZ garden tree collections.

Background

BGANZ is considering assessing the economic benefits our gardens provide to communities and our economy. Given that our gardens hold large and significant tree collections, and that the profession of modern arboriculture has developed skills and tools to quantify (often in dollar value)the many benefits trees confer to society, The BGANZ Arboriculture Professional Group (BARB) is proposing that a tool called *i-Tree Canopy* be used by member gardens to carry out a rapid assessment of benefits such as carbon sequestration, that our trees provide. If enough member gardens participate, the BARB Committee will be able to collate the results to provide an approximate dollar value of some of the benefits our trees provide, and as a result, BGANZ will be able to better advocate for our gardens, and our amazing trees.

i-Tree Canopy rapid assessment

"i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban and rural forestry analysis and benefits assessment tools". It is used by tree managers all over the globe.

For more information on i-Tree, go to this link: https://www.itreetools.org/

Rapid, easy desktop assessment that can be done over lunch!

An overview of how i-Tree works can be found at their website along with simple video resources on how to carry out the assessment, here: https://canopy.itreetools.org/

Assessment limitations

i-Tree Canopy is limited in its assessment by the lack of specific Australian climate and benefit data however, there is New Zealand data set up within the tool, and BARB have consulted with the i-Tree team and been advised that the tool can be used to some level of accuracy by Australian tree managers by using NZ, or American cities with analogous climates to the Australian locations of our gardens.

It is also important to note that the assessment is a canopy assessment, and whilst the calculations in the tool may account for tree size, health and age, the results should be considered a baseline as they may not yet account for Australian tree species, soil types, or other factors such as tree vitality.

How-to guide: Consistent method & set up of assessment to ensure rigour for our BGANZ/BARB assessment.

To ensure consistency and rigour of our assessment, we ask that you follow these key guidelines when carrying out your assessment

Step 1

- Choose an assessor that knows your garden and locations of trees – the Google Images can be low resolution and trees and other objects may not always be easily discernible
- Where possible, draw or use shapefiles of the site boundary excluding large natural areas/naturally occurring woodlands etc. We don't want the inclusion of large tracts of naturally occurring vegetation to skew outcomes. If you'd like, you can always do a second assessment and include those areas.

Figure 1 Example of draw site boundaries for Blue Mountains BG excluding natural areas.

Step 2

- Set the land cover class as the basic Land Cover default. Don't' change anything. There is an option to set to tree/non-tree, but the final outcomes will be more accurate with the additional cover classes.

Step 3

Regional Settings

- For New Zealand gardens, select your location from the New Zealand drop-down list
- For Australian gardens, either:
    - Use New Zealand locations with analogous climates, this will set the carbon price $/t as close to the newly announced Australian "Shadow Price" of $70/t or;
    - Use a US location with an analogous climate AND similar carbon price/t

Finding analogous climate locations

- For Australian capital city gardens and large centres, you may be able to find global analogues here: https://www.nationalgeographic.com/magazine/graphics/see-how-your-citys-climate-might-change-by-2070-feature
  https://www.climatechangeinaustralia.gov.au/en/projections-tools/climate-analogues/analogues-explorer/
- For smaller regional gardens, it might be a little trickier. Just consider:
    - Climate data – avg. rainfall, temp, minimum/maximum temperatures etc.
    - altitude
    - population
    - pollution contributors e.g. urban v rural, nearby industry
- and use this climate classification map http://www.bom.gov.au/climate/maps/averages/climate-classification/
- and Global map here https://www.noaa.gov/jetstream/global/climate-zones/jetstream-max-addition-k-ppen-geiger-climate-subdivisions

Note on Carbon price

Australia has recently announced it will be setting a 'Shadow Price" for carbon/t. of $70/t. This indicates the likelihood of policy to adopt this in the near future, and is used by the commission responsible for setting carbon prices as a base $ figure for carbon capture benefits in their decision making.

Selecting the NZ region set a price in AUD of ~$66.97/t. This should be adequate for our purpose.

Set currency value to AUD.

Set measurement unit

Set the ‘Measurement’ units to ‘metric’

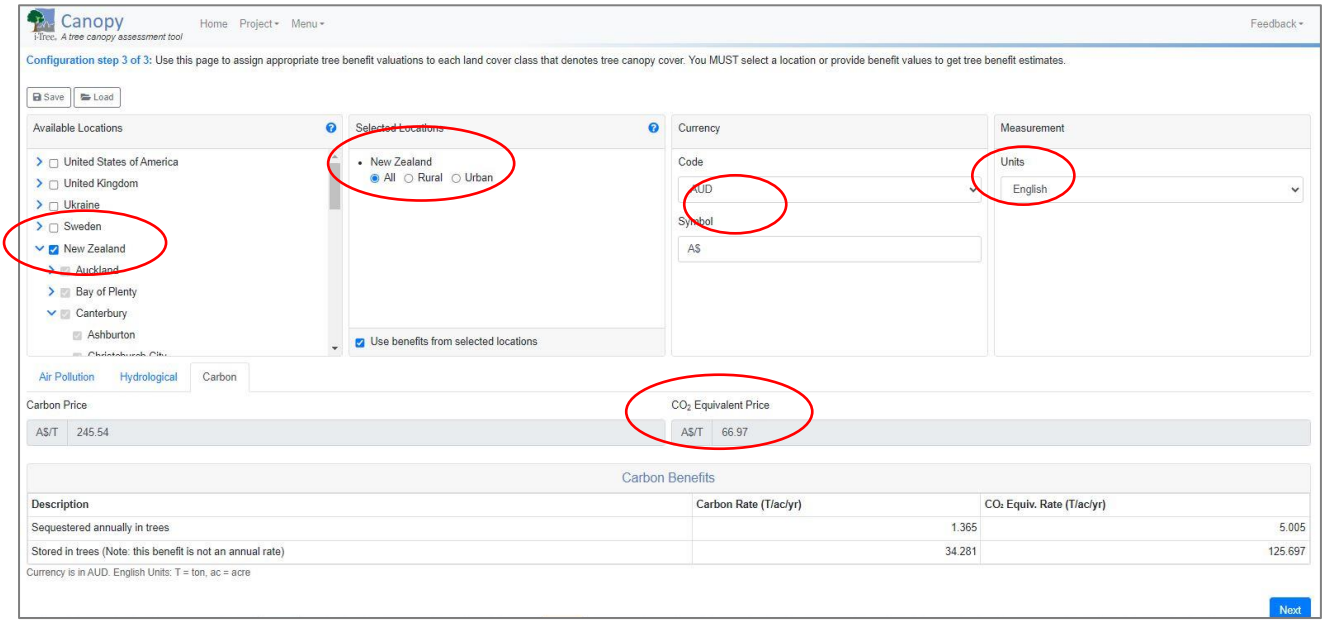


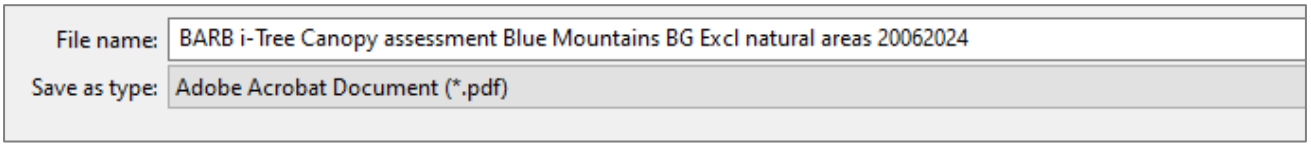
Figure 2 Step 3 regional settings. Note NZ selected, Currency set to AUD, Carbon price $66.97, change measurement to Metric

Step 4 Carry out the assessment

- please carry out at least 500 samples. The more the better!
- Save routinely along the way, and file the saved file somewhere you can access it to reload it if you don’t finish the assessment in one sitting, or if you need to change the settings at a later date

Step 5 Run the report

- Select Print from the “Report” tab in the top left of screen > set print Destination to “Save as PDF”
- Title the file with your garden name the following protocol:
- BARB iTree Canopy assessment [insert your BG name] [insert date ddmmyyyy]



Step 6 Send the completed report to BARB

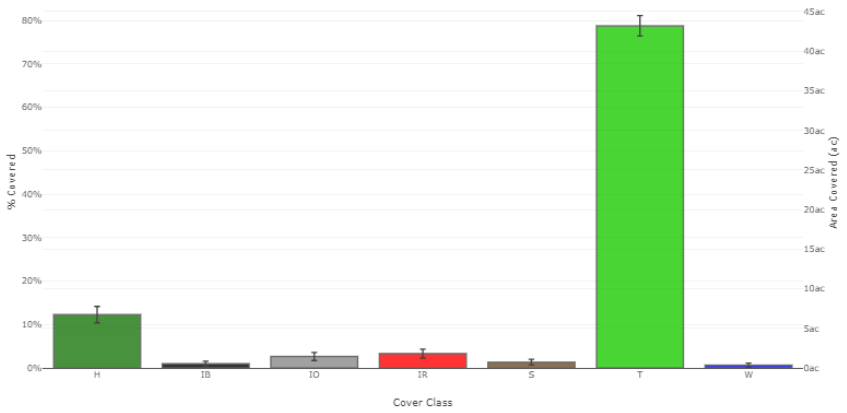
- Send the completed pdf copy of the report to ian.allan@botanicgardens.nsw.gov.au

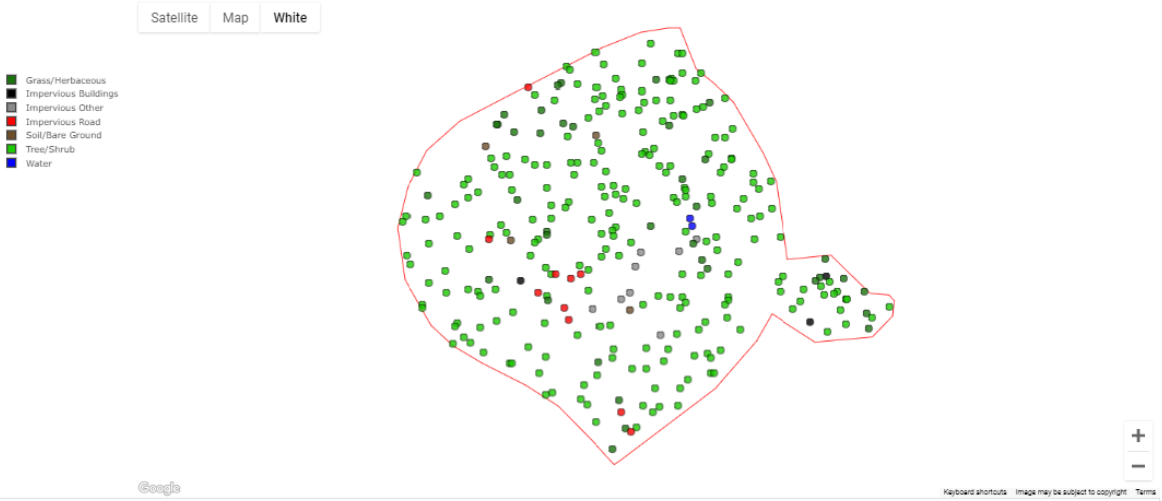
Example of completed report

i-Tree Canopy

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 6/20/2024





Abbr.	Cover Class	Description	Points	% Cover ± SE	Area (ac) ± SE
H	Grass/Herbaceous		37	12.29 ± 1.89	6.74 ± 1.04
IB	Impervious Buildings		3	1.00 ± 0.58	0.55 ± 0.32
IO	Impervious Other		8	2.66 ± 0.94	1.46 ± 0.52
IR	Impervious Road		10	3.32 ± 1.03	1.82 ± 0.57
S	Soil/Bare Ground		4	1.33 ± 0.66	0.73 ± 0.36
T	Tree/Shrub		237	78.74 ± 2.36	43.20 ± 1.29
W	Water		2	0.66 ± 0.47	0.36 ± 0.26
Total			**301**	**100.00**	**54.86**

Tree Benefit Estimates: Carbon (English units)

Description	Carbon (T)	±SE	CO_2 Equiv. (T)	±SE	Value (AUD)	±SE
Sequestered annually in trees	58.96	±1.77	216.20	±6.48	14,478 A$	±434
Stored in trees (Note: this benefit is not an annual rate)	1,480.80	±44.35	5,429.60	±162.63	363,597 A$	±10,891

Currency is in AUD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Amount sequestered is based on 1.365 T of Carbon, or 5.005 T of CO_2, per ac/yr and rounded. Amount stored is based on 34.281 T of Carbon, or 125.697 T of CO_2, per ac and rounded. Value (AUD) is based on 245.54 A$/T of Carbon, or 66.97 A$/T of CO_2 and rounded. (English units: T = tons (2,000 pounds), ac = acres)

Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (oz)	±SE	Value (AUD)	±SE
CO	Carbon Monoxide removed annually	0.66	±0.02	0 A$	±0
NO2	Nitrogen Dioxide removed annually	5,958.13	±178.46	4 A$	±0
O3	Ozone removed annually	15,718.64	±470.81	70 A$	±2
SO2	Sulfur Dioxide removed annually	3,151.47	±94.39	0 A$	±0
PM2.5	Particulate Matter less than 2.5 microns removed annually	2,540.56	±76.10	345 A$	±10
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	8,190.35	±245.32	4,875 A$	±146
Total		**35,559.81**	**±1,065.10**	**5,294 A$**	**±159**

Currency is in AUD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in oz/ac/yr @ A$/oz/yr and rounded:
CO 0.015 @ 0.10 A$ | NO2 137.933 @ 0.00 A$ | O3 363.893 @ 0.00 A$ | SO2 72.958 @ 0.00 A$ | PM2.5 58.815 @ 0.14 A$ | PM10* 189.610 @ 0.60 A$ (English units: oz = ounces, ac = acres)

Tree Benefit Estimates: Hydrological (English units)

Abbr.	Benefit	Amount (Kgal)	±SE	Value (AUD)	±SE
AVRO	Avoided Runoff	67.62	±2.03	873 A$	±26
E	Evaporation	4,540.71	±136.01	N/A	N/A
I	Interception	4,542.36	±136.05	N/A	N/A
T	Transpiration	2,636.45	±78.97	N/A	N/A
PE	Potential Evaporation	20,219.15	±605.61	N/A	N/A
PET	Potential Evapotranspiration	14,998.82	±449.25	N/A	N/A

Currency is in AUD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Hydrological Estimates are based on these values in Kgal/ac/yr @ A$/Kgal/yr and rounded:
AVRO 1.565 @ 12.92 A$ | E 105.119 @ N/A | I 105.158 @ N/A | T 61.035 @ N/A | PE 468.082 @ N/A | PET 347.229 @ N/A (English units: Kgal = thousands of gallons, ac = acres)

About i-Tree Canopy
The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton, and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company)
Limitations of i-Tree Canopy
The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

Additional support provided by: