Tree Planting Opportunity Mapping

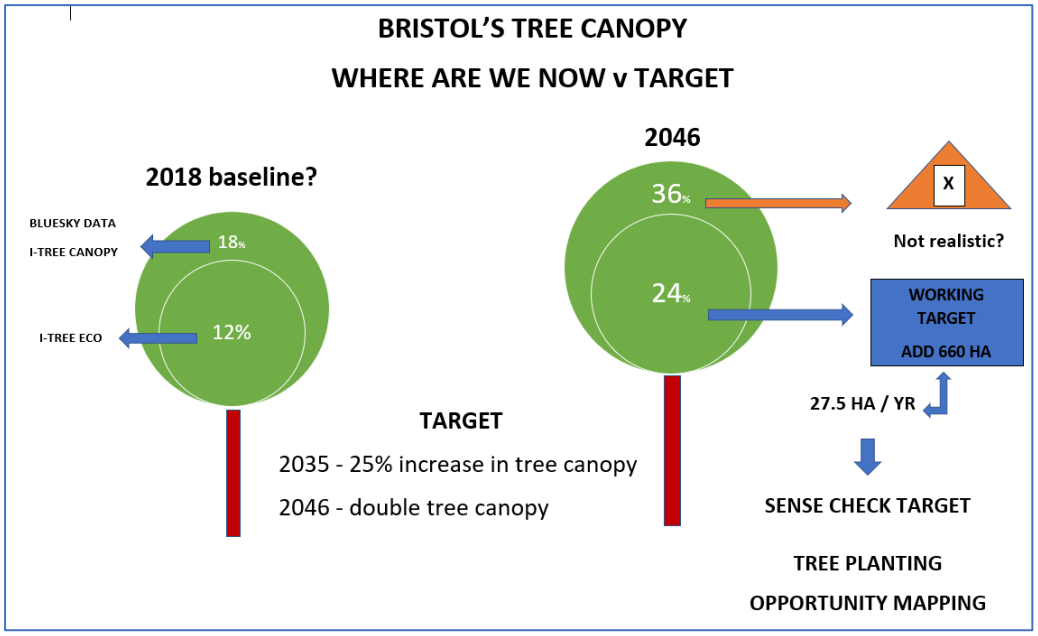
Version: 3/11/2022

In February 2022, Cabinet supported the development of a Bristol Tree Strategy and a Tree Planting Plan. The tree planting plan will be an adjunct to the tree strategy.

A two-stage approach is being applied to develop a tree planting plan for the city, firstly opportunity planting areas and secondly priority planting areas where additional trees would provide greater benefit.

Context

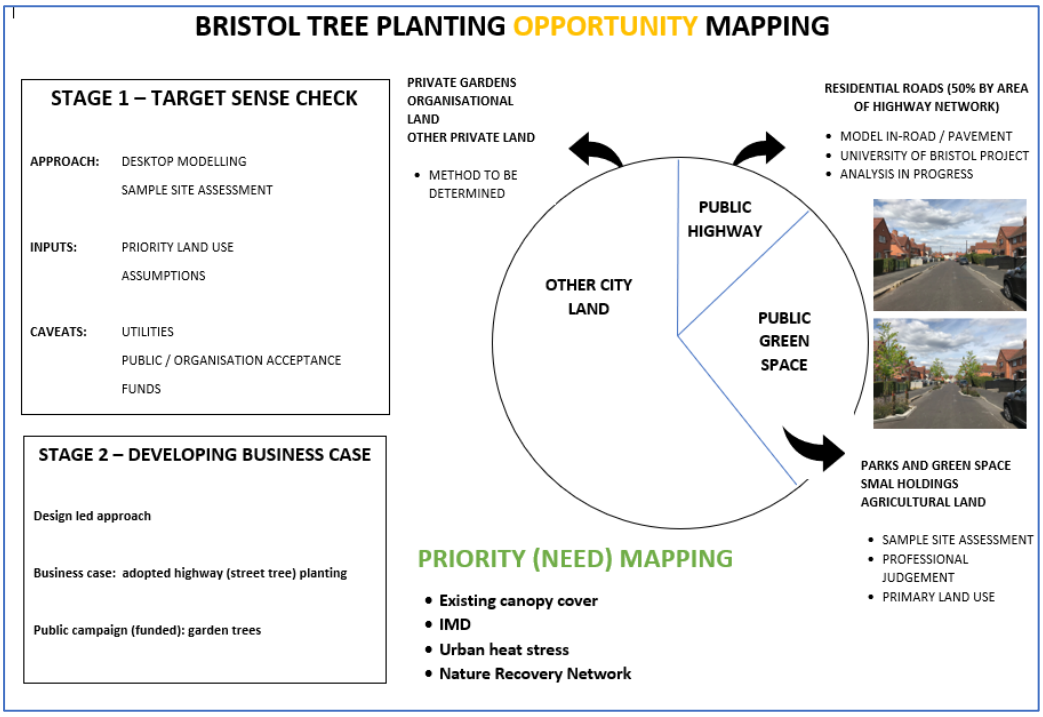
The One City Plan target is to increase Bristol's tree canopy by 25% by 2035 and double it by 2046 [from 2018 baseline]. The absolute baseline is not defined. It is likely that Bristol's baseline tree canopy is c. 18% (i-Tree Canopy and data supplied by Bluesky range from 17-18%, subject to statistical variance). However, because the doubling target was adopted on the understanding that canopy cover was c. 12%, a working target to add 660 hectares of tree canopy is being modelled – this would achieve overall 24% tree canopy [see BCC cabinet report Published, page 531).



Scope:

All land within the boundary of Bristol is being consider for tree planting. The city has been divided into three broad realms:

- A: Public grey space (BCC managed highway network),
- B: Public green space (BCC managed parks, green space smallholdings and agricultural land
- C: Other city land (private gardens, organisational land)



IMD = Indices of multiple deprivation

Out of scope:

The assessment of tree planting potential is determinedly high level – intended more to 'sense check' the target to double tree canopy (interpreted as adding 660 hectares of tree canopy). At this stage, the analysis is not constrained by cost, prevalence of utility services (gas, water, electric, telecommunication) or public acceptance of planting at this scale. Work in parallel will explore these issues - including through more design-led review and development of a business case for the inevitable significant investment required.

Approach

Opportunity mapping is a combination of modelling and professional assessment of a random sample of sites.

The need (for trees) criteria will be applied from existing data sets. Criteria are being reviewed, but are likely to encompass social deprivation, existing tree cover, urban heat stress and proximity to the West of England Nature Recovery Network (to be refined to encompass a Bristol Ecological Network). Other criteria may be relevant to reflect mitigating effect of trees on air quality and flood risk.

A: Public Realm Grey Space (adopted highway – road and pavements)

In collaboration with the University of Bristol mapping work is underway to assess the potential to plant trees within the adopted highway. Results of this assessment are due by the end of November 2022.

Scope
Adopted highway unclassified / residential road network [the area represents 90% of the highway network] + adopted highway grass verges.

Work to model the potential for tree planting within the residential road network is novel and based on a method applied in Sydney, Australia.

Method

In agreement with colleagues in the Transport teams parameters have been agreed and data sets identified to model potential to plant trees in either pavements (where > 2m wide), or otherwise in the road (on the assumption that each tree would occupy c. 1/3 of a parking space). Space within the residential road network unsuitable for tree planting have been identified and excluded – e.g., not within 5 m of a junction, where double yellow lines, dropped kerbs, within 1 m of drain covers, on zebra crossing and within the zig zag lines. Not all data is comprehensive e.g., data held on dropped kerbs is out of date and incomplete. Some assumptions may be relaxed e.g, allowing tree planting closer to junctions – this may add more trees (and somewhat offset the inevitable loss of planting sites as more constraints are identified).

Existing tree cover data is available (via Bluesky) – this shows the extent of tree canopy from which % canopy for the area being reviewed.

The potential size of tree that can be accommodated sensibly in the street is calculated based on the assumption that the ultimate radius of the tree is ½ the distance between the trees planting spot and the adjacent property – as below:

to ensure that the selected tree does not become too large for the space -which would require regular pruning or pollarding to maintain the tree at a maximum size -that would be expensive and disruptive. This distance (d) typically ranges from c. 3m (where properties have no front gardens) to around 10 m where they do - with some degrees in-between. Assumed distances have been built into the model.

Output

A GIS layer (and map) to show the potential distribution (actual location) of trees within the adopted highway residential streets and highway grass verges. Report to summarises number of trees and potential tree canopy contribution.

Next steps

A stage II assessment will involve a 'ground truthing' review of a sample number of streets (likely stratified by character informed by epoch i.e., Victorian streets, mid-20th Century layouts etc). This review will define an 'optimisation' rate for the number of trees that likely could be planted from which to model cost and impact. It is expected that the first iteration model will significantly overestimate the potential to plant trees, as know constraints, such as dropped kerbs allowing off road parking is

not a reliable input data set, in addition to the 'out of scope' items identified above. A Stage II, design-led review, will encompass a more in-depth assessment of physical constraints including consideration of the location of underground services, as provided by the utilities. This design-led approach will conclude type and size of tree appropriate to plant and design layout -in accordance with BCC tree planting design guide (see Guide and Notes).

B: Public Realm Green Space

Work is being progressed through the Parks Development Team.

Scope
BCC publicly accessible parks and green space, smallholdings, agricultural land, school grounds.

Method

The assessment includes two elements:

A. Sample site assessment of the potential to add tree canopy (all forms of tree planting)
B. Managing for Nature criteria applied to parks typologies

Sample site assessment of the potential to add tree canopy

Stratify green space sites to reflect type and size (types include parks/ green space, small holdings, school grounds, agricultural land).

Arrange sites by size within strata. Select 'representative' sites within size groupings within strata.

Around 30 sites have been selected for review. The number of sites that can be assessed is limited by resources available, so the 30 sites will be progressed at random and progress reviewed.

Within sites selected: professional judgement of sample sites by Parks staff. Minimum 2, preferably 3 Parks Officers to assess a site independently and compare notes to form a consensus view – via discussion and adjustment. Two officers to be at least one officer from the Tree Team and ideally one officer from the Parks operation team.

Officers should know the site well or have the time to visit and assess in person. Each officer is asked to judge the potential to increase tree canopy by planting or natural regeneration, reflecting potential for additional woodland, group planting, open canopy planting (20% final canopy for an area), or scattered individual trees.

Where a site is a park or green space this will be described by typology (e.g., Natural Green Space, Informal Green Space, formal Sport space etc). Certain typologies generally preclude tree planting at any scale e.g., sport and formal. The observer will note the typologies present and project canopy potential within each type – which provides a whole site outline design – but allows analysis of potential tree planting within type for projections.

Participants are encouraged to make an ambitious, but not unfettered projection i.e., what is the best potential for additional tree canopy – reflecting the target to double tree canopy and deliver at least 30% of land managed for nature (ecological emergency strategy) but accounting for primary land use which may exclude tree planting or social use which may limit tree planting.

This projection will be scaled to encompass a 'more provocative' projection v a more modest projection. A provocative projection would e.g., propose tree planting at scale across most opportunity land v a modest projection that would scale this back to reflect the range of use and enjoyment – this is clearly subjective.

Principles for selecting suitability for tree planting to be provided (not planting on priority habitats, not planting where the existing primary land use should be protected (e.g., sport use), not planting where trees would interfere and be detrimental to the character and enjoyment of a site (accepting that doubling tree canopy does imply some challenge to the status quo and that a more treed environment may be a necessary change to deliver benefits not currently available).

The Managing for Nature criteria with mapped opportunity / priority planting areas available for review and adjustment according to professional judgement, as described below.

The assessment is 'single-issue' view – i.e., how to add trees to the site, not food growing or energy generation or some other potential land use. It may be argued by others that the same land should be used for these other purposes. The exercise is to identify potential to establish tree canopy. Criteria to identify need (priority) will be applied – and from this the relative merit of one land use over another will be more evident. In some cases, a co-benefit design is possible and may be preferred e.g., an agroforestry approach such as wood pasture habitat, which allows grazing and trees or an orchard or a more mosaic (more granular) design which incorporates trees and food growing in a distinct but complimentary way.

Given access and tenure issues of small holdings and agricultural land a desktop assessment will only be applied for these spaces. Whilst small holdings are likely to be in use for animal or crop production it may be that these spaces are more suited to habitat creation including tree planting, either in part or whole. This assessment is not a statement that they should be changed, rather it is a statement that they could be changed – if on balance that was agreed to be in the interest of the city reflecting policies and priorities. The same applies to agricultural land.

The assessment for potential to plant trees within selected school sites will be undertaken by TreeBristol officers reflecting extensive experience of working with schools through One Tree Per Child programme. With experience, a desk top review is expected to be sufficient.

<u>Managing for Nature criteria applied to parks typologies</u>

Areas of Natural Green Space and Informal Green Space typologies within the West of England Nature Recovery Network (NRN) area have been assigned a 'distinctiveness' score to identify the relative existing ecological value, ranging from 1-4. A score of 1 identified land as having a low ecological value, a score of 4

identifies land of high ecological value (typically core habitats). Score 1 is generally suitable for conversion to a different higher priority habitat or enhancement to a higher quality existing habitat. Score 2 and more so 3 suggests that the ecological priority action is to enhancement the existing habitat. Land outside the NRN has not been scored. For this land a distinctiveness score has been assigned using the existing land management regime as a proxy, with multiple cut grassland (amenity grass) broadly assigned a score of 1, whereas single cut / rough cut regime would justify a higher distinctiveness score of 2 or 3.

If within the WoE NRN (or Bristol Ecological Network), where land is score 1, if the NRN suggests that the priority habitat is woodland – then nominally this area would be identified as 'opportunity and priority for trees (planting or natural regeneration)

If outside the WoE NRN (or Bristol Ecological Network), where land is score 1 then this land would be identified as opportunity for trees and would be prioritised according to other criteria (low tree cover/ higher deprivation, higher risk urban heat stress).

Input data

Site map

- % tree cover and extent of tree cover (from data provided by Bluesky)
- Location, boundary and area.
- Relevant designations e.g., registered landscape, site of nature conservation etc.
- 'Distinctiveness' score 1-4
- Nature Recovery Network (NRN), specifically the potential and priority for tree planting to connect fragmented core habitat – work has already been done to review the potential for additional tree planting in parks / green space that are within the NRN -if these sites are included in the random sample this existing judgement will be available. There may still be additional potential to plant trees within the site as the NRN review was confined to informal and natural green space typologies.
- Agricultural land grade
  - Grade 1: 'Excellent' quality agricultural land with no or very minor limitations to agricultural use. ... and Grade 2: 'Very good' quality agricultural land with minor limitations that affect crop yield, cultivations or harvesting – are both assumed to be more valuable for food growing and the presumption therefore is against tree planting at any scale, but the officer can override that if on balance tree planting within these spaces is argued for other priorities e.g., to alleviate urban heat stress or to contribute to the Nature Recovery Network.

BCC Parks and Green space, the relevant typologies viz:

- Formal green space – unlikely to be much opportunity for additional tree planting
- Informal green space – good potential for additional tree planting

- Natural green space - good potential for additional tree planting – where existing habitat is either sub-optimal (ie reasonable to convert from scrub or grassland to woodland)
- Children's play space – some potential to add specimen trees (assumed) – area of formal children's play space is fairly small overall.
- Active sport space – assumed not suitable for tree planting

BCC owned Smallholdings

- As above (where relevant) + any information on the current land use – whether active food growing or not

BCC owned agricultural land

- As above (where relevant) + any information on the current land use – whether active food growing or not

Site considerations

The assessor should account for existing land use (designations, precluding primary land use) and social use of a site - from personal knowledge and /or from a site visit (if agreed / appropriate). Considering existing land use and relevance of tree canopy / habitat targets to the site, the officer should sketch area of potential tree planting (woodland, group, wood pasture (20% final canopy) or specimen). From this will be calculated a potential tree canopy for the site (and a % increase from that existing within the site). All projections will assume the mature tree canopy of planted trees.

Caveats

This is a fairly 'rough and ready' assessment – using professional judgement to give a more credible projection of the potential for additional tree planting. Excluded from the assessment is cost of planting (and maintenance), presence of below ground services and public support (or not) via consultation. In judging the potential for more tree planting the assessor should be wary of proposing, for example, a block of trees immediately to the rear of properties where this would block views and be overbearing, or where there is an informal football kick about space etc.

Output

This is a sample assessment of the potential for additional tree planting in a random sample of public green space. The data will predominantly be used to sense check the potential contribution to doubling tree canopy from additional planting in public realm green space i.e., to suggest that there is potential to add x ha of tree canopy projected against all public realm green space. Subject to statically valid stratification and sampling rate it would be is legitimate to project potential increase in tree canopy into similar sites, but without attempting to transfer any design considerations from the sample sites. However, projections into other sites should be treated with caution.

The overall conclusion will be a combination of the sample site assessment and Managing for Nature assessment.

Next steps

Need criteria (indices of deprivation, existing canopy cover, heat risk stress and Nature Recovery Network) can be lain over projected canopy increase potential from the sample of sites assessed.

More sites can be assessed using the same methodology to increase the number of sites where we have a view of the potential of that site for more tree planting. If done within the same statistical rigour ie random sample within strata adding sites will reduce the standard error in projecting results for the population (portfolio) of all public green space.

Design led assessments on a site-by-basis will be a basis for costing and consultation and progression to implementation.

C: Other city land (private gardens, organisational land)

In scope: private gardens and other organisational land. An outline approach and detailed methodology is to be developed. This is expected to include a desk-top modelling exercise based on agreed parameters. This element of the assessment requires more work.

Funding has been secured to via the Woodland Trust's Emergency Tree Fund to progress 'tree planting opportunity mapping' within each of the WoE Local Authorities, including Bristol. Discussions are ongoing with the Forest of Avon Trust, as grant recipient, to define priority work within Bristol.