

Blenheim Estate Natural Capital Assessment

Annex 3. How to update the assessment

1 Estate boundary check

- Check whether the Estate boundary has changed and if so, update it. Note: the boundary needs tidying up if possible; it does not match OSMM polygons. It is best to create boundary extensions by selecting all the OSMM polygons within the new area and then merging into the existing boundary, then dissolving to remove any overlaps.
- Merge the new boundary into the 'Blenheim_estate_and_park_boundaries' layer, set the description to 'Estate' and delete the old Estate boundary from this layer. This combined boundaries layer is needed by the spatial natural capital analysis script.
- To create a simplified version of the boundary that does not include bisecting roads and small excluded areas (for clearer display on maps) buffer the boundary by, for example, 100m and then trim it by buffering it again by minus this amount, e.g. -100m.

2 Land cover map update

- Update the underlying natural capital map of Oxfordshire to use the most recent OSMM, HLU, CROME and designation data. To update OSMM, download the relevant tiles for the most recent release. For Oxfordshire the tiles are as follows: SP45, 34-54, 23-63, 22-62, 21-61, 10-70, SU29-79, 28-78, 67-77. Unzip each tile into a single directory for that release. Create a new file geodatabase to hold the updated OSMM, and run OSMM_prep.py to copy the TopographicArea feature class for each tile to that geodatabase, merge into a single feature class and clip to the Oxfordshire boundary (change the names of the starting folder and the geodatabase in the code first). Purchase the updated HLU from TVERC, check it as described at the top of Merge_OSMM_HLU_Preprocess.py. Download the latest CROME data; join to the lookup table and dissolve by class. Download designation datasets if they have changed; purchase updated LWS and RVNR datasets from TVERC. Then run all stages of the natural capital map creation scripts.
- To update the groundtruthed polygons for Blenheim, you can start from the last stage before adding the natural capital scores, i.e. start with OSMM_HLU_CR_ALC_Des_GS_PA. Otherwise, to start from the completed natural capital map (NatCap_Oxon), hide all the score attributes so they are not copied across to the new dataset – otherwise SetUpScores.py may not work correctly.
- Clip this to the Estate boundary.
- Use 'identity' to combine this layer with the groundtruthed polygons. Then select polygons where there is an entry for ground truthing, i.e. 'GroundTruth <>'" and copy the 'corrected habitat' attribute to the 'Interpreted_habitat' attribute for those rows only.
- Determine whether any additional groundtruthing is needed by asking the Estate manager if any land use has changed, beyond that in the Natural Capital map. If more groundtruthing

corrections are needed, update the groundtruth and corrected habitat attributes for those polygons, extract both old and new groundtruthed rows and save to a new version of Groundtruthed_polygons ready for the next update.

- Export the groundtruthed dataset to a layer called 'Estate_habitats' in the Blenheim gdb.
- If you did not start from scratch to create a new habitat file, check a couple of temporary issues: generic 'Woodland' in HLU should be replaced with OSMM hab if appropriate, and HLU mapped as Unknown which is actually S41 possible priority grassland should be mapped as semi-natural grassland. These have been corrected for the first step of creating a new habitat file but will need to be checked if you are not starting from the beginning.
- Run 'Identity' with Blenheim_Park_Zones. Then select all the rows with empty Zones and set the Zone to "Estate".
- Update the Estate_Tenancies layer if necessary. If starting from an imported CAD file from the estate, hide all fields except the tenancy name, select only the rows with tenancy information and export to a new dataset. **Check for overlapping boundaries and duplicate polygons** - these need to be removed with union / delete identical shape / dissolve.
- Use 'Identity' to add the tenancy name to the habitat dataset.

3 Public access

Need to change access in Park as by default this is all mapped as open (from Orval parks) but actually public access in some parts is confined to footpaths; wider access should be marked as 'semi-restricted' as you have to pay to get in to the gardens.

1. Clip 'Paths_merge_buffer_sp' from Public_access.gdb to the Park boundaries (to make Paths_merge_buffer_sp_Park)
2. Edit the path in the SE of the park to remove the portion that is alongside the uncrossable wall between the park and road.
3. Run Identity on the Estate_habitats_zones_tenancies layer using Paths_merge_buffer_sp_Park.
4. Select 'natural features', paths and Zones in the park from the Estate_habitats_zones_tenancies_paths dataset:

Interpreted_habitat NOT IN ('Garden', 'Amenity_grassland') AND Make <>
'Manmade' AND PAType_1 ='Path' AND Zones <>'Estate'

5. Use Calculate Field to set AccessType to Path and AccessMult to 0.75.
6. Set the access type of the remaining Park polygons according to the zones. No access for northern fields and Woodlands (unless Path) or Out of bounds so set AccessType = "No access" and AccessMult = 0 for:

(Zones = 'Northern fields' OR Zones = 'Woodlands' OR Zones = 'Out of bounds') AND
AccessType <>'Path'

7. Leave AccessType = "Open" and AccessMult = 1 for monument, lakeside, car park and parkland
8. Set AccessType = 'Semi-restricted' and AccessMult = 0.75 for pleasure gardens, palace gardens and formal gardens.

4 Updating the natural capital scores and assets

- Run SetUpScoreTable.py, setting region to “Blenheim” and method to “HLU”, using Estate_habitats_Zones_Tenancies_Paths as input. This will add the natural capital scores and also a simple habitat definition.
- Clip out a new copy of NatCap_Park using the Park boundary. Run SpatialNatCapAnalysis.py on the new NatCap_Estate and NatCap_Park datasets to generate an inventory of the natural capital assets and scores.
- Copy the information in the output text files (Scores.txt and Assets.txt) to a new sheet the Excel analysis workbook, and then paste the values into the appropriate rows in the ‘Assets’ sheet. Paste the appropriate score values into the table at the bottom (paste values to a separate block then paste transpose into the table) and copy to the report summary table S1.
- Export NatCap_Estate to a spreadsheet. Copy this spreadsheet into the analysis workbook and call it ‘NatCap_Estate_date’, or paste over the existing nat cap sheet. This is the input for all the subsequent calculations. You can re-set the named range NatCap to refer to this new table to enable it to be used in the existing pivot tables – check and refresh the existing pivot tables.

Warning: For the following stages, the user needs to create or update a number of pivot tables and then paste data into the appropriate places, so the process is not fully automated. It is often easier to create a new pivot table from the new Estate data rather than trying to update the data range of an existing table, but the existing tables have usually been left as templates to copy. It is vital to check that all the calculations are updated to use the new data and are not still using old data pasted in previously.

5 Habitat inventory

- Create a pivot table from the estate data using Interpreted_habitat (rows) and Shape_Area sum (values) – or refresh the existing pivot.
- Paste in the pivot table habitat area data to the named range ‘estate_habs) at the top right of the Habitats sheet. If there are any new habitat categories you will need to create extra rows in the habitats table to the left, which looks up values from this pasted block. The habitat table and pie charts should update automatically when the new data is pasted in. Check that the total habitat area matches the input data. When pasting to the table in the report make sure the rows have not changed (currently open mosaic habitats (OMHD) is not displayed in the report table as it is zero, so paste the top and bottom parts of the table separately). Repeat for the Park data – filter out ‘Estate’ zone on the pivot table then paste the Park habitats into the Park_habitats named range on the Habitats sheet.
- Export the Estate_hedges and Park_hedges GIS layers to spreadsheets and use pivot table to get a breakdown of Form (hedge, tree canopy, wooded strip) for each area. Paste these values into the hedgerow table on the Habitats sheet. Enter the number of trees in the Estate and Park from the Assets output files from the spatial natural capital analysis into the table in the Habitats sheet.
- To generate the habitat maps display the following layers, and use the full copyright statement including OS, CROME, TVERC data and Woodland Trust. Don’t forget to change the map title when switching from Estate to Park. You will also need to move the legend to top right and make it single column for the Park. A scale of 1:60000 ? works for the Estate and 1:23000 for the Park.

- o Park boundary: 3 point black line
- o Simplified estate boundary: 1.2 point black line
- o Ancient and veteran trees (1 point dark green dots)
- o PROW, National trails and Sustrans offroad for Estate (all same symbol of 1.2 pt dashed green line but only add PROW to key)
- o Estate_hedges 1.2 pt solid green line
- o OS_rivers_Ox
- o PROW Ox 1pt dashed green line
- o NatCap_Estate_simple (same as NatCap_Estate but set to show the simple habitat symbology so that it does not generate too many habitats for the legend)
- o Hedges_Oxon: 50% transparent
- o NatCap_Oxon: 50% transparent

6 ALC

Create a pivot table (or update the data in the existing one to point to the new natural capital table) for Interpreted habitat and ALC grade (nested rows) and sum of Shape_Area (values), filtered by Interpreted habitat = Arable, Agricultural land, Improved grassland or Improved grassland with scattered scrub (see example in template). Paste the appropriate values into the ALC table that is used to generate the pie chart and the formatted table for the report.

7 Food

7.1 Crops

- Create a pivot table with a filter on Interpreted_habitat = Arable or Agricultural land; rows = Crome_desc, cols = Tenancies and cells = sum of area.
- Aggregate the tenancies for the different BFP and Green columns.
- Paste the appropriate values into the first table on the Crops sheet. Check that the row categories still match the second table – if the number of rows or the vegetation / crop categories change, you need to paste in the appropriate row labels and will need to check the links in the rest of the sheet if you are using any of the subsequent tables.
- Update the BFP Whole Farm Income calculation using the template that is based on the Farm Accounts.
- Scale the BFP whole farm income per ha by the total Estate arable area from the second table in the Crops sheet. We cannot currently use the area of different crops because although we have profit and yield data, we don't have costs per crop type.
- Obtain the values for estimated production of different crops and their total market value from the last table on the Crops sheet (Accounting). The tables in between were used to check assumptions and are not needed.

7.2 Grazed biomass

7.2.1 Estimate one, based on tonnes biomass per ha grassland.

- **Update the Estate_grazing layer:** select 'Simple_hab IN ('Improved grassland', 'Semi-natural grassland', 'Parkland with trees')' and export to a new Estate_grazing layer. Dissolve by

TOID, Interpreted habitat, and Simple_hab. Delete polygons under 50m² as these are either slivers or too small for grazing. Run Identity to add back in Zones.

- Export this layer to a spreadsheet and create a pivot table with rows simple_hab and columns zone. Paste that values from the pivot table into the Grazing_by_zone sheet and check that the named range grazing_by_zone still covers the whole table: if not, adjust the named range (Formulas). Check that the areas of grazed improved grassland and semi-natural grassland have been copied correctly into the table on the Grazing sheet. Copy the results to the table in the report.

7.2.2 Estimate two, based on livestock numbers and their feed requirement.

- Enter the numbers of livestock per Estate zone or habitat type into the table on the Grazing sheet and paste the output values into the report.

7.2.3 Combined estimate

- Enter the values into the report.

8 Carbon

- The table on the Carbon sheet is set up for Interpreted habitat. To summarise it according to the simpler definitions, set up a pivot table based on this table with simple habitat as rows and area, average c/ha and sum c (or refresh the existing carbon pivot table) and paste the values back into the right hand table on the carbon sheet.
- For years after 2020, the carbon price will need to be updated from the government website. Obtain the carbon price from the Green Book Supplementary Guidance Data Table 3 and convert it to the current year prices using the published GDP deflator.

9 Trees

- Download and install the latest version of iTree-Eco from their website, if necessary.
- Update the Ancient and Veteran Trees dataset. At present we use the Woodland Trust Ancient Tree Inventory for trees outside the High Park woodlands, but only the Estate's own veteran tree dataset for the trees in High Park. So delete the trees in High Park from the WT dataset then merge the two datasets.
- Check and clean the new tree data, correcting any obvious errors in species names, girth or location. Trees with missing species, girth and/or location can be included in the total number of trees reported but cannot be used in iTree unless default values can be reliably assumed.
- Add the Zone, Access_type and Interpreted_habitat from the natural capital layer to the consolidated tree dataset by setting these to be the only visible fields then using Identity to add these fields. Note that any trees with no location information (which seem to be assigned a location by the Palace; perhaps the geometric centre of the dataset?, though they do not show up on the map) will be excluded by the Identity operation. In Sept 2020 there were 77 such trees in the Blenheim dataset; they also had no girth measurement.
- Create or update fields in the consolidated tree dataset for latitude and longitude, using Calculate Geometry in decimal degrees. Export the tree dataset to a spreadsheet.
- Prepare the spreadsheet for input to iTree desktop, or use the data to update the existing input spreadsheet (Estate_trees_itree.xlsx). This will require consolidating data for the two tree datasets (Woodland Trust and Blenheim) into new columns for import to iTree, so you

may need to filter for each dataset and copy over separately. Location, dbh and species are mandatory – other parameters can be assumed if necessary. Columns needed:

- o User ID – use the tree number prefixed by “B” for the Blenheim estate database or “WT” for the Woodland Trust database.
- o Dbh: calculate from Girth ($\ast 100/\pi()$)
- o height at which dbh is measured is optional. We do not include it at present because it is not recorded for Blenheim. The default value is 1.3m.
- o iTree species. Ensure that this can be looked up from the table in the Lookups sheet. You may need to add new species or codes. Correct any errors in species or code spellings. See the species list in https://www.itreetools.org/documents/488/EcoSpeciesList_20July2018_esxmUKb.xlsx
- o Tree location. Longitude and Latitude as created in GIS and/or imported from the tree databases. Reject any trees with no location (though you could set an approximate central location if wanted).
- o Land Use. Determined using the habitat and zone: two intermediate columns (Park and Land use initial) are used in the template to convert this into the final land use. You may need to add new habitat fields to the lookup tables if necessary.
- o Comment – you can use this to record the habitat and zone.
- o Public_tree: set all trees to No because they are on private land. This does not determine public accessibility, only whether the trees are managed by a public authority. It is not used in the calculations, only for information in the inventory.
- o Status: we set all to Ingrowth (self-seeded) – though in fact many are probably Planted or we could enter Unknown. This is only for inventory purposes.
- o Street_tree: Yes or No. We set all to No for Blenheim.
- o Crown_condition records the percent crown cover (100% minus dieback or ‘dead wood in crown’) and the Crown Health automatically sets the associated health (excellent for 90-100% crown cover, down to Dead for 0%). The Blenheim dataset records the actual crown cover for many trees. For the Woodland Trust we assume 75% cover for living trees. When you import the percent cover into iTree the categories need to match their default values which are centre points of 5% ranges, i.e. 2, 7, 12, 17 etc, so multiply by 100 and add 2 to each value if your data is in 5 percent intervals (e.g. 5% becomes 7, etc). Note: If no condition data is available iTree defaults to assuming 87% crown completeness for all trees (including dead ones) which will greatly overestimate the benefits. The first draft of the natural capital report using only Woodland Trust data did not use crown condition data resulting in an over-estimate; this was corrected in the second version when the full Estate inventory was available.
- o When you have set up these columns, set up a column called Import? and mark all the rows that have complete data for dbh, species and location. Select just these rows and just the iTree columns, and Paste values and formats only onto a new Import sheet.
 - Open iTree-Eco Desktop and follow the instructions in InventoryImporter.pdf to import the data from the spreadsheet.

- o Choose File / New Project and select 'Complete inventory. Enter a file name to save the project to.
- o Configure the project in Project Definition.
 - On the Location tab, select UK / South east / Oxfordshire / West Oxfordshire in the dropdowns.
 - In Weather and Pollution year, select the most recent year that has pollution data (currently 2015).
 - Select the weather station closest to Blenheim, using the pop-up map – this is currently Brize Norton.
 - In the Data collection options tab, select the following options:
 - Metric (not English) units
 - Land use
 - Status
 - Street tree / non-street tree (Default non-street-tree)
 - Map co-ordinates (this will be Lat and Long)
 - Public /private (default private)
 - Crown health: Condition
 - User tree ID
- o Click on OK. You will see a list of all the reports than can or cannot be generated with this set of input data.
- o Import the spreadsheet data. Go to the Data tab and click on Trees; the Import icon will then become usable. Select your spreadsheet and select the correct worksheet to import. The worksheet will appear. Tick 'First row contains headers' and then 'Next'. Go through each column from left to right. Choose the equivalent iTree Eco field in the dropdown at the bottom for each column you are importing. If you get red exclamation marks, this means you need to tick the checkbox for 'I need to map my source column values to Eco-field values'. Map the following fields (ignore the others).
 - User ID
 - Species – select 'Common name' (unless you have entered as Latin names or iTree codes)
 - Dbh – map to DBH1
 - Land use – select 'Description' in the second drop down
 - Public or private, Status and Street Tree - tick the checkbox for 'I need to map my source column values to Eco-field values'.
 - Crown condition – select 'Condition %' in the second dropdown. Tick the 'I need to map...' box so you can correct any errors later.
 - Latitude, Longitude and Comments
- o Select 'Next' and you will be prompted to map any unrecognised values. For example in the Status field you can tell iTree that I represents Ingrowth, or you can convert Y to Yes. For some reason you always need to do this for certain fields even if you already entered correct values, so you end up mapping Yes to Yes, etc. For Crown condition you will see any rows that do not match the iTree default mid-point values of 2, 7, 12, 17 etc and you can map these to the appropriate range, e.g. map 3 to 2, and 102 to 100.
- o Click next, and check that all rows are able to be imported. Click Finish to complete the import.
- o Set the benefit prices so that carbon matches the most recent value published by the government. You will need to set an exchange rate – there is a button to do this for you. If using avoided runoff treatment costs these are provided in 2004 prices. Convert to the current year using the government GDP deflator.

<https://www.gov.uk/government/collections/gdp-deflators-at-market-prices-and-money-gdp>

- o Click on Check data to make a final check for errors. NOTE: you will get errors for trees over 254cm diameter which will all be set back to this value. That means that carbon stored will be an underestimate for those trees. You can ignore these error messages.
- o Go to reports and Submit data for processing. When the run is completed you will receive an email. You can then view and download the report and metadata from Reports – Track and retrieve results.

10 Groundwater

Clip the Groundwater WFD Oxon layer to the Estate boundary (if the boundary has changed) and paste the areas of Good and Poor chemical status into the table on the Habitats sheet, to update the pie chart. It is easiest to export to a spreadsheet and use a pivot table.