# **RESAS1.4.3c: Visualisation of Future Woodland Scenarios**

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Suggested citation: Donaldson-Selby G (2017) Visualisation of Future Woodland Scenarios, James Hutton Institute, 9 pp.





#### Introduction

This project is part of the SRP WP 1.3.2, Objective 1, Interdisciplinary assessment of the effects of management interventions on woodland-related ecosystem service supply and WP 1.4.3, Practical interventions to realise multiple benefits and manage trade-offs. In conjunction with other methods visualisation will used to assess perceptions of ecosystem services (ES) as they change in response to management measures, thereby providing a dynamic perspective on the effectiveness of these interventions. Visualisation technologies, such as Touch Tables and Oculus Rift Virtual Reality headsets, will facilitate the collection of data and stakeholder engagement and will also be employed to help land managers and other decision-makers to assess and evaluate the impact of ES management and ecological restoration.

# Study Site(s)

At this time (28/06/2017) Forest Woods in Cumbernauld has been selected, in conjunction with Duncan Clark, Ian Mackenzie and Tracy Lambert of Scottish Wildlife Trust, as one of two study sites in Cumbernauld (see Fig 1. Cumbernauld Greenspaces). The Scottish Wildlife Trust has produced a *Long-term Forest Plan* (LFTP) for the four forest reserves in Cumbernauld "which aim to deliver long-term environmental benefits through sustainable forest management...The objective of the LTFP is to co-ordinate future management of the woods with a view to enhancing the amenity, landscape, recreational, and biodiversity benefits" (Cumbernauld Greenspaces Long-Term Forest Plan, 2011. P. 1).

- Forest Wood is situated on the south eastern edge of Cumbernauld, in North Lanarkshire,
  1 km from the town centre. The reserve lies to the north of Palacerigg Country Park and
  Fannyside Muir.
- Forest Wood is a 90 ha area comprising of mixed of old broadleaved plantation woodland, more recent coniferous and broadleaved plantation woodland, naturally regenerated broadleaved trees, areas of grassland, peat bog and several small fire ponds. Around 70% of the reserve has woodland cover.
- ) The southern part of the reserve includes part of Fannyside Muir, which is the best example of blanket bog in North Lanarkshire.
- ) The Scottish Wildlife Trust's long-term vision for Forest Wood is to gradually increase the proportion of native woodland until the woodland contains only native species, and to improve the other habitats present within the reserve.

(Cumbernauld Greenspaces Long-Term Forest Plan, 2011. P. 2)

The main identified issues relating to the reserve (and relevant for the visualisation) are:

- The dominance of non-native tree species, and thus plans for significant changes in tree species across the reserves
- The presence of coniferous plantation on bog habitat again, this will lead to visible changes as trees on bog have been removed and there will be further changes

- Importantly, the area of ground to the north and west of the reserve that is designated as a Community Growth Area by North Lanarkshire Council and any development is likely to put additional pressure on the woodland and to increase the hazard risk for woodland edge trees<sup>1</sup>.
- ) The regular occurrence of anti-social issues such as fly tipping and fire raising.

The main aims of the LTFP are to increase the proportion of native woodland; to improve biodiversity values, to enhance management and public access, and to <u>develop the woodland's robustness adjacent to the Community Growth Area.</u> (Cumbernauld Greenspaces Long-Term Forest Plan, 2011. See Fig. 2 Forest Woods: Opportunities and Constraints and Fig 3. Forest Woods: Proposals).

# **Visualisation Focus**

The visualisations intend to focus on the following (above) aims of the LFTP - namely to show:

- ) The visual impact of increasing the proportion of native woodland
- ) The visual impact of management and public access (e.g. paths and community areas)
- Various options, as discussed in meetings and detailed in *Functional Buffer Zones* (2015), to enhance the resilience of the forest edge adjacent to the Community Growth Area.

# Approaches to visualisation

All of the visualisations will be geographically based such that landscape views are scientifically defensible. Possible approaches include:

- High-resolution static images
- 3 Dimensional interactive visual simulations
- Immersive 3 Dimensional visual simulations for Virtual Reality (VR) Headsets e.g. Oculus Rift

High resolution static images, which are rendered from 3 Dimensional models, can contain high levels of detail – including understories – as they are not generated in real-time. However the viewpoint cannot be changed.

<sup>&</sup>lt;sup>1</sup> "A large area of ground directly to the north and west of the reserve is zoned as a Community Growth Area and will most likely be developed for housing in the future. If and when the area is developed, there will be restricted access to a large section of the woodland edge. Depending on the layout of new housing there may also be issues in relation to trees overshadowing houses and gardens. There may also be new pressures on the woodland edge in the form of fly-tipping and the dumping of garden waste, as well as an increase in recreational use". (Cumbernauld Greenspaces Long-Term Forest Plan, 2011, p. 21)

Three Dimensional interactive visual simulations (projected or Touch Table) allow the user to change viewpoints and interact with the model. Because the visual simulation is rendered in real-time it will usually be simpler with less detail. In the context of visualising woodlands it is usually the understories which are compromised. We have successfully used 3 Dimensional interactive visual simulations for stakeholder engagement in previous RESAS work packages – i.e. in Falkland, Dundee and Tarland.

Immersive 3D visual simulations attempt to immerse the viewer in the scene and generate a sense of presence. As the computational load on the CPU and GPU is high, higher spec, more expensive hardware is required, including the VR headsets. High-performance software (gaming engines) is used in these simulations. Immersive 3D visual simulations have been trialled at the Royal Botanic Gardens Edinburgh event, the FLARE conference and Royal Highland Show. Our experience of VR headset based models is that they can be highly convincing but require one-on-one assistance/explanations. Without an adequate menu and navigation system built into the model they can be very difficult to use as the user cannot see the keyboard. We anticipate that such a menu system will be available during 2018.

At a meeting with Scottish Wildlife Trust members on 27/06/2017 a 3 Dimensional interactive visual simulation of the Forest Woods study site was presented (see Fig 4) and it was agreed that this form of visualisation would be highly suitable for presenting proposals to stakeholders and surrounding communities. High-resolution static images may be generated for specific areas, as required. The 3 Dimensional interactive visual simulation will be modelled in Visual Nature Studio (https://www.3dnature.com/) and presented in Vega Prime (http://www.presagis.com/products\_services/products/modeling-simulation/visualization/vega\_prime/). We have used these software for some years for the generation and simulation of 3D models in the James Hutton Institute's Virtual Landscape Theatre - http://www.hutton.ac.uk/learning/exhibits/vlt - and are familiar with them.

# **Suggested Visualisation Scenarios**

At the meeting with Scottish Wildlife members on 27/06/2017 the following future scenarios (Eastwood 2017) for Forest Woods were agreed.

- A Future (2031) scenario with minimum budget. Minimal management of the woodland, with overgrown paths, exotic garden invasives, fly tipping, fire raising and dog fouling.
- A Future (2031) scenario that follows the Management Plan. Selective thinning of the woodland and removal of non-native conifers. A patchwork of habitats from open grassland, heathland and restored mire (lowland raised bog) surrounds diverse woodlands. A natural buffer zone ensures that garden exotics can be controlled and integrates the woodland and the surrounding communities with a core path network.
- ) A Future (2031) Maximising conservation and biodiversity scenario. Extensive thinning of the woodland and complete removal of non-native conifers. Restored peatlands, the diversification of woodland types and expansion of the habitat mosaics of grassland, heathland and muir has resulted in an improved biodiversity. 'Green fingers' of mixed vegetation (rowan, hawthorn and other small trees and bushes that

attract a variety of birds and insects) are reaching into the new housing area and help to improve connectivity. A natural buffer zone ensures that garden exotics can be controlled and integrates the woodland and the surrounding communities with a core path network.

A Future (2031) Maximising people/community engagement scenario. There is less emphasis on biodiversity and many of the non-native trees remain. The focus is on community use, including wood fuel, fruit trees, allotments, nature based education, sports and amenities.

It is envisaged that there would be one 'master' visualisation based on the present day with aspects of the above scenarios which could be switched on and off. These could include the Community Growth Area, a 20 metre buffer zone consisting of vegetated swales and bunds to restrict the spread of garden exotics from the Community Growth Area, thinning of the woodland, removal of exotic conifers and replanting with indigenous broadleaves, removal of trees on the peatland and restoration thereof, creation of appropriate paths and networks, creation of fire ponds, building a woodland resource centre, and integration (green fingers) of the woodlands with the Community Growth Area. The visualisation will be iteratively developed in conjunction with members of the Scottish Wildlife Trust.

# Acknowledgements

This report was funded by the Rural & Environment Science & Analytical Services Division of the Scottish Government.

#### References

Eastwood A (2017) Draft scenarios for Forest Wood, James Hutton Institute, Aberdeen.

Scottish Wildlife Trust (2011) Cumbernauld Greenspaces Long-Term Forest Plan. Cumbernauld.

Scottish Wildlife Trust (2015) Functional Buffer Zones: Best practice to protect sensitive sites, Cumbernauld Living Landscape, Cumbernauld.



**Fig 1**: Cumbernauld Greenspaces. (Cumbernauld Greenspaces Long Term Forest Plan, 2011. Reproduced by James Hutton Institute,© copyright and database right 2015. All rights reserved. Ordnance Survey Licence Number 100019294).



Fig 2: Forest Woods: Opportunities and Constraints. (Cumbernauld Greenspaces Long Term Forest Plan, 2011. Reproduced by James Hutton Institute, © copyright and database right 2015. All rights reserved. Ordnance Survey Licence Number 100019294).



**Fig 3**: Forest Woods: Proposals. (Cumbernauld Greenspaces Long Term Forest Plan, 2011. Reproduced by James Hutton Institute, © copyright and database right 2015. All rights reserved. Ordnance Survey Licence Number 100019294).



Fig 4. Three Dimensional interactive visual simulation of the Forest Woods study site, 2017. G Donaldson-Selby. James Hutton Institute.