North Devon Biosphere Reserve and Forestry Commission Impact Case Studies

The following case studies illustrate how and in what areas of NDBR and FC activity, the SWEEP THaW Toolbox is being used to provide a more precise, cost-effective and timely understanding of the extent, state and change over time of tree, hedgerow and woodland natural capital assets, thereby informing more robust and sustainable decision making.

Impact Case Study 1: North Devon woodlands back into management

Summary

As part of the £1.47m of Community Renewal Funding (CRF) awarded to North Devon in November 2021, the THaW mapping tool is being used to support surveys on current woodland condition in order to identify neglected and undermanaged woodlands. This is helping to prioritise areas of woodland that can be brought back into active management or where new woodland can be created.

What's the issue and why does it matter

Running up to July 2022, £185k of the £1.47m CRF award will be spent on the North Devon Biosphere Reserve's (NDBR) woodlands. Accounting for 11.4% (26,400 Ha) of the terrestrial part of the Biosphere Reserve, these are a vitally important asset and as such, are a designated Woodland Enterprise Zone (WEZ). Regional strategy aims to deliver WEZ interventions that help to create a stronger woodland economy.

North Devon covers an area of 2500km2 which includes the whole of the Biosphere Reserve area. Within this, currently only around 40% of woodlands are in management. The aim is to bring back at least 20% of this into management by 2030; representing a 50% increase in active woodland management. Based on current figures from the forest policy framework 2017:2027, it is anticipated that this will result in a significant positive impact for the local economy, for example by –

- increasing timber production from approximately £16m to £24m
- safeguarding the existing 460 jobs in this sector and adding to this with an further estimated 230 jobs
- boosting ecosystem services from approximately £58.5m to £87.75m

How is the THaW tool helping and what impact is it generating?

(A) THaW creates a more robust woodland baseline that enables effective project delivery and boosts the local economy. In this way, the THaW mapping tool is being used to -

- Identify and quantify woodlands not currently in management - in conjunction with Forestry Commission data on licenses, felling, and management plans.

  The THaW tool offers various advantages. The National Forest Inventory only delivers maps at a scale of 0.5 ha, whereas THaW produces mapping outputs that can show individual trees. By offering improved granularity and an easy to read, clear, visual mapping output, THaW has the benefit of providing an enhanced picture of total tree cover, and therefore, the whole woodland opportunity. It also saves the user time, and therefore money, by replacing previous methods for undertaking this work that are less accurate and slower to use e.g. digitisation analysis of aerial photographs.

- Identify failed plantations from the past 20 years – the THaW mapping outputs are beginning to be cross-referenced against historic data to identify failed areas of planting. This is one of the specific aims of CRF WEZ funded projects and which aims to bring these areas back into productivity in the broader sense - both for timber production, as well as for enhancing biodiversity and delivering ecosystem services.

This work would previously have been undertaken using normal classification methods on optical imagery; analysis that often results in significant errors. In contrast, because THaW combines remote sensing SAR and LiDAR data to look at the physical structure of woodlands, it provides data outputs that are considerably more accurate.

(B) Supporting robust policy implementation and evaluation

THaW provides an accurate and easy method for monitoring the impact of this work in the WEZ overtime. We will use the tool to understand changes in the woodland overtime, in relation to planned interventions, which allows us to know how effective our policy has been to bring woodlands back into management.

Into the future with THaW …

As the THaW tools continue to be refined, we anticipate benefitting from it further in relation to woodlands back into active management. For example, the THaW change detection tool will enable the NDBR to be able to better understand, and monitor over time, the impact of thinning interventions in existing plantations; a key element of successful active woodland management.

The survey work as part of the current CRF project in North Devon, provides an opportunity to provide valuable ground truthing data for the THaW tools, which will help to strengthen their predictive capacity, thus enhancing its application and value.

Impact case study 2: Detecting canopy loss in rapid response catchment areas

Summary

As part of its woodland responsibilities the NDBR, in conjunction with the Environment Agency (EA), monitors areas at risk of large sediment loss due to felling. The THaW tool was used in a recent consultation on a draft woodland management plan in two steep rapid response catchments in North Devon. This enabled NDBR to provide more timely and accurate advice to the land manager, avoiding the need for a site visit. With its 3-month time lag mapping outputs, the THaW mapping tool is also being used to instigate a more pro-active identification of woodland canopy loss in areas where felling activities could result in significant soil erosion.

What's the issue and why does it matter

The NDBR has many areas of steep sided woodland that, if inappropriately felled, would most likely lead to significant and damaging soil loss. There is a need to be able to more quickly identify areas of existing clear fell that could be of concern, and better advise land owners on new management plans, so that remedial action can be taken to reducing soil damage, avoid financial and environmental costs.

How is the THaW tool helping and what impact is it generating

The THaW mapping tool was used in conjunction with a management plan consultation on two steep rapid response catchments in North Devon before it was implemented. Unlike traditional approaches involving site visits (that require time and money) and the assessment of aerial photographs (that often provide coarse and inaccurate data), THaW mapping outputs allow for a quick and accurate desk-based determination of canopy height and, therefore, likely impact of felling.

Impact Case Study 3: Supporting the Forestry Commission across a range of its activities, including the detection of illegal tree felling.

What's the issue?

The Forestry Commission is responsible for protecting, expanding and promoting the sustainable management of woodlands, while increasing their value to society and the environment.

Being able to quickly and accurately assess its forest assets, and monitor changes in these over time, enables the Forestry Commission (FC) to develop robust strategies to deliver on its objectives and take swift and cost-effective action in response to issue that arise.

Traditionally the FC has relied on Google Earth aerial photographs, and undertaken multiple field visits to obtain this data. However, these methods are slow, labour intensive and costly, and often delivering low-quality data.

Why does this matter?

- 13% of the UK is forested land and in 2021 the UK forestry market was estimated to be worth £262.7m.
- To protect and enhance this land, the FC needs to undertake a range of activities effectively and efficiently. Accurate, cost-effective and quickly accessed data is key to this.
- One such activity is monitoring and reducing illegal felling – an issue that is on the increase with significant financial implication e.g. costs the FC money to monitor and respond to this/ loss of timber/ impact of this on natural capital goods and services e.g. carbon, soil etc

What benefits do the THaW tools offer the FC to tackle issues such as illegal felling?

In contrast to the traditional approaches to forest monitoring described above, the THaW mapping tool box brings numerous advantages - it autonomously and rapidly generates high spatial resolution baseline and canopy loss maps, across landscape extents, using $2m^2$ LiDAR data and Spaceborne Synthetic Aperture Radar (SAR) data. This produces significantly more detailed, extensive and easy to use maps vs established methods.

As a result, the THaW tools are increasingly being used by FC staff for the following benefits:

- ✓ **Quickly identifying the area of deforestation** - that could be linked to illegal felling activity, enabling swift and accurate deployment of a FC field officer.
- ✓ **Increased confidence in the presence of alleged illegal felling activity** - by providing robust mapping evidence of deforestation over time. This is particularly important where deforestation has occurred little and often, and where evidence (felled timber) has been removed from the site.
- ✓ **A quicker, and more accurate, understanding of the timeline of change** - i.e. by generating a series of canopy loss maps it's possible to determine what felling has occurred, where, and over what period of time.
- ✓ **Increased confidence in taking alleged illegal felling cases to prosecution** - especially where previously a lack of written or photographic evidence would mean a case couldn't proceed.
- ✓ **Delivering cost-savings** - for site visits that require two people (with travel, accommodation and site survey costs) vs one person undertaking a desk study of the THaW images. These savings are realised either by reducing or eliminating the need for initial site visits, or by increasing the efficiency of visits. The increased accuracy and higher spatial resolution of THaW data (vs existing aerial photographs) offers FC staff a more comprehensive site specific picture in advance of any visit. This enables staff to be more prepared, which in turn reduces the time required at the site, increases the efficiency of site visit work, and follow up work.
  - ➢ No. of alleged illegal felling (AIF) cases - between 2019-21, there was an average of c.750 cases of AIFs in the UK; a sharp rise from an average of c.260 AIFs in the 3 years before that. AIFs in the South West are currently between 125-150 pa.
  - ➢ Cost-savings – out of 150 AIFs pa in the South West, it is likely that 30% of these sites would no longer require a visit where THAW was used instead to verify felling. This represents a day's salary cost-saving for two people over 45 sites, allowing focus instead on the creating woodlands effort. These cost-savings are likely to increase going forward.
- ✓ **The potential to be pro-active** – identifying sites of possible illegal felling rather than waiting to be alerted. Although the better approach, this raises concerns about levels of work and a mismatch with current FC resource. However, THaW proves the potential to be able to do this, and as such may help to strengthen cases for further investment in FC resource.
- ✓ **Economic savings** –
  - ➢ Providing a more accurate understanding of biodiversity loss and change arising from unauthorised tree removal. Also enable the tracking of ecosystem services loss, as a result of tree loss – by aggregation and extrapolation of data from more detailed surveys to quantify habitats and ecosystem services.
  - ➢ By being more pro-active, THaW could help secure natural capital goods and ecosystem services savings that would otherwise have been lost due to illegal tree felling e.g. carbon sequestration, soil and water quality.
- ✓ **Supporting wider FC operations** - The THaW tools are also being increasingly being used to support more effective operations across a range of FC's work. Specific examples include detecting indicative change in hedgerows and inspecting and monitoring thinning activities

Examples of where ThaW maps have been used to evidence illegal felling activities:
Illegal feeling alerts are assessed on a case by case basis. The THaW tools and maps are already being used to benefit this work by enabling effective monitoring and assessment of deforestation activities that could constitute illegal felling. Many of these cases can't be mentioned as they are currently undergoing prosecution, but below are two examples of sites on Dartmoor where low levels of illegal felling have been tracked and evidenced using the THaW tools. These cases didn't progress to prosecution, but demonstrate how THaW clearly shows deforestation occurring under the radar that wouldn't otherwise have been detected.

These Images illustrate the automated detection of young woodland cover, lost or deforested, within a single calendar quarter (red areas) for two sites on Dartmoor. These cases provide evidence of non-permissive tree loss. These data are shown alongside the THaW baseline mapping product, and open-source aerial photography.


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THAW Legend
Below 1.3m (Fragmented - Scrub, Bushes or Misc e.g. fence/dry stone wall <10m2)
Below 1.3m (Scrub, Bushes or Misc)
Below 3m (Managed Hedegrow, Large Bushes)
Below 15m (Trees)
Above 15m (Large Trees)
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Below 1.3m (Scrub, Bushes or Misc)
Below 3m (Managed Hedgerow, Large Bushes)
3m to 15m (Tree Canopy, Mature Hedgerow)
Above 15m (Contiguous Tree Canopy)
Above 15m (Individual Trees)
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