sweep

DNPA Impact Case Studies

The following case studies illustrate how and in what areas of DNPA activity, the SWEEP Habitat Classification and Change Detection tools (developed specifically for DNPA), as well as the THaW Mapping Toolbox and Change Detection tool, are being used to provide a more precise, cost-effective and timely understanding of the extent, state and change over time of natural capital assets and thereby informing more robust and sustainable decision making.

Impact Case Study 1: Peatland management and restoration work

What's the issue?
A vital habitat for many plants and threatened bird species, water quality, carbon sequestration, landscape and recreation and archeological interest, peat bogs are under significant threat. Research carried out by the University of Exeter found that just 1% of Dartmoor's peatland area is still intact, whilst much of the remainder has been severely damaged by drainage, cutting, drying and erosion.

The South West Peatland Partnership is tasked with restoring 1599 ha of degraded peatland on the South West's moors (Bodmin Moor, Dartmoor and Exmoor) - around 300ha of this is on Dartmoor.

How are SWEEP Habitat tools being used to address this issue, and what benefits are they providing both now and anticipated over the next few years?

- **To identify new areas for peatland restoration** – through their ability to measure peat depth, identify habitat type and monitor vegetation change over time, the SWEEP maps will be used to inform detailed peatland restoration and monitoring plans, and used to answer questions from Commoners around their future grazing management in relation to peatland.

  'The work has been extremely important and complementary to Naomi's previous work on the remote sensed depth of peat. It has added an extra dimension that would otherwise have been missing from a data set had it been generated elsewhere, or if we had relied on some nationally generated map'. ***Richard Knott, DNPA's Ecologist.***

  'Working with the MOD as a landowner on Dartmoor, the SWEEP tools provide an opportunity to reveal priority areas not previously identified as part of the Peatland Partnership bid'. ***Richard Knott, DNPA's Ecologist.***

- **To explore the value and limitations of using landscape scale remote sensing data** - such as that produced by SWEEP, for informing this kind of work, in comparison with traditional site scale surveys. Findings and recommendations to be shared to encourage wider uptake and further development of these kind of tools.

Impact Case Study 2: Natural capital mapping for carbon sequestration enhancement on DNPA land
What's the issue?
The planet's natural carbon cycles are designed to be kept in balance through its ecosystems such as forests, oceans, and soils sequestering carbon. But rising human-induced CO_2 emissions has thrown nature significantly out of balance.

As Governments begin to understand and support the vital role of ecosystems in climate mitigation and adaptation strategies, a growing need and opportunity exists for land managers to understand their current

natural capital asset and value in terms of carbon capture (credits) and how this can be enhanced to provide a nature-based solution for reducing carbon emissions.

How are SWEEP Habitat tools being used to address this issue, and what benefits are they providing both now and anticipated over the next few years?

- SWEEP Habitat classification tool data are being used, along with Cranfield soils data, on some of DNPA's large land holdings (e.g. whole Haytor/ Holne Tor) to develop an effective sampling strategy to quantify (and value) the existing and potential for carbon capture in these areas. This is enabling a more accurate, timely and landscape-scale assessment than would otherwise have been possible and will help to inform effective future DNPA carbon sequestration strategies.
- It is anticipated the THaW dataset will also feed into this. For example, to determine tree height and stand density which, used alongside the farm carbon tool kit, can determine volumes and values of standing carbon. Additionally, calculate carbon storage values for woody boundaries (e.g. gorse and scrub) to inform what particular mix of species to plant in a boundary, and over what length, to accrete a quantified amount of carbon.
- Longer-term, it is hoped this ground-breaking work could lead to a publication of methodology and findings to benefit the whole national park (producing a full carbon audit), other areas of work e.g. Environment Net Gain, and wider beneficiaries such as farmers, as they seek to work collaboratively, across landscapes, taking advantage of developing carbon markets.

Impact Case Study 3: Informing Defra policy by strengthening the submission of DNPA's ELMs T&T work

What's the issue?

There are three new schemes that will reward environmental land management. These schemes are intended to support the rural economy while achieving the goals of the 25 Year Environment Plan and a commitment to net zero emissions by 2050.

Between January 2020 and November 2021, DNPA were invited to input to Defra's Environmental Land Management Scheme (ELMs) via a Test and Trial (T&T) by exploring a 'payment by results' approach which could operate on commons as well as home farms.

An advisory team of farmers and landowners guiding the T&T wanted to use a scorecard as a land management plan to deliver the whole of the ELM on a payment by results basis, looking to score based on the costs of delivering public goods and the value of these goods. Two iterations of the score card were developed and trialled on Duchy Dartmoor demonstration farms and sense checked against other farms Dartmoor, Exmoor & Bodmin.

How are SWEEP Habitat tools being used to address this issue, and what benefits are they providing both now and anticipated over the next few years?

- The SWEEP Habitat tool/ map was vital in enabling the proportion of different habitat cover on each land holding to be calculated. This was a key piece of information in determining payment rates per ha. Payment rates were calculated by multiplying the score allocated to each habitat type (in accordance with the estimated cost of delivering public goods on them) by the amount of that particular type of habitat cover on the farm. Calculating this for each of the different habitat types, provides a total payment for the holding. Thus, SWEEP Habitat maps were submitted to Defra along with the second iteration of the scorecard.
- One of the issues identified early in the T&T was the challenge of regularly, affordably and consistently mapping the Dartmoor landscape. SWEEP maps made this possible at a very low cost. This meant habitat

maps could easily be generated for every farm and common involved, as well as using other data sets to show information related to the scorecard, such as heritage assets.

- A clear majority of the farmers/ commoners and landowners involved in the T&T felt that using the SWEEP maps would help them in the future to use the scorecard and identify where to locate different habitats on the farm.
- Furthermore, 16 out of 17 trial home farms felt the maps would help them monitor habitat change over time. Participants were entirely positive about the potential to use the SWEEP maps to pre-populate some of the scorecard answers but 100% of participants felt that they would only want to use that approach if data could be easily corrected where necessary.
- Following this work it was recommended that the SWEEP tool and maps were hosted on a suitable platform so farmers can access easily – not just for monitoring purposes but for reporting and decision making. It was also suggested that farmers could help ground truth the data whilst they self-monitor thier payments.

Impact Case Study 4: Strengthening the delivery of current DNPA projects and new proposals

What's the issue?

DNPA covers an area of 86,186 acres and is currently managed in line with the strategic Dartmoor Partnership plan 2021-26. This has an ambition to manage better for climate change; the next generation; for nature and natural beauty; for cultural heritage; for people; for farming and forestry and for business and communities.

To do things 'better' DNPA is keen to be at the forefront on new technologies and data that can inform more timely, accurate and cost-efficient decisions for land management practices that deliver greater environmental, community and economic benefits.

How are SWEEP Habitat tools being used to address this issue, and what benefits are they providing both now and anticipated over the next few years?

- The innovative and ground-breaking SWEEP tools help to meet this need, and are already being used to enhance the decision making and delivery on the ground. As Richard Knott, DNPA's ecologist attests:

  'SWEEP Habitat classification and ThaW baseline tools are now the primary landscape scale data for the National Park and SWEEP mapping is providing the mainstay of our habitat monitoring from now on. Both the Habitat and THaW datasets are being used on a daily basis – from advising event organisers on where to locate and manage Dartmoor runs to minimizing the impact on fragile habitats to Commons grazing advice'.

- One project already benefitting from SWEEP's Habitat maps is the Defra funded Dartmoor Farming in Protected Landscapes Programme (FiPL) DNPA is delivering. The maps are used on a weekly basis both to help farmers understand their opportunities for nature enhancement and for the project management team to assess the wider landscape habitat context of land holding when enquiries are received from potential applicants.
- The SWEEP tools have already been used to successfully leverage funding in association with DNPA, for example the £X Landscape Recovery Scheme project for East Dartmoor, with the Devon Wildlife Trust and University of Exeter. The results of the Habitat Classification tool were used to quantify a baseline for priority habitat in the landscape project area.
- The SWEEP tools will be the primary source for habitat mapping during the proposed 6 years of delivery for the current (>£5.5m) Heritage Lottery Fund bid. This will work with land managers over three of Dartmoor's river catchments, piloting approaches to nature enhancement that respond to post Brexit agri environment schmes, green finance markets and changing societal views/needs from farming. The mapping tools will initially to support land managers' understanding of what they have and opportunities/planning and then to

monitor and report on progress. The confidence scores in the tool will guide our citizen science work, engagement with volunteers with targeted ground truthing surveys.

Impact Case Study 5: **Accelerating DNPA's partners' work e.g. RSPB's Common Cause indicator bird species study**

What's the issue?

Certain species of birds are used as an indicator of the general quality of the environment because birds sit near the top of the food chain. Monitoring the populations of these species and understanding the types and quality of habitat they need to survive and thrive is key for management and restoration projects. This RSPB study is one such survey.

How are SWEEP Habitat tools being used to address this issue, and what benefits are they providing both now and anticipated over the next few years?

- The SWEEP Habitat tools have provided important additional layers of data to the RSPB study which is examining the factors that are influencing changes in Whinchat, Tree Pipit and Cuckoo distribution between the late 1970's and present, especially in relation to habitat.
- Adding to the already collected 'fine-scale' vegetation information, the SWEEP tools provide 'landscape composition' variables for the final study analysis which help identify key habitats and features preferred by the indicator bird species e.g. bracken. The SWEEP data has provided information that RSPB wasn't able to obtain through fieldwork and at a level of detail that wasn't possible through other existing remotely sensed datasets (e.g. the Land Cover Map, which focuses on coarser land cover categories).
- Thus it will play a key role in increasing the robustness and accuracy of this RSPB's study, and any future conservation work it informs.
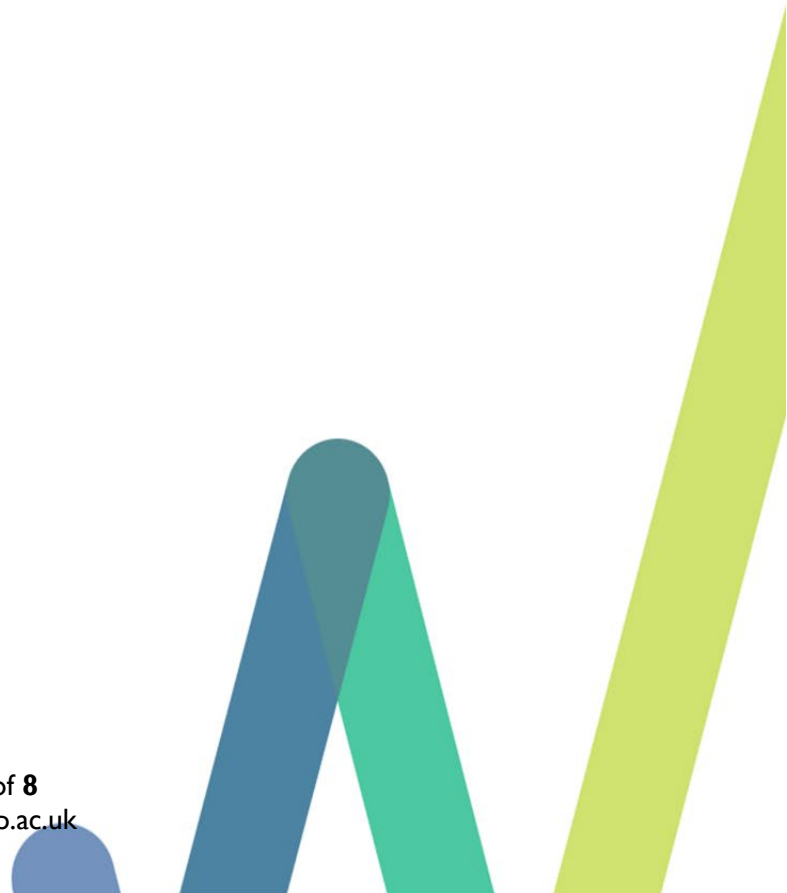
are considerably more accurate.

(A) 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.

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 Hedgerow, Large Bushes)
- Below 15m (Trees)
- Above 15m (Large Trees)
- change in last 3 months
- change for selected period

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 Hedgerow, Large Bushes)
- 3m to 15m (Tree Canopy, Mature Hedgerow)
- Above 15m (Contiguous Tree Canopy)
- Above 15m (Individual Trees)
- Change in last 3 months
- Change for selected period